

Class 13: Structure above the segment I

To do

- Kalinga assignment (on last week’s material) is due Friday
- Next reading is Hall 2006 (due Tuesday)

Overview

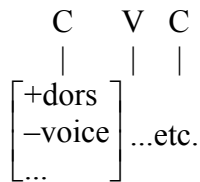
Let’s turn our attention from processes to the representations they manipulate, starting with structure above the segment. This week we’ll consider arguments for having skeleta, moras, syllables, grids, feet, prosodic words...

1 Representations in SPE

- Sequence of feature matrices:

$$\left[\begin{array}{l} \text{--segmental} \\ +\text{WB} \\ \text{--FB} \end{array} \right] \left[\begin{array}{l} +\text{seg} \\ +\text{cons} \\ +\text{dors} \\ \text{--voice} \\ \text{--nas} \\ \text{--son} \end{array} \right] \left[\begin{array}{l} +\text{seg} \\ \text{--cons} \\ +\text{dors} \\ \text{--hi} \\ +\text{low} \\ \text{--back} \\ \text{--round} \end{array} \right] \left[\begin{array}{l} +\text{seg} \\ +\text{cons} \\ +\text{cor} \\ \text{--voice} \\ \text{--nas} \\ \text{--son} \end{array} \right] \left[\begin{array}{l} \text{--seg} \\ +\text{WB} \\ \text{--FB} \end{array} \right]$$

2 Reasons to add skeletal structure



- Persistence of skeletal structure
 - Bakwiri (aka Mokpwe, Niger-Congo language from Cameroon with 32,200 speakers) syllable-reversing language game (Bagemihl 1989, data from Hombert 1973):

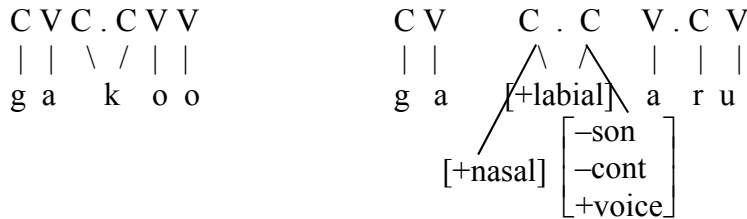
<i>normal</i>	<i>reversed</i>	
lìjé	jèlí	‘stone’
lùù ^ŋ gá	^ŋ gààlú	‘stomach’
zèéjà	jàázè	‘burn’
ʔéžèè	zèʔèè ¹	‘is is not’
lìòβá	βààlío	‘door’

- Let’s draw before-and-after representations with a skeletal tier

¹ I don’t know what’s up with the tone on the first syllable; maybe it’s a typo.

• Licensing of a feature by one of its multiple associations

- Japanese (Ito 1986): place features in a coda are OK only if they belong to a place-assimilated nasal or the first half of a geminate.
- Explanation: place features must be associated to (= are licensed by) an onset/prevocalic C:



• Geminate inalterability: shared structure is special

- Consider the linear versions of some optional rules from Toba Batak, (Hayes 1986b) (aka Batak Toba, Austronesian language from Indonesia with 2 million speakers):

glottal formation $\begin{bmatrix} -\text{son} \\ -\text{cont} \\ -\text{voice} \end{bmatrix} \rightarrow \text{ʔ} / \text{ ___ } C$

/ganup taən/	→	ganuʔ taən	‘every year’
/dohot lali i/	→	dohoʔ lali i	‘and the hen-harrier’
/halak batak/	→	halaʔ batak	‘Batak person’
/lap piŋgəl/	→	laʔ piŋgəl	‘wipe off the ear’
/maŋihut taən/	→	maŋihuʔ taən	‘according to the year’
/halak korea/	→	halaʔ korea	‘Korean person’

n-h rule n h → k k

/maŋan halak i/	→	maŋak kalak i
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denasalization $\begin{bmatrix} C \\ +\text{nas} \end{bmatrix} \rightarrow \begin{bmatrix} -\text{nas} \\ -\text{voice} \end{bmatrix} / \text{ ___ } \begin{bmatrix} C \\ -\text{voice} \end{bmatrix}$

