

Class 18: Structure below the segment, part III

To do

- Fijian assignment is due tomorrow. I'll post an assignment on autosegmentalism (last one!) tonight.
- Last reading: Steriade 1999 (study questions due Tuesday if not already handed in)
- Project: abstract due tomorrow. You can put a hard copy in my mailbox

Overview: We'll see some reasons to think there's structure below the segment, then talk more about the relationship of all this to phonetics.

1 Feature geometry; we're not really using it in this course, but at least you'll know what it is

- Discuss: what are we really doing when we use [place] in a rule or constraint?

Example—from McCarthy 1988, a systematic overview of feature geometry:

- *[anterior]* can spread with all the place features
as in Malayalam (Dravidian language from India with about 36 million speakers)

n → m / __ bilabials
 ṅ / __ dentals
 n / __ alveolars
 ŋ / __ retroflexes
 ɲ / __ palatals
 ŋ / __ dorsals

- *[anterior]* can spread with just the other tongue-tip/blade feature

English t,d,n ([+anterior, -distributed])

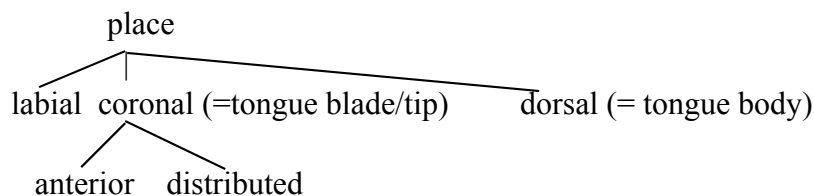
→ dental / __ θ, ð ([+anterior, +distributed])
 → palatoalveolar / __ tʃ, dʒ, ʃ, ʒ ([-anterior, +distributed])
 → retroflex¹ / __ ɻ ([-anterior, -distributed])

- *[anterior]* can spread on its own

Navajo sibilant harmony

s → ʃ / __ X₀ {tʃ, dʒ, ʃ, ʒ}
 ʃ → s / __ X₀ {ts, dz, s, z}

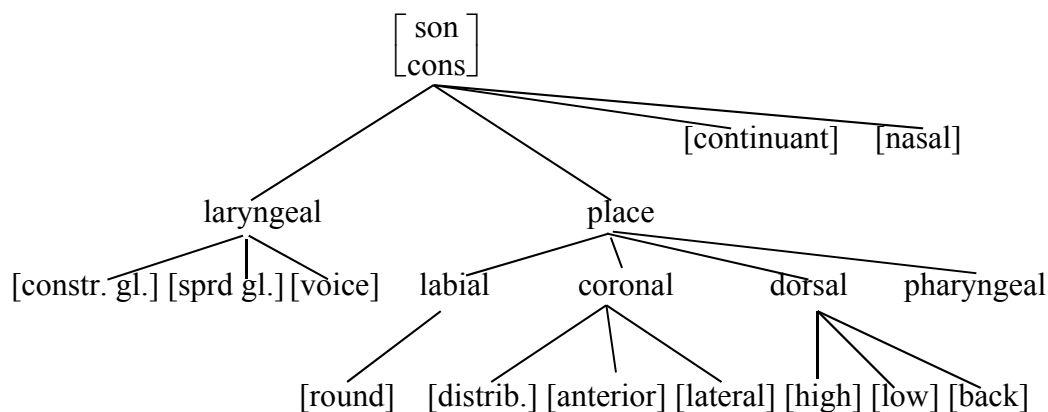
- This suggests a hierarchical organization of features:



¹ for speakers who have a retroflex *r*

The general idea

- Certain features seem to group together in their behavior.
- Such grouping gave rise to an elaborated theory of *feature geometry* in autosegmental representations.
 - The idea was that not only features can spread and delink, but also **nodes** that dominate multiple features, or nodes that dominate intermediate nodes.
- Here's a proposed full geometry, more or less the one in McCarthy 1988—the top, “root” node, is what attaches to the C-V skeletal tier (or to the syllable structure, for skeleton-less theories):



