Class 13, 2/21/23: Finishing Bases; Phonetics in phonology I

1. Current assignments

- Please hand in your MaxEnt phonotactics homeworks (if you didn't get an extension)
  - ➢ Don't forget to email me your spreadsheet.
- Web site is still down: please visit instead
  - ➢ https://www.palisadessymphony.org/temp/index.htm
- Read:
  - ➢ Steriade, Donca (2001) Directional asymmetries in place assimilation. In E. Hume and K. Johnson (eds.) *Perception in Phonology*, Academic Press
  - ➢ No summary required
- New homework: Indonesian stress, due in class Tues. Feb. 28.

FINISHING UP BASES

2. So far

- Classical inside-out theory (*SPE*, Lexical Phonology, Stratal OT)
  - ➢ "Optional cyclicity" as a problem for these theories
- Steriade and Breiss on split bases
  - ➢ Evidence for a simple MaxEnt vote, from "malign" (anti-alternation) bases
- Steriade on inflectional bases for derivational morphology
- Albright on inflectional bases — the privileged paradigm slot, learned early as most informationally nutritious
  - ➢ Evidence from historical change (basis of changes in other slots; never changes itself, never a paradigm gap)

3. A possible refinement to the Albrightian system: intermediate bases
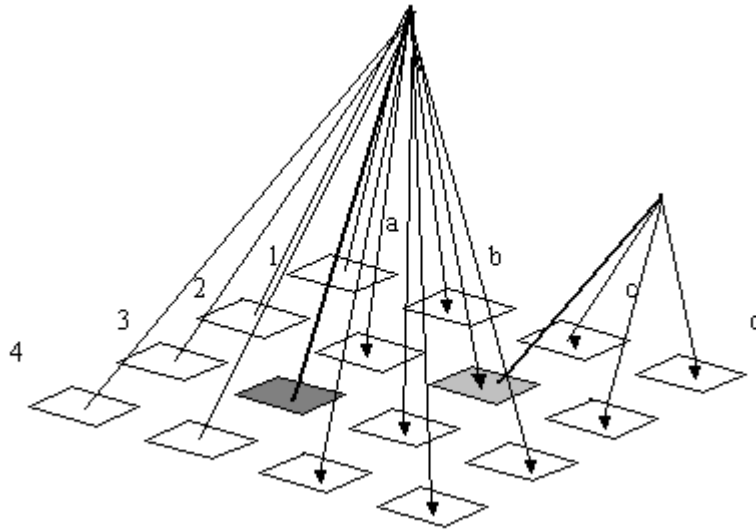
- Dark gray = primary base, light gray = secondary
- Store (at least) those members of the secondary base category that cannot be predicted from the primary base, then use them (along with predictable forms) to form the local derivatives.
- For a working out of this idea for French morphology, see
  - ➢ BONAMI, OLIVIER, and GILLES BOYE. 2002. Suppletion and dependency in inflectional morphology. *Proceedings of the 8th International Conference on Head-Driven Phrase Structure Grammar*, ed. by Frank Van Eynde, Lars Hellan, and Dorothee Beermann, 51–70. Stanford, CA: CSLI Publications.
  - ➢ Bonami, Googlable, has continued this research direction since.

4. Bonami and Boyé's dependency tree for French *boire*
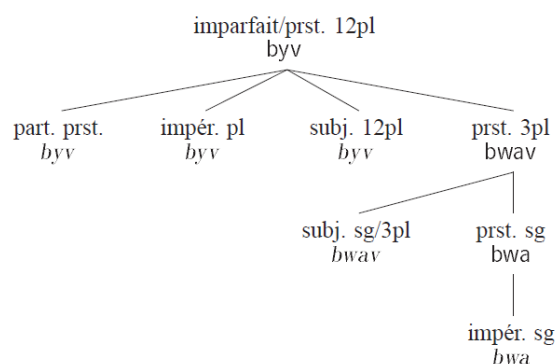

Figure 4: The stem dependency tree for *boire* ('drink')

5. Intermediate bases in traditional language description — *principal parts*

- Many languages are described as having *multiple stems* for each word.
- Persian: every verb has a **present stem** and a **past stem**.

- ➢ To form the past from the present in "regular" cases, attach [-id]: pres. [xɑb], past [xɑb-id] 'sleep'
- ➢ But irregular forms probably actually outnumber the irregular:

[gu] ~ [goft]	'speak'
[ʃu] ~ [ʃost]	'wash'
[kon] ~ [kard]	'do'
[ʃæv] ~ [ʃod]	'become'
[bin] ~ [did]	'see'

- ➢ This is less awful than it sounds: there are only so many verb stems, since most verbs are compounds (typically "X-do" or "X-become").
- ➢ But once you know the past stem, you can form the various inflected past forms:

past	[goftam] 'I spoke')
infinitive	[goft-an]
past participle	[goft-e]
future	[xɑh]-person ending-[goft]

and several more. These are regular.

