

## Class 17: Structure below the segment, part II autosegments that aren't tones

### To do

- Fijian assignment (on last week's material) is due Friday
- Project: abstract due Friday (syllabus says Thursday, but might as well make it Friday)

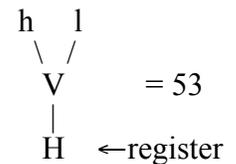
**Overview:** Last time we saw some reasons to treat tones as “autosegments”, or independent entities. Today let's see a little more tone, then look at other features that might deserve the same treatment. Then next time we'll talk more about the relationship of all this to phonetics.

### 1 What about East-Asian-type tone? (examples taken from Kenstowicz 1994, ch. 7)

- Seems to be different from African-type<sup>1</sup> tone:
  - often more than three levels (5 is typical)
  - often transcribed with Chao numbers (Chao 1930): [ma<sup>213</sup>] means tone starts lowish (2), then dips to the bottom of the range (1) then goes up to the middle (3)
  - contour tones often behave as a unit rather than combination of H&L
- Various proposals—here's a simple one (Yip 1989): add another tier with features [hi register] and [lo register].

<i>register</i>	<i>tone (aka “contour”)</i>	<i>resulting pitch</i>
[+hi register] (H register)	h	5
[-lo register]	m	4
	l	3
[-hi register] (L register)	h	3
[+lo register]	m	2
	l	1

*example*



- Allows the register of an entire contour to change by just changing one feature, e.g. 53 → 31
- What is register, articulatorily?
  - It's been proposed to correspond to stiff vs. slack vocal folds. But often this is true only in the language's history & not synchronically.
  - Can be associated with a voice quality difference, e.g. L is breathy
- How do you know whether a 3 is H & l or L & h?
  - Normally the whole syllable has the same register tone.<sup>2</sup> So if you see 53, 34, etc., it must be H; if you see 13, 32, etc., it must be L.
- But what if it's just 3 or 33?
  - You will have to use other facts about the language to deduce the right representation.

<sup>1</sup> Of course these labels are very approximate, and there are many other regions of the world with lots of tone languages.

<sup>2</sup> Could be problematic for Mandarin 3<sup>rd</sup> tone, commonly claimed to be 214. See, e.g. Zhang & Lai 2006 for a 213 transcription (p. 79). Then again, some analyze Mandarin as an African-type system: H, LH, L, HL (Duanmu 2007).

## 2 Example: distribution of tones in Songjiang

(Bao 1990, via Kenstowicz 1994; apparently a Shanghai-area dialect of Wu Chinese [Sino-Tibetan; China; 77 million speakers] example words from Chen 2000)

voiced onset, unchecked syll.	voiced onset, checked syll.	voiceless onset, unchecked syll.	voiceless onset, checked syll.
<b>22</b> di <sup>22</sup> ‘younger brother’	<b>3</b> baŋ <sup>3</sup> ‘white’	<b>44</b> ti <sup>44</sup> ‘bottom’	<b>5</b> paŋ <sup>5</sup> ‘hundred’
<b>31</b> di <sup>31</sup> ‘lift’		<b>53</b> ti <sup>53</sup> ‘low’	
<b>13</b> di <sup>13</sup> ‘field’		<b>35</b> ti <sup>35</sup> ‘emperor’	

“checked” syllable = syllable that ends in a glottal stop

- Draw the representation of each tone.
- What markedness constraints can we develop to explain the inventory?

## 3 Exercise: Tibetan compounds

- Data from Meredith (1990). (I am simplifying some of the tones!! For instance, 3 is really 2. Sorry for missing data; Meredith often doesn’t give concrete examples, just schematics)
- Draw representations for tones 5, 53, 31 (there’s also 3 but worry about that later)
- Look at the data and develop an analysis of the tone changes that occur in compounds
  - You’ll need to invent a constraint on tones in non-word-final syllables
  - You’ll need to invent a quite arbitrary constraint on tones in the second member of a compound.