- McCarthy's **evidence** for each grouping comes from...
 - assimilation as a group (=spreading; see examples above for *coronal* and *place*)
 - deletion as a group (=delinking)
 - debuccalization*: Spanish dialects $s \rightarrow h / __]_{\text{syll}}$
 - English dialects, some Ethiopian languages $C^? \rightarrow ?$
 - laryngeal neutralization*: Korean obstruents have 3-way laryngeal distinction, collapsed to 1 value in codas
- Obligatory Contour Principle (OCP) effects: adjacent (-on-their-tier) identical elements are prohibited.
 - Not only is two Hs in a row on the tone tier bad, two +s in a row on the [anterior] tier is bad too, and so is two +s in a row on the *coronal* tier.
 - Manifested as restrictions on allowable sequences (no two labials in an Arabic root), behaving as a block

2 Relationship to phonetics—my personal opinion

- Features that correspond to an articulatory gesture behave autosegmentally
 - [+nasal]: lower the velum
 - [+dorsal]: use the tongue body
 - [+back]: back the tongue body
- Features that don't correspond to a gesture really are just properties of a sound
 - [-sonorant]: total or near-total obstruction of airflow
 - [+consonantal]: significant supraglottal interference with airflow

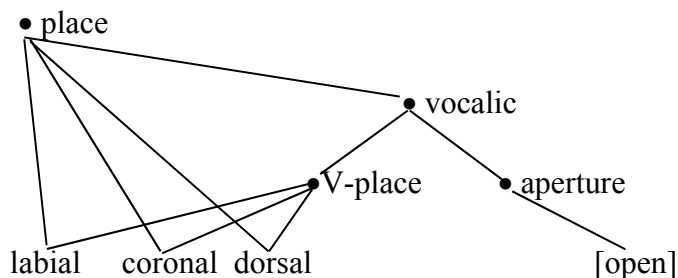
3 “Privative” features

- One more thing to know about features is that some researchers think that for some features, there’s no [-F] vs. [+F] vs. nothing
 - but rather only [+F] (or “[F]”) vs. nothing. (The idea goes way back—see Steriade 1995) for review.)
 - Such features are called privative or monovalent
- E.g., maybe there’s no [-nas] in representations:
 - In rule theory, means no autosegmental rules can insert, delete, or move it
 - In OT, means no MAX([-nas]), DEP([-nas]), ALIGN([-nas])
 - A segment that previously was represented as [-nas] is now just **underspecified** for [nasal]
- Relationship to phonetics?
 - If the [-F] value is just the resting position, there’s no need to specify its articulation
 - The articulator can just relax back towards its resting position
 - So features like [dorsal] or [voice] are likely to be privative/monovalent
 - Features like [sonorant] or [consonantal] are likely to be bivalent

4 If extra time: vowels vs. consonants in feature geometry (Clements & Hume 1995)

- Do Vs and Cs share features? Sometimes Vs and Cs interact, sometimes they don’t.
 - Spreading: in many languages, velar and labial consonants can become coronal before front vowels (so are front vowels coronal?)
- *Maltese*: certain vowels become [i] before coronal consonants
- OCP: in many languages, sequences of featurally-similar Vs and Cs are prohibited
- *Cantonese*: round V can’t occur after k^w , k^{hw} ; round V can’t be followed by a labial coda C.
 - Yet vowel harmony generally skips right over consonants, suggesting that the consonants are underspecified for the features in question.

- Clements & Hume propose something along these lines:



- Explains why single consonantal features can skip vowels (as [anterior] in Navajo), but the whole Place node seems never to skip vowels (what that look like?).

5 Long-distance effects

- Sibilant harmony in Navajo (Na-Dene language from the U.S. with about 149,000 speakers; discussion based on Martin 2004)

- Simple version: two [+strident] segments within a word must agree in [anterior]—the feature [anterior] is contrastive only among stridents:

/sì + tʃìd/	→	ʃì + tʃìd	‘he is stooping over’
/sì + té:ʒ/	→	ʃì + té:ʒ	‘they two are lying’
/ji + s + lé:ʒ/	→	ji + ʃ + tʃé:ʒ ²	‘it was painted’
/ji + s + tiz/	→	ji + s + tiz/	‘it was spun’
/tsé + tʃé:ʔ/	→	tʃ ^h é + tʃé:ʔ	‘amber’
/tʃa: + né:ʒ/	→	tʃa: + né:ʒ	‘mule’

- Write a linear rule to account for this.

