

## Class 16: Stress I, the grid

### To do

- Hayes reading, SQs due Tuesday
- Project abstracts due Tuesday
- Last assignment due Tues., Dec. 2 (i.e., in a week and a half)

In a lot of ways, stress doesn't look like a feature. Accordingly, a type of representation called a *grid* has been proposed, to which stress rules apply.

### 1. What is stress?

It's hard to say: stress doesn't have a consistent phonetic realization, although stressed syllables tend to...

- have longer duration than unstressed
- be louder than unstressed
- support a larger set of vowel contrasts (see Crosswhite 2001,<sup>1</sup> Barnes 2006<sup>2</sup> for surveys)
- have longer VOT, more fortition on their consonants than unstressed (see Lavoie 1996,<sup>3</sup> González 2002<sup>4</sup> for surveys)
- attract glottalization and aspiration away from unstressed
- be associated with pitch excursions (high or low, depending on utterance melody)<sup>5</sup>

It's easier to define stress as an abstract prominence relation—some syllables are more prominent (stressed) than others, and this has phonetic and phonological consequences such as those listed above.

### 2. Stress as a feature?

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

óorigin	oríginál	oríginálicity
phótogràph	photógrápher	phòtogràphic

- Other features don't act at long distances across other instances of that feature (well, not usually...):

Mìssissìppi vs. Míssissìppi législàtors

<sup>1</sup> Crosswhite, Katherine. 2001. *Vowel reduction in Optimality Theory*. Routledge.

<sup>2</sup> Barnes, Jonathan. 2006. *Strength and Weakness at the Interface: Positional Neutralization in Phonetics and Phonology*. Berlin/New York: Mouton de Gruyter.

<sup>3</sup> Lavoie, Lisa. 2001. *Consonant Strength: Phonological Patterns and Phonetic Manifestations*. New York: Garland.

<sup>4</sup> González, Carolina. 2002. *The Effect of Prosodic Structure in Consonantal Processes*. USC dissertation.

<sup>5</sup> This is what makes stress different from pitch accent. A pitch-accented syllable always gets the same tone or tone contour.

- 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 really a feature any more).
- 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.

### 3. The grid

Instead, stress is often represented as a *grid* (Liberman 1975<sup>6</sup>). The rows (a.k.a. 'layers') represent degrees of stress; the columns are associated with stress-bearing units (syllables, in the simple cases).

Example from Hayes (1995<sup>7</sup>):

				x		
	x			x		
	x	x		x		
x	x	x	x	x	x	
re	con	ci	li	a	tion	

Grids are assumed to be 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.

### 4. Payoff I: Locality

English phrasal stress rule (a.k.a. nuclear stress rule): Places main stress on the last word of a phrase,<sup>8</sup> even though this is sometimes several syllables from the end of the phrase (example from Hayes: *hypothetical imitators*, which could also perhaps be *hypothetical imitators*).

The grid allows us to state the rule very locally. It's assumed that any amount of white space is allowed between and on either side of *x*s on the same layer when matching representations up to the structural description, and that the structural description could match any (adjacent) rows of the grid:

$$\left[ \begin{array}{c} \phantom{x} \\ x \phantom{x} \end{array} \right] \rightarrow \left[ \begin{array}{c} x \\ x \phantom{x} \end{array} \right]$$

- Draw grids for *hypothetical* and *imitators* in isolation, then put them together and apply this rule.

The optional English rhythm rule (Prince 1983<sup>9</sup>): really an interaction between a constraint NO-CLASH and a rule Move-X.

<sup>6</sup> Liberman, Mark. 1975. *The intonational system of English*. MIT dissertation.

<sup>7</sup> Hayes, Bruce. 1995. *Metrical Stress Theory*. U of Chicago Press.

<sup>8</sup> This can be overridden by focus. Also, look out for compounds.

<sup>9</sup> Prince, Alan. 1983. Relating to the Grid. *Linguistic Inquiry* 14: 19-100. (!)

No-Clash: \* 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)

- 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?

### 5. Payoff II: Consequences of the Continuous Column Constraint

The rich get richer: in the rhythm rule, Prince notes that the stress retracts onto the strongest preceding syllable.

- Draw grids for *Sunset Park* and *Zoo*, and then put them together and apply Move-x to resolve the clash. What would be the permissible landing sites for the moved *x* if the Continuous Column Constraint didn't exist?
- Let's use the rhythm rule to figure out grids for *totalitarian tendencies* and *Constantinople trains*.

And the poor get poorer: Consider the cyclic derivation of a word like *paréntal* (from *párent*). When *-al* is added to *párent*, assume that, rather than recalculating stress entirely, the Level 2 stress rules merely add stress to the penult (*páréntal*). Then assume that main stress is added to *rent* (*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 that constraint. What options do we have for applying that rule?

## 6. The perfect grid—describing four basic stress systems

Prince proposes that the four basic stress types of Hayes (1981<sup>10</sup>) can be achieved through setting two parameters for lining up syllables with a *perfect grid*:

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      x   x   x
... x x x x x x x ...

