Class 8: Structure below the segment

To do
☐ Project: meet with me a second time by the end of this week. Goal is to solidly have a topic by end of this week.

Overview: We saw all kinds of structure above the segment. How about below?

1 A couple of remarks about Manam

2 Tiers (Goldsmith 1990, 1976, 1979, and others)

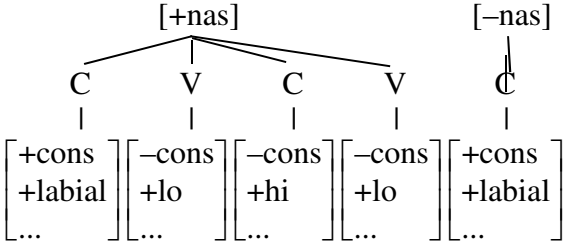
- A "linear representation" (i.e., what we've been using till now) of [mãj̃ãb] might look like:

+nas	+nas	+nas	+nas	–nas
+cons	–cons	–cons	–cons	+cons
+labial	+lo	+hi	+lo	+labial
...	...	...	...	...

- but we could imagine a reasonable notation system where we write instead:

[+nas]				[–nas]
+cons	–cons	–cons	–cons	+cons
+labial	+lo	+hi	+lo	+labial
...	...	...	...	...

- Adding a C-V skeleton tier, as Goldsmith does:



- We could even put every feature on its own tier:

[+nas]				[–nas]
[+cons]	[–cons]			[+cons]
[+labial]				[+labial]
	[+lo]	[–lo]	[+lo]	
	[–hi]	[+hi]	[–hi]	

3 This starts to resemble a "gestural score"—though not all features are gestures

(Browman & Goldstein 1986; Browman & Goldstein 1989; Browman & Goldstein 1992)

	m	ã	j̃	ã	b
lips	closed				closed
tongue tip/blade					
tongue body	low front		hi front	low front	
velum	down				up
glottis	voicing				

4 How can we decide?

- Changing the theory in this way is a good idea only if the new theory does a better job than the old at correctly[1] distinguishing highly valued from lowly valued grammars.
- As in SPE, the claim is that rules that can be expressed in a simple form (though we won't spell out how rule simplicity is to be calculated in this new notation) are highly valued.
- So, we're interested in cases were old theory says that Rule A is simpler than Rule B, but new theory says the reverse.

5 Notation clarification

- We often use acute (á) and grave (à) accent marks to mark primary and secondary stresses. In strict IPA usage, these marks are reserved for tone, and today we'll use them only for **tone**.
  - á = [a] with high tone
  - à = [a] with low tone
  - ā, or sometimes just "a" = [a] with mid tone
  - â = [a] with falling tone (high then low)
  - ǎ = [a] with rising tone (low then high)

  } contour tones

6 Tonal association

- Kikuyu (Niger-Congo language from Kenya with about 5.3 million speakers; discussion here based on Goldsmith 1990, whose data come from Clements & Ford 1979)

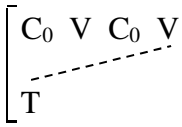
tò rɔ̀r ìrɛ́	'we looked at'	má rɔ́r ìrɛ́	'they looked at'
tò mò rɔ̀r ìrɛ́	'we looked at <u>him</u>'	má mó rɔ̀r ìrɛ́	'they looked at <u>him</u>'
tò mà rɔ́r ìrɛ́	'we looked at <u>them</u>'	má má rɔ́r ìrɛ́	'they looked at <u>them</u>'
tò tòm írɛ́	'we sent'	má tóm írɛ́	'they sent'
tò mò tòm írɛ́́	'we sent <u>him</u>'	má mó tòm írɛ́	'they sent <u>him</u>'
tò mà tóm írɛ́	'we sent <u>them</u>'	má má tóm írɛ́	'they sent <u>them</u>'

? Take a minute to ascertain the basic facts—on what does the tone of the tense suffix *ìrɛ́/írɛ́* depend? On what do the tones of the two verb roots (in **bold**) depend? On what do the tones of the object suffixes (<u>underlined</u>) depend?

