Overview 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. A little background on syllables
   • Segments seem to be grouped into syllables, which themselves show evidence (that we won’t discuss) of internal structure:
     
     ![Diagram of syllable structure]

     
     • Although SPE eschewed syllables, they were quickly readopted because they allow simplification of lots of rules and constraints (e.g., all “/__{C,#}” rules)
     • It’s not always clear where the boundaries between syllables are (given? giv.en? giv.ven?)
     • Be skeptical of sources that claim a syllabification as though it were observable data—syllabification is always part of a phonological analysis.

     - E.g. Spanish [kó.pja] ‘copy’
       - explains why the /j/ has its non-syllable-initial allophone ([j]) rather than [jj])
       - consistent with claim that Spanish forbids [p] in coda (since we don’t observe them word-finally or before non-glide/liquid Cs)
       - consistent with claim that Spanish allows [pj] onset, since words can begin [pj]

     - vs. Tagalog [kóp.ja] ‘copy’ (loan from Spanish)
       - explains why suffixed form is [kópja-hin] ~ [kòpja-hín] (only roots with stressed, closed penult show this pattern)
       - consistent with observing lots of words that end in [p]

   • Stress seems to be a property of syllables, not segments
     - You can’t have a syllable where the onset C is [+stress] and the nucleus V is [–stress], for example.
2. **What is stress?**

- Not all languages have it.
- Among those that do, stress doesn’t have a fixed phonetic realization. Stressed syllables tend to:
  - have longer duration
  - be louder
  - support a larger set of vowel contrasts (see Crosswhite 2001; Barnes 2006 for surveys)
  - have longer VOT, more fortition on their consonants (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)
- This means stress isn’t something you can hear, see in a spectrogram, or ask a speaker to intuit—it’s the result of a phonological analysis to explain traits like those listed above.
  - That’s why phonologists can disagree about a word’s stress pattern, or even about whether a certain language has stress (French, Korean...)

- It’s better to define stress as an abstract prominence relation:
  - Some syllables are more prominent (stressed) than others, and this has phonetic and phonological consequences, depending on the grammar, such as those listed above.

3. **Stress as a feature? (see Hayes reading for more)**

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

```
ó·r·i·gin
ór·i·gí·nal
ó·r·i·ná·l·ity
phó·tó·grá·ph
dó·tó·grá·pher
phó·tó·grá·phí·c
```

- Other features don’t (usually) act at long distances across other instances of that feature:

```
Mississí·ppi
vs.
Mí·ssissí·ppi lé·gi·slá·tors
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- Languages don’t require every content word to have at least one + value of other features (except maybe [syllabic], which not all theories have).
- 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.

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1 This is what makes stress different from pitch accent. A pitch-accented syllable always gets the same tone or tone contour. So what makes pitch accent different from tone? Maybe nothing really: see Hyman 2009.
4. The grid

- The prominence relation 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).

\[
\begin{array}{ccc}
  & & \\
  x & x & x \ \\
  x & x & x \ \\
 x & x & x & x & x & x \\
\end{array}
\]

\textit{Example from Hayes}

- 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.

5. Payoff I: Locality

- English phrasal stress rule (a.k.a. nuclear stress rule)
  - Place 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: \textit{hypothetical imitators}, which could also perhaps be \textit{hypothetical imitators}.

- 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
  - The structural description could match any (adjacent) rows of the grid:

\[
\begin{array}{ccc}
  x & x & \\
  x & x & x \\
\end{array} \rightarrow \begin{array}{ccc}
  & & \\
  x & \\
  x & x & x \\
\end{array} = \text{“if the top layer of the grid has exactly two marks, add another mark to the second one”}
\]

- Draw grids for \textit{hypothetical} and \textit{imitators} in isolation, then put them together and apply this rule.

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\(^2\) This can be overridden by focus. Also, watch out for compounds.
• 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? A: yes, B: no

  o Apply Move-X if necessary—where can X move to without violating the Continuous Column Constraint? A: Mi, B: ssi, C: ppi, D: gi

  o In what way might this operation appear non-local? In what way is it local?

6. 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. Where can the moved x land? A: Sun, B: set, C: Park, D: Zoo
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 párrent.  
  - 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 (páréntal).

- Draw the grid for páréntal. What constraint is now violated? Can Move-X help? A: Yes, move an X to pa, B: yes, move an X to rent, C: yes, move an X to al, D: no

- Assume a rule ‘Delete (one) x’ that can be triggered by constraint violation. What options do we have for applying that rule?

7. 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  …

- where to start on the grid: peak or trough
- 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)? [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’
- láng.kà.rà.te.tì ‘prawn’
- wé.le.pè.ne.màn.ta ‘kind of duck’

**Weri** (Trans-New Guinea, PNG, 4,000 speakers; data orig. H. Boxwell & M. Boxwell 1966)
- njin.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.kì.ta.ne.hà.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’
- tì.pán.to ‘year’
- e.lú.mu.yù ‘give us’
- e.lú.a.è.new ‘he will give me’
- ki.mú.ba.lù.wú.lày ‘he pretended not to know’

- Additional parameter: add a grid mark on the top level 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?
Next time: Adding feet to the grid; ALIGN constraints.

References
Liberman, Mark. 1975. The Intonation System of English. MIT.