<i>1st member</i>	<i>2nd member</i>	<i>compound</i>	
5	5	5-5	
53	5	<b>5-5</b>	
yum 3	chěē 5	yum-chěē 3-5	‘mother-hon.’ (mother+great)
31	5	<b>3-5</b>	
5	53	5-53	
thuu 53	caa 53	thuu-caa 5-53	‘iron banner fixture’ (banner+iron)
3	53	3-53	
31	53	<b>3-53</b>	
5	3	<b>5-5</b>	
see 53	yöö 3	see-yöö <b>5-5</b>	‘intellectual’ (knowledge+possessor)
phöö 3	mi 3	phöö-mi 3-5	‘Tibetan’ (Tibet+person)
ree 31	see 3	ree-see <b>3-5</b>	‘cotton robe’ (cotton+robe)
cu 5	kεε 31	co-pkεε 5- <b>53</b>	‘eighteen’ (eight+ten)
53	31	<b>5-53</b>	
3	31	<b>3-53</b>	
31	31	<b>3-53</b>	

#### 4 Turning to non-tone features... a morpheme that has no consonant or vowel: Japanese

- Rendaku ('sequential voicing') happens in compounds (data from (Ito & Mester 2003))<sup>3</sup>

eda + ke	→	eda-ge	‘split hair’ (branch+hair)
unari + koe	→	unari-goe	‘groan’ (groan+voice)
me+tama	→	me-dama	‘eyeball’ (eye+ball)
mizu + seme	→	mizu-zeme	‘water torture’ (water+torture)
ori+kami	→	ori-gami	‘origami’ (weave+paper)
neko+çita	→	neko-dzita	‘aversion to hot food’ (cat+tongue)

○ What's the compound-forming morpheme?

○ Unresolved issue to discuss: What faithfulness constraint(s) does [eda-ge] violate?

#### 5 A feature that moves from one segment to another: Tyneside English (Newcastle, England; via (Kenstowicz 1994))

		<i>assume</i>
skəmʔi	‘scampi’	/skɛnpi/
ɛnʔi	‘aunty’	/ɛnti/
hɛŋʔi	‘hanky’	/hɛnki/
hɛʔn	‘happen’	/hɛpn/
bɛʔn	‘button’	/bɛtn/
tʃiʔŋ	‘chicken’	/tʃikn/

○ First, analyze this with two (non-autosegmental) rules: place assimilation and place loss.

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<sup>3</sup> If you're curious how a system like this came about, it's been argued that historically, the genitive-like particle [no] 's' occurred in the middle of most compounds (eda+no+ke 'branch's hair'). Then, the vowel deleted in most cases (eda+n+ke) and the *n* merged with the following consonant, which became voiced (for the same reason that, as you read in Kager ch. 2, many languages don't allow a sequence of *nasal+voiceless*, many languages also disallow voiceless prenasalized voiceless obstruents): [eda-<sup>n</sup>ge]. Later, the prenasalization was lost.

- o In OT, we can avoid the question of rule ordering if we let [place] be autosegmental. Give it a try...(I've left room under the candidates to draw in a [place] tier)

/tʃɪkn/	
a tʃɪʔŋ	
b tʃɪʔŋ	
c tʃɪkŋ	
d tʃɪkŋ	

- o Your thoughts on Kalinga counterbleeding?

**6 A feature associated to multiple segments: nasal harmony**

*Paraguayan Guaraní* (Tupí language from Paraguay with 4,850,000 speakers). Data taken from Beckman 1999, originally from Lunt 1973, Rivas 1975.

- Nasality is contrastive, but not freely distributed:<sup>4</sup>

tũ'pã	'god'	tu'pa	'bed'	*tu'pã
ṗĩ'ri	'to shiver'	pi'ri	'rush'	*pi'ri
mã'ĩẽ	'to see'	<sup>m</sup> ba'ʔe	'thing'	*m <sup>b</sup> a'ʔẽ, *m <sup>b</sup> ã'ĩẽ, *ma'ʔe
hũ'ũ	'to be bland'	hu'ʔu	'cough'	*hu'ũ
ã'kĩ	'to be tender'	a'ki	'to be wet'	*a'kĩ
ṗõ'ĩ	'to be done for'	po'ti	'to be clean'	*po'ĩ

Aside: How do we represent prenasalized stops like [ṑ]? Just like a contour tone!

[-cont, +COR, etc.]

/ \

[+nas] [-nas]

This explains why the segment behaves as [+nasal] on the left side and [-nas] on the right side.