? Ideas for how we can account for this with linear representations and rules (assume a feature [hi tone])?

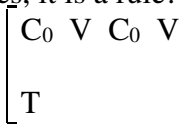
[1] As usual, the evidence as to what is actually highly valued comes, in practice, mainly from typology—even though typological evidence can be problematic.

- In the "autosegmental" notation proposed by Goldsmith, we can write a rule thus (Goldsmith 1990's (9)—"T" stands for any tone, such as H [high] or L [low] in this language):



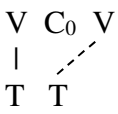
peninitial association

- Yes, it is a rule! Its structural description is

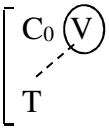


(i.e., everything except the dashed line), and the structural change it requires is insertion of the association line that is shown dashed.

- We need two more rules for the rest of the tones:



association convention[2]



initial association

- The circle is part of the structural description, and means "not associated to anything on the other tier".

? Let's apply this grammar fragment to derive 'we looked at them'—what must we assume about the association status of tones in underlying forms?

[2] For Goldsmith, association conventions actually derive from universal principles, and don't need to be specified on a language-particular basis.

- All three rules are typical of the kind of thing you see in tone languages, and all three rules are some of the simplest that could be written in this notation.

? Compare this to the linear analysis we developed above: do the linear rules look simple compared to other, less plausible linear tone rules we could write? [It's not whether the autosegmental rule looks simpler than the linear rule that matters.]

7 Beginnings and ends of contour tones

- Hakha Lai (Hyman & VanBik 2004); aka Haka Chin, Sino-Tibetan language from Chin State, Burma & adjacent areas of India & Bangladesh, w/ 130,000 speakers) forbids certain tone sequences:

	+falling	*+rising*	*+low*
falling+	falling +falling → falling+low	OK	OK
rising+	OK	rising+rising → rising+falling	rising+low → low+low
low+	low+falling → low+low	OK	OK

? Let's first try to treat this linearly: we'll have to choose a feature system and then use it to express the constraint(s) at work.

? Let's re-write these representations autosegmentally. Is it easier to express the constraint?

8 Autosegmentalism in OT

- Whether representations are linear or autosegmental is (pretty much) orthogonal to whether the grammar consists of rules or constraints or both. See Zoll (1996) for a framework; also Zoll 2003.

- For example, if we were to re-cast the analysis of Kikuyu in OT with autosegmental representations, we could have a constraint like

$$* \begin{bmatrix} C_0\ V\ C_0\ V \\ \quad |\quad\ | \\ \quad T\quad\ T \end{bmatrix}$$

"*don't associate the first two vowels to two separate tones*"

? Within OT, how do we decide whether linear reps. or autosegmental reps. are better?

9 Something else that autosegmentalism is good for: tonal stability

- *Margi* (Hoffman 1963, via Kenstowicz 1994) aka Marghi Central, Afro-Asiatic language from Nigeria with 158,000 speakers

sál	sál-árì	'man'	-árì/-ărì = definite suffix
kùm	kùm-árì	'meat'	
ʔímí	ʔímj-árì	'water'	
kú	kw-árì	'goat'	
tágú	tágw-árì	'horse'	
tì	tj-ărì	'morning'	
hù	hw-ărì	'grave'	
úʔù	úʔw-ărì	'fire'	

? What's the underlying form of the suffix?

? How could we describe the tonal alternation in rules?

? What about with constraints—what's the problem with using IDENT(tone)?

- If we really are treating tones not as features (properties of segments) but as segments, then...
  - they have correspondence indices (that we sometimes write, sometimes don't write)
  - it makes sense to have the MAX and DEP constraints refer to them:

/hu + ari/ L_1 H_2L_3	ONSET	IDENT(syll)	MAX-Tone
a hu . ari | | | L_1 H_2 L_3	*!		
☞ *b* hwari /\ \ $L_1H_2L_3$		*	
c hwari | | H_2 L_3		*	*!