- The linear rule must skip over [–strid] segments, which happen to be, plausibly, just those segments that are unspecified for [anterior] in Navajo.
- But the rule gets no special credit for this—it is valued the same as a rule that skipped over all the [+voice] segments, say.
- This seems to miss something. Cross-linguistically, long-distance rules of assimilation seem to skip over segments that don’t bear the feature in question, so we would like this kind of skipping to be valued more highly than other types.
- Autosegmental representation of ‘mule’s UR, assuming underspecification of nonstridents for [anterior]—IPA symbols stand for the rest of the features:

<table style="border-collapse: collapse; width: 100%;"> <tr> <td style="text-align: center; padding: 5px;">[–ant]</td> <td style="width: 20px;"></td> <td style="text-align: center; padding: 5px;">[+ant]</td> </tr> <tr> <td style="text-align: center; padding: 5px;"> </td> <td></td> <td style="text-align: center; padding: 5px;"> </td> </tr> <tr> <td style="text-align: center; padding: 5px;">C</td> <td style="text-align: center; padding: 5px;">V V +</td> <td style="text-align: center; padding: 5px;">C V V C</td> </tr> <tr> <td style="text-align: center; padding: 5px;"> </td> <td style="text-align: center; padding: 5px;">\ /</td> <td style="text-align: center; padding: 5px;"> </td> </tr> <tr> <td style="text-align: center; padding: 5px;">tʃ</td> <td style="text-align: center; padding: 5px;">a</td> <td style="text-align: center; padding: 5px;">n é Z</td> </tr> </table>	[–ant]		[+ant]				C	V V +	C V V C		\ /		tʃ	a	n é Z	capitalization on this tier indicates agnosticism as to [ant]
[–ant]		[+ant]														
C	V V +	C V V C														
	\ /															
tʃ	a	n é Z														

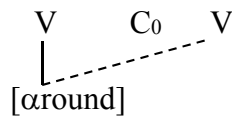
- Propose an autosegmental rule of strident harmony

- How about in OT?

² Not sure if there’s another process going on with /l/ vs. [ɬ] or this is just a mistake. Sorry.

6 Phonetic basis of long-distance effects?

- Some researchers have argued most long-distance assimilations are, articulatorily, local. E.g. Gafos 1999.
- For instance, in a rounding-harmony system like this:



we could reasonably claim that (and test instrumentally whether) the Cs that are skipped by the rule actually take on the lip-rounding value that spreads.

7 Locality: transparent vowels in Hungarian (Benus & Gafos 2007)

- Front non-round vowels in Hungarian allow front/back harmony to spread right over them:

<i>Front</i>		<i>Back</i>
emír-nek [ɛmi:r-nɛk]	‘emir-Dative’	papír-nak [pɒpi:r-nɔk] ‘paper-Dative’
zefír-ból [zɛfi:r-bø:l]	‘zephyr-Elative’	zafír-ból [zɔfi:r-bo:l] ‘sapphire-Elative’
rövid-nek [røvid-nɛk]	‘short-Dative’	gumi-nak [gumi-nɔk] ‘rubber-Dative’
bili-vel [bili-vɛl]	‘pot-Instrumental’	buli-val [buli-vɔl] ‘party-Instrumental’
művész-nek [my:ve:s-nɛk]	‘artist-Dative’	kávéné-nak [kɔ:ve:-nɔk] ‘coffee-Dative’
vidék-től [vide:k-tø:l]	‘country-Ablative’	bódé-tól [bo:de:-to:l] ‘hut-Ablative’

(p. 274)

- Let’s draw some autosegmental representations.

- B&G argue that the tongue actually remains in front or back(ish) position during the transparent vowel.
- So why does it still sound front? Because, especially for [i] (the most-transparent of the transparent vowels; see (Hayes et al. 2009)), the tongue has to get fairly back before it makes much acoustic difference.

8 Locality: Kinyarwanda coronal harmony (Walker, Byrd & Mpiranya 2008)

(3) -sas-+i	→ [-ʃaʃi]	‘bed maker’
	cf. [-sasa]	‘make the bed (INF STEM)’
-so: ⁿ z-+i	→ [-ʃo: ⁿ zi]	‘victim of famine’
	cf. [-so: ⁿ za]	‘be hungry (INF STEM)’
-sá:z-+i-e	→ [-ʃá:ze]	‘become old (PERF)’
n-sá:z-+i-e	→ [ⁿ ʃa:ze]	‘I am old (PERF)’
	cf. [-sá:za]	‘become old (INF STEM)’
-úzuz-+i-e	→ [-úzuzɛ]	‘fill (PERF)’
	cf. [-úzuzɔ]	‘fill (INF STEM)’
βa-n-ziz-i+izɛ	→ [βa: ⁿ zizizɛ]	‘they punished me (for sth) (PERF)’
	cf. [βa: ⁿ ziza]	‘they punish me (for sth) (IMPERF)’