6. "Unmotivated" intermediate bases

- The Persian past stem is the base of many different forms, which do not (to my knowledge) have a clear morphosyntactic basis.
- A long-standing analytic tradition in linguistics tried to make unmotivated bases look more motivated.
- But perhaps we should *expect* unnatural mapping relations in morphology, just like in phonology, and for the same reason — diachrony.
- From a learning-theoretic perspective the idea is not so absurd, perhaps:
  - ➢ Diachrony dishes out arbitrary relations of predictability.
  - ➢ Assiduous children locate them and use them, for they are helpful.
  - ➢ In fact, assiduous children even extend them, if Maiden (cited below) is right.

7. Intermediate bases in agglutinative languages

- E.g. Turkish, Bantu, Inuit
  - ➢ Perhaps these would involve a very heavy use of intermediate bases: the word is built up affix by affix, with each position forming an intermediate base.
  - ➢ The Albrightian approach is more focused on complex systems where a single paradigm slot is being filled.

A TINY BIT ON LEXICALIST INFLECTIONAL MORPHOLOGY

8. A general take on lexicalism as applied to paradigms

- Baayen and others: the inflected lexicon is, more than we tend to think, approximated by the idea of a gigantic list.
  - ➢ Evidence: even many regular forms get listed, as shown by priming experiments.

- The lexicon is a "navigable" list, in that speakers learn to predict what they do not not already know — synthesize a form.
- Albright on Yiddish, etc.: they pick ways to predict that are particularly effective.

9. The research tradition in lexicalist inflectional morphology

- The "any port in a storm" principle: use whatever you can to predict — rather than respecting inflectional natural classes
- The concept **morphome** (Aronoff 1994) refers (I think) to the bundle of mutually predictable forms in an inflectional paradigm that does not coincide with an inflectional natural class (box in the paradigm).
- There is an ongoing, often fierce, debate about the analysis of morphomes by lexicalists (immediately below) vs. anti-lexicalists of various stripes.[1]
  - ➤ See, e.g., *The Morphome Debate* (2016) ed. by Luís and Bermudez-Otero, Oxford University Press.

10. Some references on lexicalist inflectional morphology

- Matthews, Peter H. (1972) *Inflectional morphology: A theoretical study based on aspects of Latin verb conjugation*. Vol. 6. CUP Archive, 1972. Urtext in this approach.
- Aronoff, Mark (1994) *Morphology by Itself.* MIT Press — origin of morphome.
- Stump, Gregory T. (2001) *Inflectional morphology: A theory of paradigm structure*. Cambridge University Press, 2001.
- Various work by Arnold Zwicky (Google-scholar him), who coined "rules of referral" for the rules that map on paradigm member onto another.
- Various work by Stephen Anderson (Google-scholar him)
- Maiden, Martin. *The Romance verb: Morphomic structure and diachrony*. Oxford University Press, 2018. — morphomes are stable, extended, across history of Romance

SETTING UP A PROBLEM SET: BASES IN INDONESIAN

11. Guide

- Take a look at the Indonesian problem just handed out.
- We will do the basic metrical analysis in class together.
- Then, in the problem, I leave it to you to figure out how to extend it to suffixed forms.

- See course web site for a "start up" file to do this in OTSoft.

PHONETICS AND PHONOLOGY

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[1] Some notable anti-lexicalists include Alex Marantz, David Embick, Heidi Harley, and Andrew Nevins.

12. You are in an unusually good position

- I.e. a department with mutually friendly phonetics and phonology — not always so!
- Ph.D.'s with "mixed" phonetics/phonology research (often advising, too): Roy Becker, Michael Lefkowitz, Hiro Katsuda, Isabelle Lin, Adam Chong, James White, Kevin Ryan, Victoria Thatte, Kuniko Nielsen, Sameer Khan, Matthew Gordon, John Choi, Abigail Cohn.
    - ➢ Most of their dissertations are on the Linguistics web site.

