Class 17: Stress I, the grid

To do
- Hayes reading, SQs due Tuesday
- Holoholo due tomorrow
- I'll try to post the last assignment (stress, due Dec. 1) before the weekend

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; Barnes 2006 for surveys)
- have longer VOT, more fortition on their consonants than unstressed (see Lavoie 2001; González 2002 for surveys)
- attract glottalization and aspiration away from unstressed
- be associated with pitch excursions (high or low, depending on utterance melody)[1]

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? (see Hayes reading for more)

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

órigin	oríginal	orìginálity
phótogràph	photógrapher	phòtográphic

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

  Mìssissíppi vs. Míssissìppi législàtors

- 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 dissimilation.

[1] This is what makes stress different from pitch accent. A pitch-accented syllable always gets the <u>same</u> tone or tone contour. So what makes pitch accent different from tone then? Maybe nothing: see Hyman 2009.

3. The grid

Instead, stress is often represented as a *grid* (Liberman 1975). Rows (a.k.a. 'layers') represent degrees of stress; columns are associated with stress-bearing units (syllables, typically).

Example from Hayes:

```
                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,[2] even though this is sometimes several syllables from the end of the phrase (example from Hayes: *hypothètical ímitators*, which could also perhaps be *hỳpothetical ímitators*).

The grid allows us to state the rule very locally. 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:

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

- o Draw grids for *hypothetical* and *imitators* in isolation, then 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.

- o Draw the grids for *Mississippi* and *legislators*. If you put them together, is NO-CLASH violated?
- o Apply Move-X if necessary—where can X move to without violating the Continuous Column Constraint?
- o In what way might this operation appear non-local? In what way is it local?

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[2] This can be overridden by focus. Also, watch out for compounds.

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. Here are some of Hayes's examples.

- o Draw grids for *Sunset Park* and *Zoo*, and then put them together and apply Move-x to resolve/alleviate the clash. What would be the permissible landing sites for the moved *x* if the Continuous Column Constraint didn't exist?

- o 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, rather than recalculating stress entirely, the Level 2 stress rules merely add stress to the penult (*páréntal*). Then assume that main stress is assigned to *rent* (*pàréntal*).

- o Draw the grid for *pàréntal*. What constraint is now violated? Can Move-X help?

- o 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?

6. The perfect grid—describing four basic stress systems

Prince proposes that the four basic stress types of Hayes 1980 can be achieved through setting two parameters for lining up syllables with a *perfect grid*:

```
        x   x   x
   … x  x  x  x  x  x  x …
```

(a) where to start on the grid: peak or trough
(b) where to start in the word: beginning or end

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

Maranungku (aka Maranunggu, Australian lang. from Australia, highly endangered; data orig. from Tryon 1970)

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

Weri (Trans-New Guinea, PNG, 4,000 speakers; data orig. H. Boxwell & M. 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, Venezuela, 28,000 speakers; data orig. from Osborn 1966)

yi.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 Echeverria & Contreras 1965)
Family consisting of Mapudungun (Chile & Argentina, 300,000 speakers) & Huilliche (Chile, 2000 speakers).

wu.lé	'tomorrow'
t̪i.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.

- Which setting does each of the four languages above have?

- Consider Araucanian *elúmuyù*: 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 (almost always at ends) of words is 'left out' of the grid-mark assignment (*extrametrical*).

Hayes 1980 proposes that only constituents (segments, syllables, feet [which we'll get to later], phonological words, or affixes) may be made extrametrical.

Example: Winnebago (aka Ho-Chunk, Hocąk; Siouan, U.S., highly endangered; data orig. Miner 1979; Hale & White Eagle 1980).

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

ha.ki.rú.jik.šą̀.ną	'he pulls it taut'
hi.ra.wá.haz.rà	'the license'
ho.ki.wá.ro.kè	'swing'
ho.čį.čį̀.nįk	'boy'
hi.jo.wí.re	'fall in'
hi.pi.rák	'belt'
hiš.ja.sú	'eye'

- Any ideas for analyzing these?

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.

We'll come back to what might drive extrametricality.

8. Moras

In order to look at the next example, we need to introduce the *mora* (abbreviated μ), a unit of <u>weight</u>. 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. It's generally assumed (though see Topintzi 2008) that onsets don't contribute:

CV, CCV, V 1 μ   CVV, CVː 2 μ   CVC 1 or 2 μ, depending on lang.

9. Exercise: fragment of Cairene Classical Arabic (data taken from **Hayes 1995, Kenstowicz 1994**, orig. from **Mitchell 1960, Kenstowicz 1980**—probably resulting in contradictions)

(=the variety of Classical Arabic spoken in Cairo)

Building the grid on moras rather than syllables [not a typical move, as we'll see when we get to feet next time!!], 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

a ká.ta.ba 'he wrote'
b ša.ja.rá.tu.hu 'his tree'
c 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?

d ʔad.wi.ya.tú.hu 'his drugs (nom.)'
e ʔin.ká.sa.ra 'it got broken'
f qat.tá.la 'he killed'
g haa.ðáa.ni 'these (m. dual)'

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

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

10. Extrametricality: why?

Recall that (despite the first example I chose) extrametricality is overwhelmingly a word-*final* phenomenon.

Lunden 2006 proposes an explanation that relies on (i) final lengthening and (ii) Weber's law.

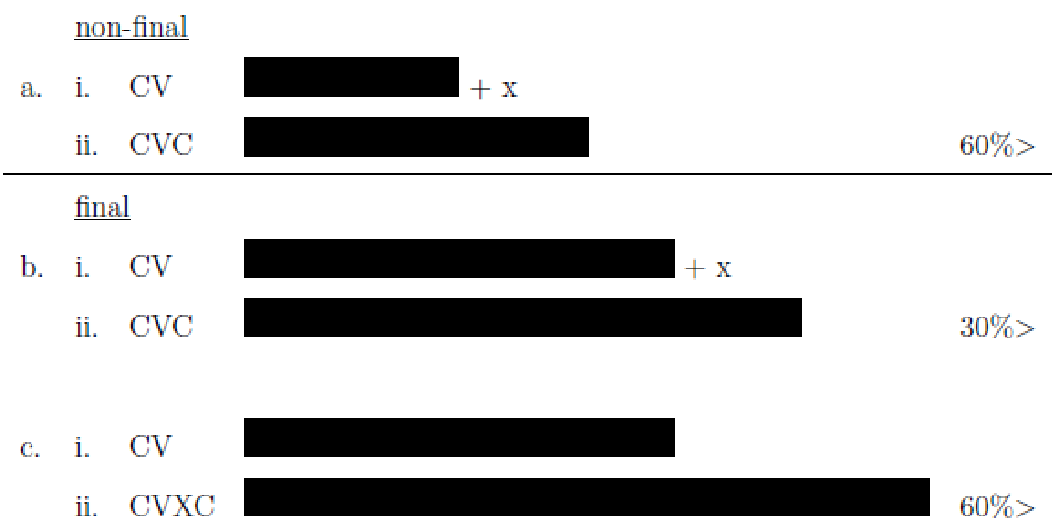
<u>Final lengthening</u>: Speech slows down at the ends of words, phrases, utterances, etc.

(1) Average vowel duration in Jordanian Arabic (Ahn 2000:118)

	Final	Penult	Antepenult
Stressed CV:	173 ms.	137 ms.	127 ms.
Unstressed CVC	73 ms.	51 ms.	46 ms.
Unstressed CV	81 ms.	65 ms.	57 ms.

(Lunden p. 195)

<u>Weber's law</u> [orig. formulated to describe human perception of changes in weight]: "the smallest noticeable difference [is] essentially proportional to the starting unit" (Lunden p. 3)



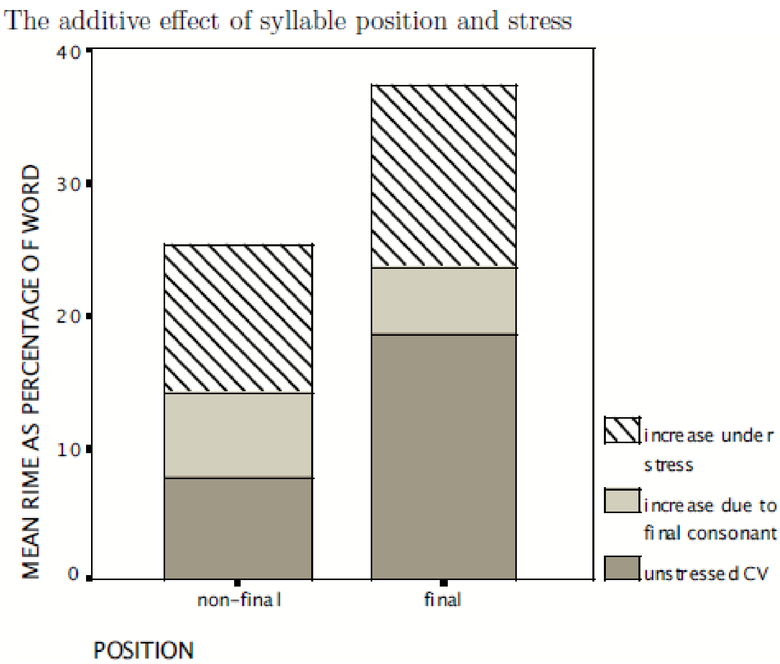
(Lunden p. 7)

The idea is that the perceptual difference in (a) is the same as that in (c), *not* the same as in (b): Δ(a.i, a.ii) = Δ(c.i, c.ii) > Δ(b.i, b.ii).

So, while non-finally CVC can be one mora heavier than CV, word-finally it takes CVXC to be a mora heavier than CV. Thus, it looks as though the final C is ignored:

CVC . CV . CV<C> CVC . CV . CVC<C>
μμ μ μ μμ μ μμ

Of course, this works only if word-final lengthening affects primarily the V, and not the final C! That seems to be true, in Lunden's results for Norwegian:



(Lunden p. 64)

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