- o Warm up by drawing autosegmental representations for some of these surface forms. Assume that if more than one segment in a row is [+nasal], they share the same [+nasal] feature.

<sup>4</sup> Phonetics puzzler: What's the articulatory difference between [p] and [ṑ]? What's the acoustic difference? Walker 1999 argues based on acoustic and nasal-airflow data that voiceless stops don't actually get articulatorily nasalized in Guaraní. So the real analysis will be more complicated...

- How do you explain the alternations in the prefixes?

**nõ-řõ-nũ** pã-i<sup>5</sup> ‘I don’t beat you’

not-I.you-beat-*negation*

**nõ-řõ-ñẽ**<sup>n</sup>du-i ‘I don’t hear you’

not-I.you-hear-*negation*

**<sup>n</sup>do-ro-hai**<sup>h</sup>hu-i ‘I don’t love you’

not-I.you-love-*negation*

**řõ-<sup>m</sup>bo-γwa**<sup>h</sup>ta ‘I made you walk’

I.you-*causative*-walk

**řõ-<sup>m</sup>õ-<sup>p</sup>õ**<sup>h</sup>řã ‘I embellished you’

I.you-*causative*-nice

**řõ-<sup>m</sup>õ-<sup>ẽ</sup>**<sup>n</sup>du ‘I made you hear’

I.you-*causative*-hear

⇒ The feature [nasal] seems to be behaving autosegmentally too.

## 7 More about Guaraní, if we have extra time

- Compare these data to what we saw above:

ũ<sup>h</sup>mĩ-fa-<sup>h</sup>γwa ‘like those’

**re-<sup>h</sup>xo-<sup>h</sup>tã-<sup>h</sup>řã**<sup>h</sup>mõ ‘if you go’

ã-nẽ-<sup>h</sup>řẽ<sup>n</sup>du ‘I hear myself’

<sup>m</sup>ba<sup>h</sup>ʔe<sup>m</sup>bia<sup>h</sup>fĩ ‘sadness’

- Why doesn’t spreading go all the way in these cases? Hint: in addition to IDENT(nas), let’s have a special IDENT(nas) constraint for a particular environment.
- Beckman has argued that we do need a special faithfulness constraints and not a special markedness constraint (e.g., “\*[+nasal] unless associated to a stressed syllable” vs. general \*[+nasal]). Can you see how ‘if you go’ supports her claim?
- Words like \*[mã<sup>h</sup>ʔe] do not occur. Does our analysis so far explain this fact (and if not, how can we fix it)?

<sup>5</sup> Actually, this last [i] is nasalized, but the nasality of final vowels is complicated and controversial in Guaraní so let’s pretend it’s not—see Beckman’s book on positional faithfulness for more.

## 8 Exercise: Terena

- Arawakan language from Brazil with 15,000 speakers. Bendor-Samuel 1970, 1966, which transcribe NCs differently.

- Propose underlying forms for the first- and second-person affixes.

e'moʔu	'his word'	ẽ'mõʔũ	'my word'		
'ayo	'his brother'	'ãỹõ	'my brother'		
'owoku	'his house'	'õwõõngu	'my house'		
'ahyaʔaʃo	'he desires'	ã'nʒaʔaʃo	'I desire'		
'piho	'he went'	'mbiho	'I went'	'pihe	'you went'
'tuti	'his head'	' <sup>n</sup> duti	'my head'	'tiuti	'your head'
'nokone	'his need'	'nõ <sup>n</sup> gone	'my need'	'nekone	'your need'
o'topiko	'he cut down'			yo'topiko	'you cut down'
'ayo	'her brother'			'yayo	'your brother'
ku'rikena	'his peanut'			ki'rikena	'your peanut'
'piho	'he went'			'pihe	'you went'
'nene	'his tongue'			'nini	'your tongue'
'xerere	'his side'			'xiriri	'your side'
'paho	'his mouth'			'peaho	'your mouth'

- Let's play with AGREE and ALIGN constraints

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

- We've seen, informally, that certain features seem to group together in their behavior.
- This is the justification for the abbreviation "place" ([labial, coronal, dorsal, anterior, distributed, hi, lo, back] and maybe some others).
- 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.