/maŋinum tuak/	→	maŋinup tuak	‘drink palm wine’
/manaŋ pulpen/	→	manak pulpen	‘or a pen’
/holom saətik/	→	holop saətik	‘somewhat dark’
/mananəm piriŋ/	→	mananəp piriŋ	‘bury a dish’
/mamerəŋ kalabbu/	→	mamerek kalabbu	‘look at a mosquito net’

h-assimilation [-voice] h → 1 1
 1 2

/marisap hita/	→	marisap pita	‘let us smoke’
/dohot halak/	→	dohot talak	‘and a person’
/modom halak i/	→	modop palak i	‘the man is sleeping’
/dibərəŋ halak i hərbə i/	→	diberek kalak i hərbə i	‘the man saw the buffalo’

- There is an ordering solution here under the linear theory: what is it?

- More data—can we patch up the linear account to handle them?

/diktator²/ → diʔtator ‘dictator’
 /rɔʔrɔt/ → rɔʔrɔt ‘to knock down’

vs.

/dɛkkɛ/ → dɛkkɛ ‘fish’
 /pittu/ → pittu ‘door’
 /aŋsa/ → aksa ‘fish’

vs.

/adat+ta/ → adaʔta ‘our custom’
 /suddut+ta/ → sudduʔta ‘our generation’

- Hayes’s solution (spelling it out explicitly gets more complex—see the paper): assimilation creates a **shared structure**, not eligible for the glottal-formation rule (“geminate inalterability—see also Schein & Steriade 1986, Hayes 1986b).

- Let’s try some examples.

3 SPE rejected syllables, but they started to come back into style afterwards. Reasons?

- They can explain basic C/V phonotactics well.

- Yawelmani Yokuts (Kisseberth 1970, Penutian, California) seems to require a constraint

$$*\left\{ \begin{array}{c} \# \\ C \end{array} \right\} C \left\{ \begin{array}{c} \# \\ C \end{array} \right\} .$$

- How could we rephrase this if the theory includes syllables?

- They can explain finer-grained phonotactics too (see Steriade 1999 for classic references, including Steriade herself in the 1980s):

- Certain contrasts are licensed only in onsets (place, voicing,...)
- Sonority tends to rise within an onset, fall within a coda

But Steriade 1999 argues that these phenomena are better explained in a way that sticks closer to the phonetics:

- Yokuts: all consonants must be V-adjacent
- Prevocalic position is a better place for certain contrasts (place, voicing)
 - place cues from release burst, outgoing formant transitions...
- (I’ll refer you to Steriade for the sonority-contour material.)

² How do we know this is the underlying form? Because in careful speech, all these rules are optional.

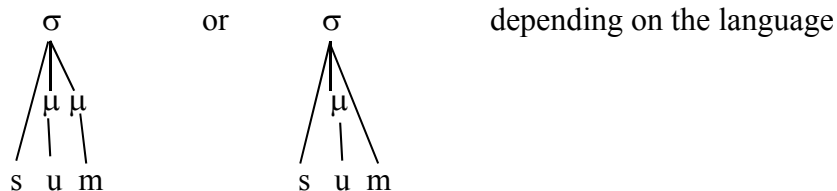
And, Steriade argues, sometimes syllables make the wrong prediction.

- Retroflex consonants' place is best cued in the transition from the preceding V, not the transition to the following V.
 - There are languages where a retroflex is allowed only in a coda!

○ Things we might still want syllables for?