- Sweater vs. eye color example (I'll explain)

10 Something else autosegmental representations are good for: floating tones

Igbo (Goldsmith 1976; Niger-Congo; 17,000,000 speakers; Nigeria)

- Subordinate clauses are preceded by a complementizer morpheme that is nothing but a H tone:

ọ̀nụ̀	'yam'	ọ̀nụ̄ [rèré èré]	'the yam [that is rotten]'
ázụ̀	'fish'	ázụ̄ [rèré èré]	'the fish [that is rotten]'
ánụ́	'meat'	ánụ́ [rèré èré]	'the meat [that is rotten]'
àkwhá	'eggs'	àkwhá [rèré èré]	'the eggs [that are rotten]'

? Fill in the tableau (gives you an idea of some typical OT autosegmental constraints)

/ az̃ụ + + rere + ere/ H_1 L_2 H_3 L_4 H_5 L_6 H_7	NO UNATTACHED TONES	DEP-V	MAX-TONE	*>1TONE PERTBU	IDENT(tone)/ first syll of word	UNIFORMITY-TONE
a a z̃ ụ r e r e e r e | | | | | | | H_1 L_2 H_3 L_4 H_5 L_6 H_7						
b a z̃ ụ r e r e e r e | | \ | | | | H_1 L_2 H_3 L_4 H_5 L_6 H_7						
☞ *c* a z̃ ụ r e r e e r e | | | | | | | H_1 $M_{2,3}$ L_4 H_5 L_6 H_7						
d a z̃ ụ r e r e e r e | | | | | | | H_1 L_2 $M_{3,4}$ H_5 L_6 H_7						
e a z̃ ụ a r e r e e r e | | | | | | | | H_1 L_2 H_3 L_4 H_5 L_6 H_7						
f a z̃ ụ r e r e e r e | | | | | | | H_1 L_2 L_4 H_5 L_6 H_7						

[What prefers $M_{2,3}$ over $H_{2,3}$ or $L_{2,3}$? It seems like maybe we do need tonal features after all....]

11 Tones behaving as a block

- *Shona* (Odden 1980), via Kenstowicz; Niger-Congo; 7,000,000 speakers; Zimbabwe and Zambia)

? Fill in a possible autosegmental tone representation under each example

mbwá	'dog'	né-mbwà	'with dog'
hóvé	'fish'	né-hòvè	'with fish'
mbúndúdzí	'army worm'	né-mbùndùdzì	'with army worm'
hákátà	'diviner's bones'	né-hàkàtà	'with diviner's bones'
bénzíbvùnzá	'inquisitive fool'	né-bènzìbvùnzá	'with inquisitive fool'

⇒ sequences of the same tone undergo a rule together, <u>as though they were a single tone</u>.

- Let's assume there is some reason why H → L after né-, and consider only outputs that do so:

? Why [né-hòvè] and not *[né-hòvé]? What must be the surface representation of [hóvé]?

? Why [né-bènzìbvùnzá] and not *[né-bènzìbvùnzà]?

? Richness of the base: what if there were an input like $/{}^{\text{hove}}_{\text{H H}}/$?

- The OCP (Obligatory Contour Principle) constraint says that adjacent identical elements (such as two Hs in a row) are not permitted. Does this help with the Richness of the Base question?

? We'll still have a puzzle if we add né- to hypothetical /hove / ... Will strata help?
H H

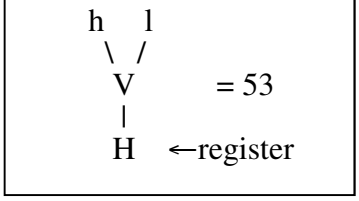
12 What about East-Asian-type tone? (examples taken from Kenstowicz 1994, ch. 7)

- Seems to be different from African-type[3] tone:
  - often more than three levels (5 is typical)
  - often transcribed with Chao numbers (Chao 1930): [ma^{213}] 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].

register	*tone (aka "contour")*	*resulting pitch*
[+hi register, –lo register] (H register)	h	5
	m	4
	l	3
[–hi register, +lo register] (L register)	h	3
	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 register is breathy
- How do you know whether a 3 is H & l or L & h?
  - Normally the whole syllable has the same register tone. 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.