13. Topics I would like to cover

- Phonetic influences in phonology
    - ➢ Maps, both articulatory and perceptual
    - ➢ The P-map and its purposes: solving Too-Many-Solutions, biased learning
- Phonology-like models of phonetics
    - ➢ Rule based generative phonetics
    - ➢ Crowded targets and Harmonic Grammar models
    - ➢ near-neutralization and phonetic paradigm uniformity

14. What phoneticians have said about naturalness in phonetics

There is no consensus position, but see:

- ➢ Kohler, K. 1990 "Segmental reduction in connected speech in German: phonological facts and phonetic explanation:" in Hardcastle, W.J. and A. Marchal (eds.*) Speech Production and Speech Modeling*, Kluwer, Dordrecht, 69-92.
- ➢ Lindblom, B. 1990 "Explaining phonetic variation: a sketch of the H&H theory", in Hardcastle, W.J. and A. Marchal (eds.*) Speech Production and Speech Modeling*, Kluwer, Dordrecht, 403-439.
- ➢ Lindblom, B. S. Guion, S. Hura, S.-J.Moon, R. Willerman 1995 "Is sound change adaptive?" *Rivista di Linguistica* 7, 5-37.

- The speaker seeks (at some level) to create an acoustic output that
    - ➢ **minimizes articulatory effort**
    - ➢ **maximally assists the listener in recovering the message**
        - —perceptually distinct contrasting forms
        - —also, perhaps: minimization of allomorphy—Wilson 2006

15. Research scheme

- Research and understand the nature of phonetic difficulty — not trivial.
- Posit and study mechanisms in which phonological constraints could come to reflect avoidance of phonetic difficulty

16. What we will mainly *not* talk about: effects of articulatory difficulty

- Asymmetries by voicing in stop inventories

- Maddieson (1984) *Patterns of Sounds* (Cambridge) gives several hundred phoneme inventories, remarking on asymmetries

    (a) characteristic stop inventory:

p	t	k
b	d	g

    I.e. the pressure for symmetry is generally rather strong.

    (b) gappy stop inventories:

    often:

		t	k	
	b	d	g	(Arabic)

    and perhaps:

p	t	k	
b	d		(Dutch)

    and certainly:

p	t	k	q	
b	d	g		(Persian)

- These asymmetries plausibly reflect articulatory difficulty, documented with aerodynamic modeling
    - ➢ J. R. Westbury & P. A. Keating (1986) On the naturalness of stop consonant voicing. *Journal of Linguistics* 22, 145-166.
- Crucial mechanism: amount of yielding of vocal tract wall
- They can be described by local conjunction, but this gives no purchase on the place asymmetry.

17. The main focus for us here: phonetic similarity

- We cover Steriade (2001), a fairly seminal paper[2] in establishing relevance for phonetic information in phonology.
- This put for the concept of the P-map, and served as a basis for later work on learning bias in phonology.

18. A central principle of perception: internal and external cues

- Statement of the principles with literature review:
    - ➢ Richard Wright (2004) A review of perceptual cues and cue robustness. In B. Hayes, Robert Kirchner, and Donca Steriade (2004) *Phonetically Based Phonology*, Cambridge.
- The fundamental dilemma: how can be detect the presence of speech sounds that are inherently feeble or even silent?
- Exercise: please identify as I utter one of
    - ➢ [p̚] [t̚] [k̚]

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[2] At least, it hugely changed *my* thinking …

> ➢ [b̥] [d̥] [g̊]
> ➢ [m̥] [n̥] [ŋ̥]
> ➢ [f̩] [θ̩]

## 19. Basis for identification of inherently-feeble segments

- We don't directly hear consonants and vowels in any event, but *interpret* them.
  - ➢ The feeble sounds are detected through the intermediating factor of **coarticulation**.

20. Cues

a. **Internal cues** = heard during the sound

 i. **Stops**: none
 ii. **Nasals**: few, and not particularly distinct for different nasals
 iii. **Non-sibilant fricatives**: few, and not particularly distinct for different fricatives
 iv. **Sibilant fricatives**: fairly ample
 v. **Vowels**: very ample, particularly if long and/or stressed