4 What are moras? Review

- A *mora* is an abstract unit of duration³ that has been proposed for dealing with footing and stress assignment in so-called “quantity-sensitive” languages.
 - It's the difference between a light syllable and a heavy syllable.
- What gets a mora?
 - Onsets usually don't get any (but see Topintzi 2006, Ryan 2014)
 - A nucleus vowel almost always gets one (though in some languages, schwa gets no mora).
 - A long vowel or diphthong (2 vowels in the same nucleus) usually gets two.
 - A coda consonant may get one, depending on the language—and in some languages, only certain coda consonants get one



- Syllable weight
 - 1 mora: light syllable
 - 2 moras: heavy syllable
 - 3 moras: superheavy syllable
- How could a syllable have 3 moras?

5 Reasons to add moras

- Syllables with more moras often attract stress, leading to this constraint (Prince 1990):
 - WSP** (“weight-to-stress principle”): a heavy syllable must be stressed
 - Before moras you had rules like $V \rightarrow [+stress] / _ C \{C, \#\}$
 - Doesn't capture the typology (why not $V \rightarrow [+stress] / _ CV$ instead?)
- Compensatory lengthening (Hayes 1989)
 - Latin historical change*
 - *kas.nus > ka:.nus ‘gray’
 - *kos.mis > ko:.mis ‘courteous’
 - *fi.des.li.a > fi.de:.li.a ‘pot’

³ or total acoustic energy, or total acoustic energy weighted with some frequencies counting more than others. See Gordon 2002,

Turkish free variation sav.mak →optionally sa:.mak ‘to get rid of’
but da.vul →optionally da.ul ‘drum’

- Draw the moras and syllable structure for [sav.mak] and [da.vul]. Let’s ponder why deletion leads to lengthening in one case but not the other.

Greek (East Ionic) *woi.kos > oi.kos ‘house’
 *ne.wos > ne.os ‘new’
 *od.wos > o:.dos ‘threshold’

- Draw the moras and syllable structure for [woi.kos], [ne.wos], [od.wos], and ponder.

Middle English (originally from Minkova 1982) ta.lə > ta:l ‘tale’

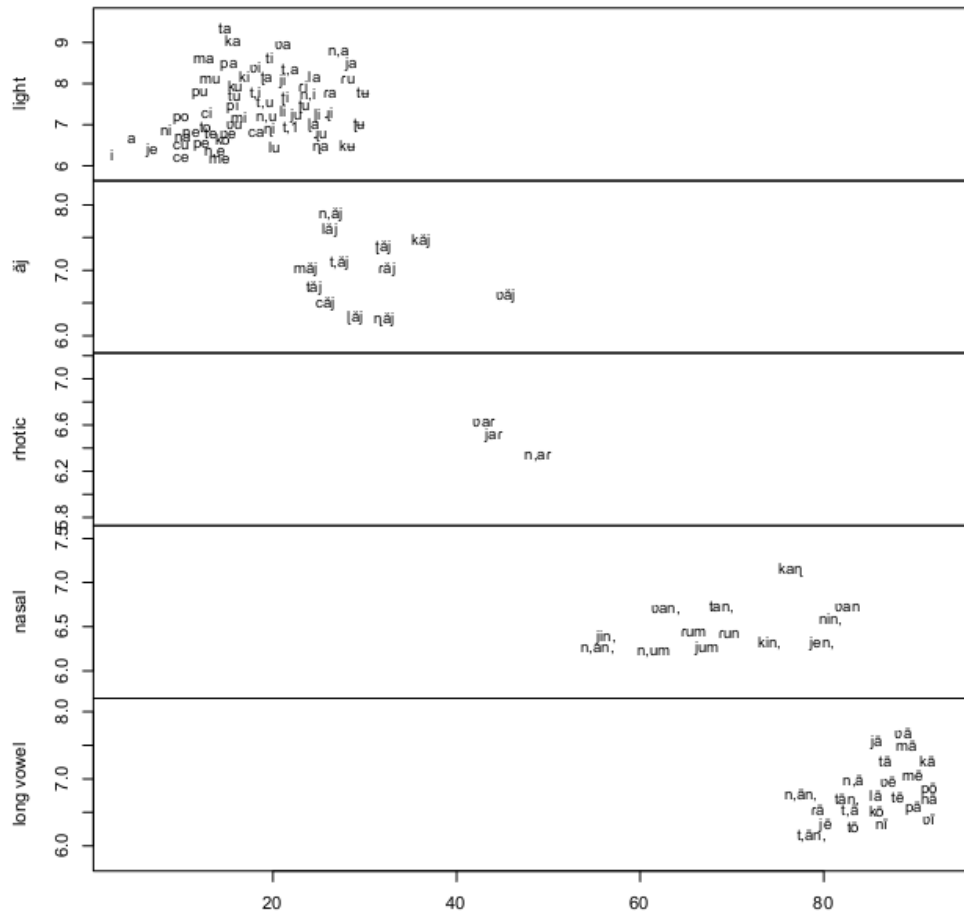
- We have to ignore several complications, but we can get the basic idea by drawing [ta.lə]