**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  
 ṇ / \_\_\_ alveolars  
 ɳ / \_\_\_ retroflexes  
 ɲ / \_\_\_ palatals  
 ŋ / \_\_\_ dorsals

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

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

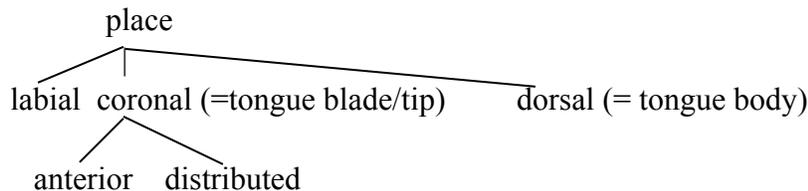
→ dental / \_\_\_ θ, ð ([+anterior, +distributed])  
 → palatoalveolar / \_\_\_ tʃ, dʒ, ʃ, ʒ ([–anterior, +distributed]) □  
 → retroflex<sup>6</sup> / \_\_\_ ɻ ([–anterior, –distributed])

- *[anterior]* can spread on its own

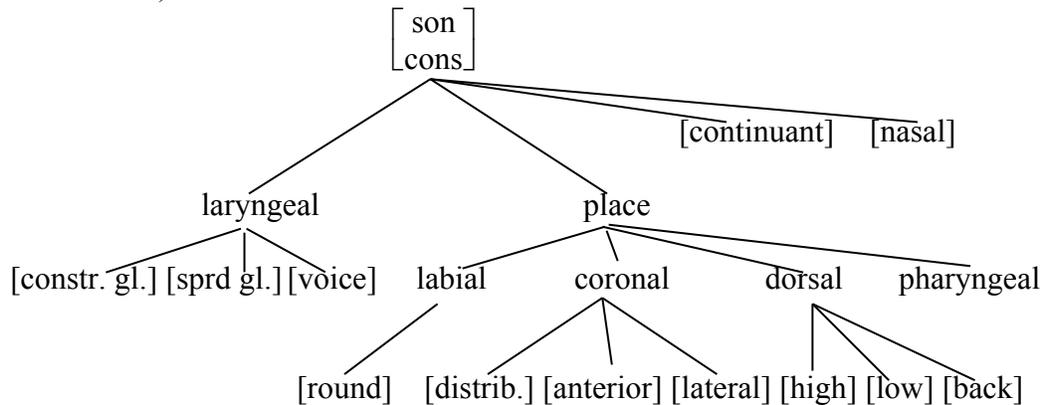
Navajo sibilant harmony

s → ʃ / \_\_\_ X<sub>0</sub> {tʃ, dʒ, ʃ, ʒ}  
 ʃ → s / \_\_\_ X<sub>0</sub> {ts, dz, s, z}

- This suggests a hierarchical organization of features:



- Here’s a proposed 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):



<sup>6</sup> for speakers who have a retroflex r

- 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

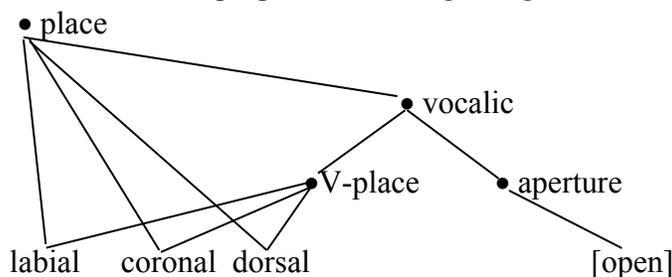
## 10 “Privative” features

- 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.)
- E.g., 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])

## 11 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?).

## 12 If we have even more time (?): Chaha (I stole this from an assignment for my 165A class)

Afro-Asiatic, Ethiopia, 130,00 speakers; Data from (McCarthy 1983), (Petros Banksira 2000).