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(a) where to start on the grid: peak or trough

(b) where to start in the word: beginning or end

- What are the parameter settings for each of the following four languages (don't worry about primary vs. secondary stress)?

*Maranungku* (Australian; data originally from Tryon 1970)

tí.ralk	'saliva'
mé.re.pèt	'beard'
yán.gar.mà.ta	'the Pleiades'
lángkaràteti	'prawn'
wélepènemànta	'kind of duck'

*Weri* (Trans-New Guinea; data originally from Boxwell & Boxwell 1966)

ŋin.típ	'bee'
kù.li.pú	'hair of arm'
u.lù.a.mít	'mist'
à.ku.nè.te.pál	'times'

*Warao* (Language isolate from Venezuela, Guyana, and Suriname; data orig. from Osborn 1966)

yì.wà.ra.ná.e	'he finished it'
yà.pu.rù.ki.tà.ne.há.se	'verily to climb'
e.nà.ho.rò.a.hà.ku.tá.i	'the one who caused him to eat'

*Araucanian* (data originally from Echeveria and Contreras 1965)

Family consisting of 2 languages, Mapudunun from Chile & Argentina, and Huilliche from Chile.

wu.lé	'tomorrow'
ʧi.pán.to	'year'
e.lú.mu.yù	'give us'
e.lú.a.è.new	'he will give me'
ki.mú.ba.lù.wu.lày	'he pretended not to know'

Additional parameter: add an extra grid mark at either the beginning or the end of the word.

<sup>10</sup> Hayes, Bruce. 1981. *A metrical theory of stress rules*. MIT dissertation.

- Which setting does each of the four languages above have?
- Consider Araucanian *elumuyu*: how does the extra grid mark end up in the right place?

## 7. Extrametricality

In order to analyze some languages' stress systems, it is necessary to suppose that certain material at the beginnings or ends (usually ends) of words is 'left out' of the grid-mark assignment (*extrametrical*).

Hayes (1981) proposes that only constituents (segments, syllables, feet [which we'll get to later], phonological words, or affixes) may be made extrametrical.

*Example*: Winnebago/Hocąk (Siouan; data orig. from Miner 1979, Hale & White Eagle 1980).

(All the hooks under vowels—which indicate nasalization—should be going the other way.)

- What are the parameter settings for Winnebago, and what has to be extrametrical?

ha.ki.rú.jik.ṣ̌à.ną	'he pulls it taut'
hi.ra.wá.haz.rà	'the license'
ho.ki.wá.ro.kè	'swing'
ho.č̣j.č̣j.ṇik	'boy'
hi.jo.wí.re	'fall in'
hi.pi.rák	'belt'
hiṣ̌.ja.sú	'eye'

- How are these forms different? Any ideas about why?

wa.jé	'dress'
wi.júk	'cat'

➔ Most languages require every content word to have a stress. When a word is otherwise unstressable, a special rule steps in.

- Let's try to formulate Winnebago's rule for otherwise unstressable words.

## 8. Moras

In order to look at the next example, we need to introduce the *mora*, a unit of weight (abbreviated  $\mu$ ). Weight is sort of an abstract version of duration. In most languages, short vowels have one mora and long vowels have two. In many languages, some or all coda consonants also get one.

**9. Exercise: Cairene Classical Arabic** (data taken from Hayes 1994 and Kenstowicz 1993, originally from Mitchell 1980 and Kenstowicz 1980—probably resulting in some contradictions and redundancies)

(=the variety of Classical Arabic spoken in Cairo)

Building the grid on moras rather than syllables, figure out the parameter settings for Cairene and what has to be extrametrical. You can assume that secondary stressed gets assigned and then wiped out by a later rule.

- First make a guess about the basic grid parameters

<i>a</i>	ká.ta.ba	‘he wrote’	
<i>b</i>	ša.ja.rá.tu.hu	‘his tree’	
<i>c</i>	ka.ta.bí.tu	‘she wrote it’	(not Classical, but apparently words of this shape are stressed the same in Classical and Colloquial Cairene)

- What’s going on here?

<i>d</i>	ʔad.wi.ya.tú.hu	‘his drugs (nom.)’	
<i>e</i>	ʔin.ká.sa.ra	‘it got broken’	
<i>f</i>	qat.tá.la	‘he killed’	
<i>g</i>	haa.ďáa.ni	‘these (m. dual)’	

- The ends of the words are problematic:—how can we use extrametricality to help?

<i>h</i>	ša.ja.ra.tu.hú.maa	‘their (dual) tree (nom.)’	
<i>i</i>	fí.him	‘he understood’	(not Classical)
<i>j</i>	ša.ja.rá.tun	‘tree (nom.)’	
<i>k</i>	ʔad.wi.ya.tú.hu.maa	‘their (dual) drugs’	
<i>l</i>	bée.tak	‘your (m.sg. house)’	(not Classical)

- These data are also relevant to determining what’s extrametrical.

<i>m</i>	ka.tábt	‘I wrote’	(not Classical)
<i>n</i>	haj.jáat	‘pilgrimages’	
	cf. (e) fí.him		

There is more to it—this is just a fragment.