Unattested cases sa → a:
 sla → sa:

- Why don’t these occur?

But: Ryan 2011a; Ryan 2011b shows that language can make many more than 2 or 3 weight distinctions

- Tamil: using sophisticated statistical measures over a huge verse corpus, Ryan finds 5 partly-overlapping weight classes



horizontal axis:
percentage of the time
each syllable type acts
as though heavy in
verse.

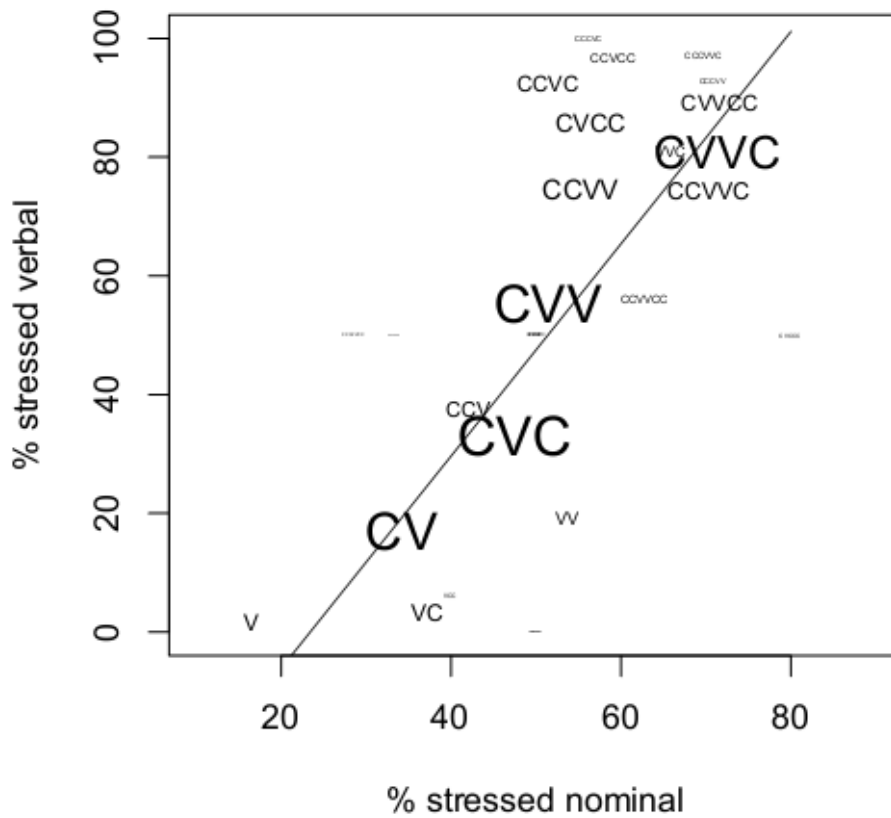
vertical axis within each
slice: log frequency of
each type (not important
for our purposes).

Figure 14: Figure 13 filtered into five phonological classes.