b. **External Cues** = heard on neighboring sounds, due to coarticulation
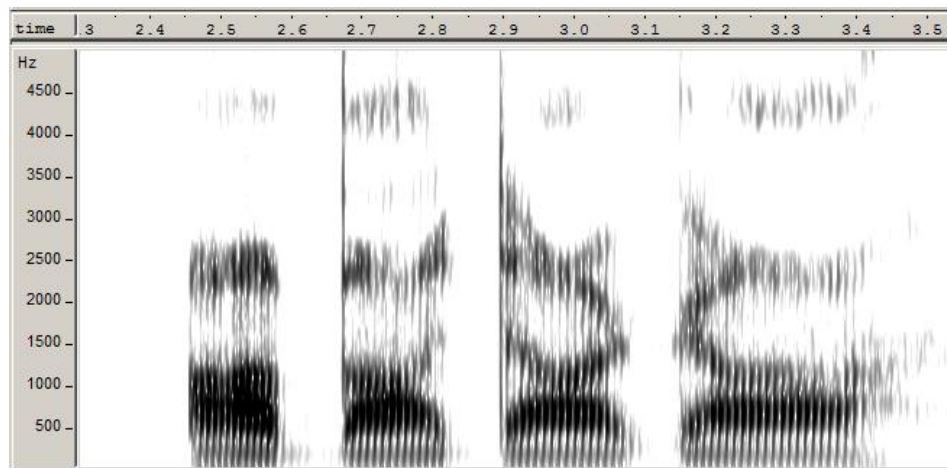
Three semi-voiced stops in the frame / a ___ a ___ a ___ a, speaker BH. What are they?

Formant transitions on neighboring vowels
    Note: every sound except glottals triggers formant transitions. Even other vowels do.
Nasals: **coarticulatory nasality**. Spliced [ba] + [ãm], i.e. [bam], sounds a lot like [bab]
Voicing: Voice Onset Time (VOT), duration of preceding vowel

21. Factoring in the asymmetries of the auditory system

- Literature review: Wright, Richard (1997) Consonant Clusters and Cue Preservation in Tsou, UCLA dissertation; also Wright (2004), cited above.

- The auditory system goes wild at sudden increases in amplitude, is indifferent to sudden decreases.
  → CV transitions are salient, VC transitions are not
  → a preference for consonants in prevocalic position

22. Response curves (figure from Wright 2004)
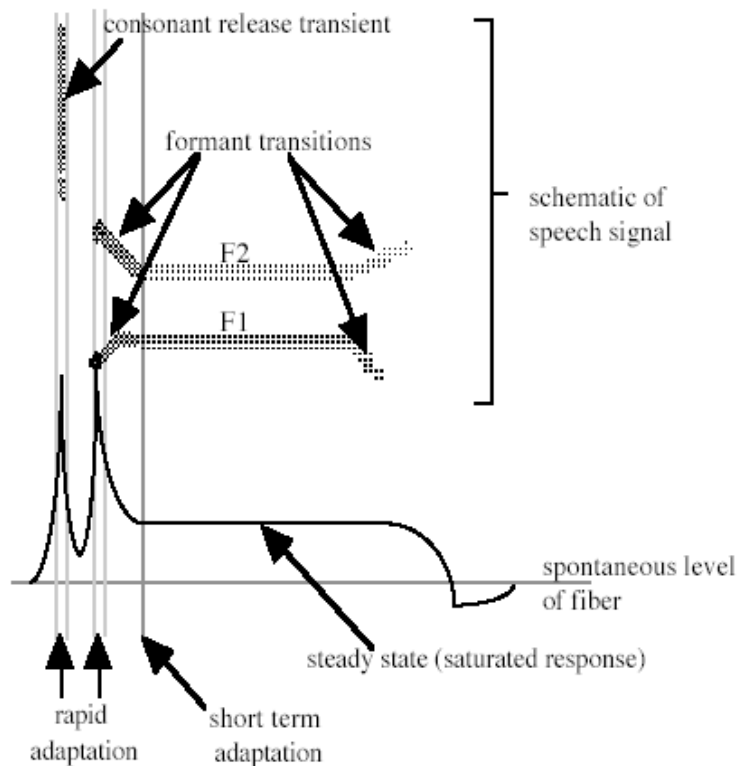
23. External cues

- Plausibly, these should be more abundant; e.g. put more vowel contrasts into the long vowels (Hindi), or the stressed vowels (English).
- See, e.g.
  - Crosswhite, Katherine. "Vowel reduction." In Hayes/Kirchner/Steriade *Phonetically based phonology* (2004): 191-231.

SOME CASE STUDIES OF PHONETIC EFFECTS IN PHONOLOGY

24. What is the direction of assimilation in consonant clusters?

- Pre-Steriadian wisdom:
  - ➢ Coda consonants assimilate to onset consonants
  - ➢ Exceptions: affix consonants assimilate to stem consonants
  - ➢ Hebrew homework shows both principles, in elaborate ranking.