(p. 503)

- EMA study: receiver pellets attached to tongue tip and blade; magnetometer tracks their position (along with reference receivers on nose and gums).
- Result: tongue tip remains angled upward during intervening segments, as in [βaʃamá:zɛ]

9 Non-locality: Guaraní nasal harmony (Walker 1999)

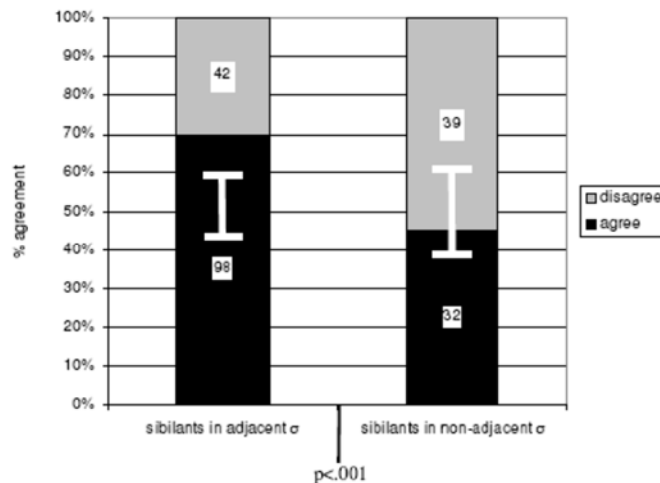
(3) a.	/ ⁿ do-roi- ⁿ du'pã-i/	→	[<u>nõrõĩnũ'pãĩ</u>]
	not + I-you + beat + NEG		‘I don’t beat you’
b.	/ro- ^m bo-po'rã/	→	[<u>rõmõpõ'rã</u>]
	I-you + CAUS + nice		‘I embellished you’
c.	/i ^d ja ₁ kãra'ku/	→	[<u>ĩñã₁kãrã'ku</u>]
			‘is hot-headed’
d.	/a ₁ kãra'γ ^w e/	→	[<u>ã₁kãrã'γ^we</u>]
			‘hair (of the head)’

(p. 9)

- Are the transparent Cs actually nasal?
- Acoustic study, but found no evidence for nasal airflow
 - if there was any, it wasn’t enough to produce detectable turbulence
 - the stops did have a release burst, meaning air pressure was building up in the oral cavity, so it’s unlikely to have been venting out the nose
- Let’s discuss the theoretical implications.

10 A problem: gradient long-distance effects

- The autosegmental account above predicts that it doesn't matter how much material intervenes between the two sibilants—they are still adjacent as far as the [anterior] tier is concerned.
- But Martin found that, in compounds, agreement is *gradient*: the more material intervenes between the two sibilants, the more likely they are to agree:



Martin 2004, p. 23

(There is an additional twist that I'll refer you to the thesis and to Martin 2007 for: much of the agreement in compounds comes not from alternation but from the underlying forms!)

- See Kimper 2011, Zymet 2014 for gradient distance effects in vowel harmony and even *dissimilation*.

11 Illusory assimilations and deletions

- We saw that Hall argues that a gap between consonants can lead to something that sounds like a vowel even though there's no vowel gesture.
 - Let's review what such a representation looks like.
- Similarly, if two consonants are too overlapped, one may be inaudible though it was produced.
 - Let's draw the gestural score for a famous one (Browman & Goldstein 1987), *perfect memory*, with the *t* being inaudible because of overlap by *k* and *m*

- Here's how the articulatory data looked:

