Metrical Models

1. "grid-only" (Prince ’83, Selkirk ’84, Goldsmith ’93, Gordon ’02): stress as rhythmic alternation of peaks and troughs in prominence grid with no internal grouping.

Hayes ’81 typology of alternating stress:

Maranungku:  "s s 's s  "s s s "s
Warao:       's s "s s  s 's s s s
Weri:        s 's s "s  's s s s s
Araucanian:  s "s s 's s  s s s s

• primitive rhythmic alternation of peaks and troughs: ....x x x x x x ....
• parameters of initial association to (peak/trough) and (left/right) edge of word;
• one-to-one mapping of remaining syllables

Maranungku:  peak-first, left-to-right
Warao:       trough-first, right-to-left
Weri:        peak-first, right-to-left
Araucanian:  trough-first, left-to-right

"Grid-only" model abandoned in face of empirical arguments for grouping on the basis of stress shifts under deletion and insertion of vowels and conceptual arguments for particular types of rhythm.

2. Alternative foot theory: stress reflects a parsing of syllables into asymmetric units called feet. There are two basic types of feet: a trochee in which the first element is strong and the second weak and an iamb in which the first is weak and the second strong. Feet are optimally disyllabic but a monosyllabic foot can be created as a marked option.

(x x) trochee  (x x) iamb  (x) degenerate

• Maranunuku: left-to-right trochaic parse; degenerate foot option exercised
• Warao: right-to-left trochaic parse; degenerate foot option not taken
• Weri: right-to-left iambic parse; degenerate foot option taken
• Araucanian: left-to-right iambic parse; degenerate foot option not taken
• Pintupi: left-to-right parse; degenerate foot option not taken
• Passamaquoddy: right-to-left iambic parse; degenerate foot option not taken

Evidence for grouping

3. stress shifts resulting from deletion of stressed syllable

Central Yupik: stress syllables with a long vowel and initial syllables closed by a consonant; otherwise assign alternating left-to-right pattern to remaining syllables.

qayáni 'his own kayak', sagúyáani 'in his (another's) drum', qayápígkáni 'his own future authentic kayak', qánrútkaqa 'I speak about them' < /qánrutékaqa/ by deletion of stressed vowel and retraction of stress to the left--not to the right where it might otherwise be expected. (Jacobson '85: 30-34)

qayáni \[\rightarrow\] qayápígkáni \[\rightarrow\]

\[
\begin{array}{cccccccc}
& & & x & x & x & (x x) & x & x \times \times \times \\
qayáni & - & \rightarrow & qayápígkáni & - & \rightarrow
\end{array}
\]

qánrútkaqa \[\times \times \times \times \times (x ) (x x) \times \times

Ø

4. quantity changes to yield a bimoraic foot

• Latin –io verbs (Mester 1994)

aud-i:-mus ‘hear’ root + theme + desinence i: \[\approx i\]
sent-i:-mus ‘feel’
aper-i:-mus ‘open’
sepel-i:-mis ‘bury’
cáp-i-mus ‘catch’
fác-i-mus ‘make’

• allomorphs distributed to promote exhausative parsing
5. Alternating stress typology and binary foot parsing

- Parsing: left-to-right/right-to-left
- Foot type: trochaic/iambic
- Degenerate foot option: (*)
- Seven of eight languages attested (Kager 2005)

6. Optimality Theoretic alternative (McCarthy & Prince 1993)

- Constraints:
  
  Parse Syll: penalize any syllable that is not parsed into a foot
  
  Foot-Binarity: penalize and foot that is not composed of two syllables
  
  All-Feet L/R: assign violations marks for the number of syllables that intervene between
  
  the foot and the left/right edge of the word
  
  Iambic/Trochaic: foot is right/left headed

- Exemplification of trochaic systems: Trochiac » Iambic

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*Buckley (2010) finds that Kashaya fills this cell.*
Pintupi: left to right binary parse:

**Ft-Bin » Parse-Syll » All-Ft left » All-Ft right**

<table>
<thead>
<tr>
<th>/12345/</th>
<th>Ft-Bin</th>
<th>Parse syll</th>
<th>All-Ft-L</th>
<th>All-Ft-R</th>
</tr>
</thead>
</table>
| > (12)(34)5 | * | ** | *** | *** | *
| (12)3(45) | | | | | |
| 1(23)(45) | | | | | |
| (12)345 | | | | | |
| (12)(34)(5) | * | | | |

Maranungku: left-to-right parse with no lapse

**Parse-Syll » Ft-Bin » All-Ft-L » All-Ft-R**

<table>
<thead>
<tr>
<th>/122345/</th>
<th>Parse-Syll</th>
<th>Ft-Bin</th>
<th>All-Ft-L</th>
<th>All-Ft-R</th>
</tr>
</thead>
<tbody>
<tr>
<td>(12)(34)5</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(12)3(45)</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1(23)(45)</td>
<td></td>
<td></td>
<td>* ,***</td>
<td>**</td>
</tr>
<tr>
<td>(12)345</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; (12)(34)(5)</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(12)(3)(4)(5)</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Warao: right-to-left binary parse