<i>he Ved</i>	<i>he Ved him</i>	
dænæg	dænæg <sup>w</sup>	‘hit’
nædæf	nædæf <sup>w</sup>	‘sting’
k’ænæf	k’ænæf <sup>v</sup>	‘knock down’
nækæb	<b>nækæb<sup>w</sup></b>	‘find’
s’æfær	s’æf <sup>w</sup> ær	‘cover’
nækæs	næk <sup>w</sup> æs	‘bite’
kæfæt	kæf <sup>v</sup> æt	‘open’
bækær	<b>bæk<sup>w</sup>ær</b>	‘lack’
k’æt’ær	k’ <sup>w</sup> æt’ær	‘kill’
bænær	b <sup>w</sup> ænær	‘demolish’
mæsær	m <sup>w</sup> æsær	‘seem’
æræs	æræs	‘build’
sædæd	<b>sædæd</b>	‘chase’
næt’ær	næt’ær	‘separate’

- Assume that the ‘he Ved’ form is the same as the underlying form of the verb root. Past tense and 3<sup>rd</sup>-person-singular-masculine subject don’t add any affixes.
- Assume the difference between C and C<sup>w</sup> is that C<sup>w</sup> is [+round].
- Decide what the underlying form is for the 3<sup>rd</sup>-person-singular-masculine object morpheme.
- Account for the **bold** words.

<i>V! (masc. subject)</i>	<i>V! (fem. subject)</i>	
nəmæd	nəmæd <sup>j</sup>	‘love’
nək’ət’	nək’ət’ <sup>j</sup>	‘kick’
nəkəs	nəkəs <sup>j</sup>	‘bite’
gəræz	gəræz <sup>j</sup>	‘be old’
wət’æk’	<b>wət’æk’<sup>j</sup></b>	‘fall’
fəræx	fəræx <sup>j</sup>	‘be patient’
bənær	bənær	‘demolish’
k’ət’ær	k’ət’ær	‘kill’
nəkəb	<b>nəkəb</b>	‘find’
bəkər	bəkər	‘lack’
sənæb	sənæb	‘spin’

- Assume that the ‘V!’ form is the same as the underlying form of the verb root. Imperative and masculine-subject don’t add any affixes.
  - (This is not totally true: as you may notice, imperative does change the vowels of the root. But ignore that.)
- Assume the difference between C and C<sup>j</sup> is that C<sup>j</sup> is [+hi].
- Decide what the underlying form is for the feminine subject morpheme.
- Assume a constraint \*{r<sup>j</sup>, b<sup>j</sup>}

<i>V! (masc. subject)</i>	<i>V! (fem. subject)</i>	
g’æk’æt	g’æk’æt <sup>j</sup>	‘accompany’
<b>s’ægær</b>	s’ægær	‘change’
t’əf’ær	t’əf’ær	‘scratch & mark’
g’æk’ær	g’æk’ær	‘straighten out’

- Adjust the analysis to accommodate these.

<i>he Ved</i>	<i>impersonal V</i>	
kæfæt	<b>kæf<sup>w</sup>æt<sup>j</sup></b>	‘open’
nækæs	næk <sup>w</sup> æs <sup>j</sup>	‘bite’
t’æbæs	t’æb <sup>w</sup> æs <sup>j</sup>	‘fry’
dæmæd	dæm <sup>w</sup> æd <sup>j</sup>	‘join’
tæzrabæt’	tæzrab <sup>w</sup> æt <sup>j</sup>	‘have hope for’
bænær	<b>b<sup>w</sup>ænær</b>	‘demolish’
k’æt’ær	k <sup>w</sup> æt’ær	‘kill’
s’ægær	s’æg <sup>w</sup> ær	‘change’
nækæb	<b>nækæb<sup>w</sup></b>	‘find’
sænæb	sænæb <sup>w</sup>	‘spin’
t’æf <sup>w</sup> ær	t’æf <sup>w</sup> ær	‘scratch & mark’
g <sup>j</sup> æk <sup>j</sup> ær	g <sup>j</sup> æk <sup>j</sup> ær	‘straighten out’
bætæx	<b>bætæx<sup>w</sup></b>	‘dig out’
<b>ax<sup>w</sup>ænæk’</b>	ax <sup>w</sup> ænæk <sup>w</sup>	‘take off the clothes’
dænæg	dænæg <sup>w</sup>	‘hit’

- Again, assume that the ‘he Ved’ form is the same as the underlying form of the verb root.
- Decide what the underlying form is for the “impersonal” morpheme.

### To sum up

- Not just tone, but other features too can be independent.
- There may be further structure within the features

**Next time**, relationship to phonetics: epenthetic vs. excrescent vowels, locality, etc.

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