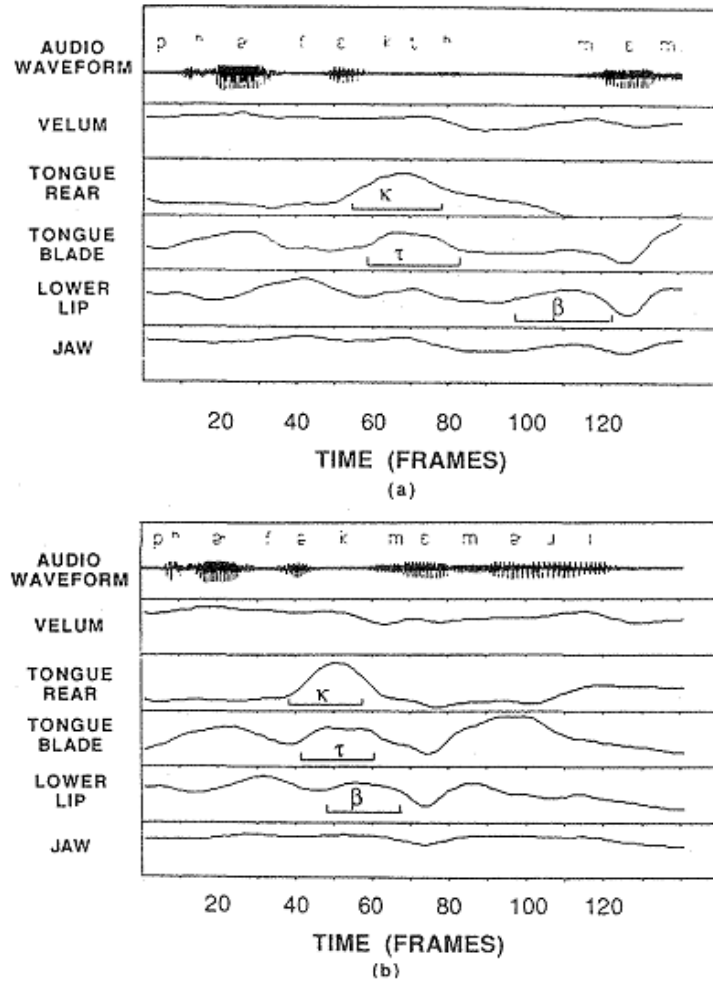
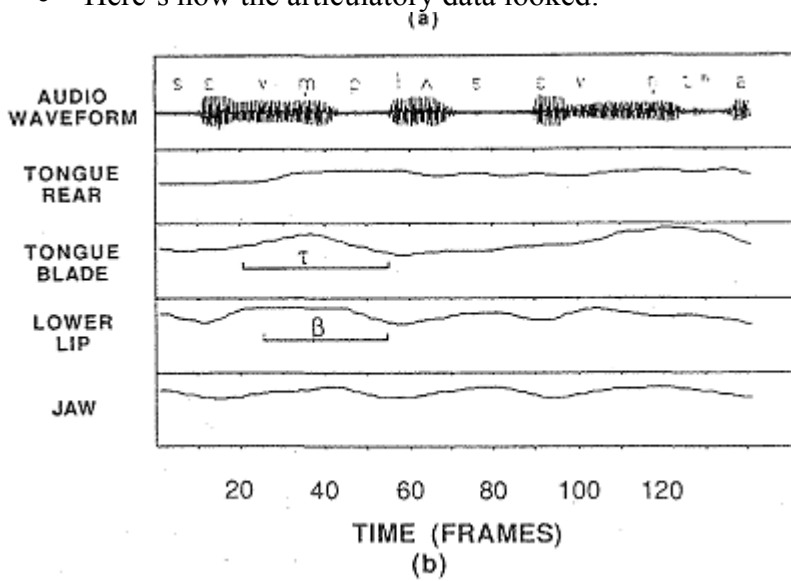


Figure 13. X-ray pellet trajectories for "perfect memory." (a) Spoken in a word list ([pə'fekt#'mɛm...]). (b) Spoken in a phrase ([pə'fek'mɛm...]).

(p. 20)

- The same thing could happen in place assimilation.
 - Let's draw the autosegmental representation for another one from (Browman & Goldstein 1987), *seve[m] plus seven*.

- Here's how the articulatory data looked:



(p. 22)

(Rose & Walker 2004), (Zuraw 2002), (Hansson 2001)

To sum up

- There may be further structure within features (feature geometry)
- Not all segments are specified for all features
- Maybe locality of phonological processes is not just abstract (tier-adjacency), but totally concrete: an autosegment is a phonetic gesture that extends over a continuous span.
- But what about Walker's nasal data from Guaraní? Maybe such cases shouldn't be represented autosegmentally? (See Rose & Walker 2004, Zuraw 2002, Hansson 2001 for an alternative).
- We should think not just about the acoustics (do we hear a vowel between those Cs? do we hear a consonant that is underlying?) but also about the articulation underlying them.

Next week: phonology's "upward" interface with morphology revisited

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