**Ft-Bin » Parse-Syll » All-Ft-R » All-Ft-L**

<table>
<thead>
<tr>
<th>/12345/</th>
<th>Ft-Bin</th>
<th>Parse-Syll</th>
<th>All-Ft-R</th>
<th>All-Ft-L</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 1(23)(45)</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(12)(34)5</td>
<td></td>
<td></td>
<td>* ,***</td>
<td>**</td>
</tr>
<tr>
<td>(12)3(45)</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>(1)(23)(45)</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Biangai: right-to-left binary parse with clash

Parse-Syll » Ft-Bin » All-Ft-R » All-Ft-L

<table>
<thead>
<tr>
<th>/12345/</th>
<th>Parse-Syll</th>
<th>Ft-Bin</th>
<th>Align-L</th>
<th>Align-R</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; (1)(23)(45)</td>
<td>*</td>
<td>*</td>
<td>***</td>
<td>****, **</td>
</tr>
<tr>
<td>1(23)(45)</td>
<td>*!</td>
<td></td>
<td>,***</td>
<td>**</td>
</tr>
<tr>
<td>(12)(3)(45)</td>
<td>*</td>
<td></td>
<td><strong>,</strong>*!</td>
<td>*<strong>,</strong></td>
</tr>
<tr>
<td>123(45)</td>
<td><em>!</em>*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7. In many languages syllables divided into heavy vs. light as relevant for stress

- heavy: CV
- light: CV
- variable: CVC

8. Quantity-sensitive parses (Hayes 1995)

- rhythmic templates
- iambic: [L L], [L H], [H]
- trochee: [L L] [H] Latin

9. Quantitative trochee: Classical Cairene Arabic (Mitchell 1962)

- syllables
  - light CV
  - heavy: CVV, CVC
  - super-heavy: CVVC, CVCC (limited to final syllable)

- classical pronunciation (Al-Azrah University)

jalāra

jalāratun

jalāratuhu

jalāratuhumaa
darábt ʔa9máal

mustáʃfaa, mu9álim, muqáatil, jaabaátun

kaatába, qattálat, maktábah, wálad, ráʔaa, híya, kátaba, ʔinkásara, bulahníyawun, murtabíTátun

• Mitchell & Langendoen Generalizations
  i. stress a final supra-heavy syllable
  ii. otherwise, stress a penultimate heavy
  iii. otherwise, stress the penult or the antepenult depending on which is
       separated from the begeniing of the word or a previous heavy syllable by an
       even number of light syllables

• Metrical analysis

  left-to-right moraic trochee parse with (main) stress on final foot
  final mora is “extrametrical”
  head foot is interpreted phonetically with duration
  no secondary stress

<table>
<thead>
<tr>
<th></th>
<th>Project</th>
<th>line 0</th>
<th>* * * *</th>
<th>* * * * *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parse-LR</td>
<td>line 0</td>
<td>(* *)</td>
<td>(* *)</td>
<td>(* <em>) (</em> <em>) (</em> *)</td>
</tr>
<tr>
<td>Head-L</td>
<td>line 1</td>
<td>(* *)</td>
<td>(* *)</td>
<td>*</td>
</tr>
<tr>
<td>Unbounded-R</td>
<td>line 2</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

Project

<table>
<thead>
<tr>
<th></th>
<th>Parse-LR QS</th>
<th>line 0</th>
<th>(<em>) (</em>)( * *)</th>
<th>(<em>) (</em>)( * <em>) (</em>)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head-L</td>
<td>line 1</td>
<td>(*)</td>
<td>(* *)</td>
<td>(*)</td>
</tr>
<tr>
<td>Unbounded-R</td>
<td>line 2</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>
10. OT analog

- constraints

  Weight-to-Stress: a heavy syllable occupies the head of a foot

  Ft-Bin: feet are bimoraic

  Final Mora of heavy and supraheavy syllable ignored

- ranking

  Trochaic » Iambic

  Ft-Bin » Parse-Syll » All-Ft left » All-Ft right

- tableaux

  \[
  / \text{fajarátu hu} / \begin{array}{ccc}
  \text{Ft-Bin} & \text{Parse-syll} & \text{All-Ft-left} \\
  > (12)(34)5 & * & ** \\
  (12)(34)(5) & *! & **,**** \\
  1(23)(45) & * & *,**!* \\
  (12)345 & **!* \\
  \end{array}
  \]

  / ?adwiyatúhu / \begin{array}{ccc}
  \text{Ft-Bin} & \text{Parse-syll} & \text{All-Ft-left} \\
  > (1)(23)(45) & * & ,*** \\
  (12)(34)5 & * & ** \\
  (1)(23)45 & **! & * \\
  \end{array}