(Ryan 2011a p. 21)

- Later he finds more and more categories (here and for other languages)
 - The categories also don't behave as though evenly spaced
- In versification and lexically-variable stress (English real and fake words), it seems more like you can attach a real number to each syllable, like “0.81”.

- Here's Ryan's English real-word data:



Size of font indicates frequency.

Notice that more-complex onset leads to more stress.

(Ryan 2011a, p. 179)

6 Reasons not to treat stress as a feature

- Other features (usually) don't shift from segment to segment based on distance from a word edge:

óigin	original	originálicity
phótogràph	photógrápher	phòtogràphic
- Other features (usually) don't act at long distances across other instances of that feature:

Míssissíppi	vs. Míssissìppi	législàtors
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- Languages don't require every content word to have at least one + value of other features (except maybe [syllabic], which, in the CV-skeleton theory, is not a feature anyway).
- For just about every other feature, there is some language where it assimilates—but I know of no rules of stress assimilation, only stress dissimulation.

7 Reasons to handle stress with a metrical grid

- Stress relations are often represented as a *grid* (Lieberman 1975).
 - Rows (a.k.a. ‘layers’) represent degrees of stress; columns are associated with stress-bearing units (syllables, typically).

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                x
x              x
x      x      x
x  x  x  x  x  x
re  con ci li a tion (example from Hayes)

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- Grids are subject to the inviolable **Continuous Column Constraint**: for every grid mark (except on the bottom layer) there must be a grid mark in the same column on the layer below.
- Locality
English phrasal stress rule (a.k.a. nuclear stress rule): place main stress on last word of phrase⁴
 - But sometimes main stress ends up several syllables from the end of the phrase—makes for an awkward rule
 - Example from Hayes: *hypothetical imitators*, which could also perhaps be *hypothetical imitators*.

Grid version of the rule is local:

$$\begin{bmatrix} \\ \end{bmatrix} \rightarrow \begin{bmatrix} x \\ x \end{bmatrix}$$

= “if the top layer of the grid has exactly two marks, add another mark to the second one”

- Any amount of white space is allowed between and on either side of xs on the same layer when matching representations up to the structural description
- The structural description could match any (adjacent) rows of the grid
- Draw grids for *hypothetical* and *imitators* in isolation; put them together and apply this rule.
- The optional English rhythm rule (Prince 1983): really an interaction between a constraint NOCLASH and a rule Move-X.

NOCLASH: * x x (if two grid marks are adjacent on their layer, the grid marks under
 x x them can’t also be adjacent on their layer)

Move-X: Move one grid mark along its layer (triggered by NO-CLASH)

English-specific detail: only leftward movement is allowed here.

⁴ This can be overridden by focus. Also, watch out for compounds.

- Draw the grids for *Mississippi* and *legislators*. If you put them together, is NO-CLASH violated?

- Apply Move-X if necessary—where can X move to without violating the Continuous Column Constraint?
- In what way might this operation appear non-local? In what way is it local?
- The rich get richer: in the rhythm rule, Prince notes that the stress retracts onto the strongest preceding syllable. Here are some of Hayes's examples...
- Draw grids for *Sunset Park* and *Zoo*, and then put them together and apply Move-x to resolve/alleviate the clash. Where can the moved x land?

- Let's use the rhythm rule to figure out grids for *totalitarian tendencies* (more than one possible outcome?) and *Constantinople trains*

- And the poor get poorer (Hayes): Consider the derivation of *paréntal* from *párent*. When *-al* is added, assume that stress rules add stress to the new penult (*páréntal*). Then main stress is assigned (*pàréntal*).
- Draw the grid for *pàréntal*. What constraint is now violated? Can Move-X help?

- Assume a rule 'Delete (one) x' that can be triggered by constraint violation (though not by NOCLASH, apparently). What options do we have for applying that rule?

To sum up

- We've seen some of the classic arguments for adding various types of representational structure above the segment.
- We've also seen some of the doubts.
- Next time: arguments for two more pieces of structure: the **foot** and the **prosodic word**.

References

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