25. Steriade: reference to syllables is a prioristic; let's look at the cues

- Simple cases: non-prevocalic consonants assimilate to prevocalic ones.
- This follows from two things:
    - ➢ The principles just given concerning the salience of external cues.
    - ➢ The further principle (a key theme of this course) that alternation tends to be minimally salient perceptually.
- Let us consider a canonical case, found all over the world: /an+pa/ → [ampa]
    - ➢ Try three candidates: faithful, [ampa], [anta]

26. Steriade's *Paradebeispiel*:³ retroflex/alveolar contrasts

- Retroflexes are common in the languages of Australia and India
- There is enough information to obtain typological preferences.
- Strikingly, they tend to be backward:
    - ➢ In retroflex-alveolar or alveolar-retroflex sequences, we normally get *progressive* assimilation (/atʈa/ → [atta], /aʈta/ → [aʈʈa]).
    - ➢ Why should these be different?

27. The phonetics of retroflex articulation

- There is forward tongue movement during retroflexes:
    - ➢ at release, they are almost alveolars
    - ➢ cues are mostly in preceding vowel   [aɖa] [ada]
    - ➢ characteristic preferred position of retroflexes is **postvocalic**, even in codas
    - ➢ Thus: neutralization (usually to alveolar) in initial and postconsonantal position
    - ➢ progressive assimilation of retroflexion in consonant clusters, rather than the normal regressive assimilation
- This shows up on a spectrogram, and indeed is (I think) plainly audible, at least for retroflexes as I articulate them:
    - ➢ [ad] [aɖ], [da], [ɖa]
    - ➢ see spectrogram

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³ German, 'parade example'. A favorite word of Indo-Europeanists, all of whom read German.

a ḍ a   a d a
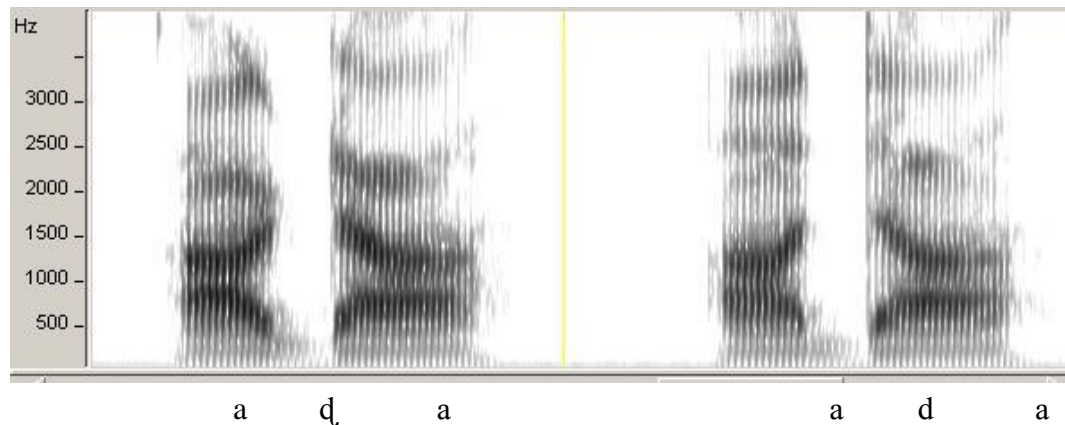
28. Consequence

- In coronal sequences with retroflexes, phonetic salience of alternation is minimized by progressive assimilation.
- Again, try an informal tableau with /atʈa/: faithful, regressive, progressive

29. Steriade's theoretical proposal: the P-map

- Children accumulate phonetic experience in perceptual and articulatory maps (Steriade readings).
  - ➤ Here is a sample P-map from Steriade:

	V_V	V_#	V_C	#_V	C_V	C_C
s/ʂ	s/ʂ	s/ʂ	s/ʂ	s/ʂ	s/ʂ	s/ʂ
t/ʈ	t/ʈ	t/ʈ	t/ʈ	t/ʈ	t/ʈ	t/ʈ
n/ɳ	n/ɳ	n/ɳ	n/ɳ	n/ɳ	n/ɳ	n/ɳ

- They use this as a learning bias; favoring phonetically sensible constraints.
- For Steriade this is a set of universal a prior rankings on a set of highly-detailed Faithfulness constraints.
- Colin Wilson (2006, *Cognitive Science*) built on this, developing a "soft UG" version with μ's for the weights of each Faithfulness constraint, derived from the P-map.

30. Further: Jun (2004)

- Other factors affecting perceptibility of place also affect assimilation.
- Nasals obscure the formants of neighboring vowels; are weakly cued for place, assimilate more easily.
  - ➤ Jun, Jongho. "Place assimilation." In Hayes/Kirchner/Steriade *Phonetically based phonology* (2004): 58-86.