[3] Of course these labels are very approximate, and there are many other regions of the world with lots of tone languages.
[4] Problematic for Mandarin 3rd tone, commonly claimed to be 214. See, e.g. Zhang & Lai 2006 for a 213 transcription.

13 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.
22 di^{22} 'younger brother'	**3** baʔ^{3} 'white'	**44** ti^{44} 'bottom'	**5** paʔ^{5} 'hundred'
31 di^{31} 'lift'		**53** ti^{53} 'low'	
13 di^{13} 'field'		**35** ti^{35} '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?

If we get this far…

14 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)) [4]

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+ɕita	→	neko-d͡ʑita	'aversion to hot food' (cat+tongue)

? Ideas for what the compound-forming morpheme could be?

[4] 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 dissallow voiceless prenasalized voiceless obstruents): [eda-^{n}ge]. Later, the prenasalization was lost.

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

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

		assume
skɐmʔi	'scampi'	/skɐnpi/
ɐnʔi	'aunty'	/ɐnti/
hɐŋʔi	'hanky'	/hɐnki/
hɐʔm̩	'happen'	/hɐpn/
bɐʔn̩	'button'	/bɐtn/
tʃɪʔŋ	'chicken'	/tʃɪkn/

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

? 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* tʃɪʔŋ̩	
b tʃɪʔn̩	
c tʃɪkn̩	
d tʃɪkŋ̩	

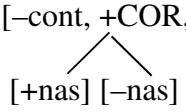
16 A feature associated to multiple segments: nasal harmony

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:[5]

tʃ̃ũˈp̃ã	'god'	tuˈpa	'bed'	*tuˈpã
p̃ĩˈr̃ĩ	'to shiver'	piˈri	'rush'	*piˈrĩ
mãˈʔẽ	'to see'	^{m}baˈʔe	'thing'	*^{m}baˈʔẽ, *^{m}bãˈʔẽ, *maˈʔe
h̃ũˈʔũ	'to be bland'	huˈʔu	'cough'	*huˈʔũ
ãˈk̃ɨ̃	'to be tender'	aˈkɨ	'to be wet'	*aˈkɨ̃
p̃õˈt̃ĩ	'to be done for'	poˈti	'to be clean'	*poˈtĩ

Aside: How do we represent prenasalized stops like [^{n}d]? Just like a contour tone!



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

? 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.

? How do you explain the alternations in the prefixes?

nõ-r̃õ-nũˈp̃ã-i[6]	'I don't beat you'
not-I.you-beat-*negation*	
nõ-r̃õ-h̃ẽˈ^{n}du-i	'I don't hear you'
not-I.you-hear-*negation*	
^{n}do-ro-haɨˈhu-i	'I don't love you'
not-I.you-love-*negation*	
r̃õ-^{m}bo-ɣwaˈta	'I made you walk'
I.you-*causative*-walk	
r̃õ-mõ-p̃õˈr̃ã	'I embellished you'
I.you-*causative*-nice	
r̃õ-mõ-x̃ẽˈ^{n}du	'I made you hear'
I.you-*causative*-hear	

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

[5] Phonetics puzzler: What's the articulatory difference between [p] and [p̃]? 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 Guarani. So the real analysis will be more complicated...

[6] 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.

To sum up

- Many features seem to behave not as properties of segments but an entities in their own right.
- This can be captured by autosegmental representations (and, in OT, including autosegments in correspondence relations).

Next week

- Relation to phonetics: locality, gestural scores, feature geometry, excrescent vowels, illusory deletion...

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