The proposed course draws on material from Topintzi (2010) Onsets: Suprasegmental and Prosodic Behaviour. Cambridge: Cambridge University Press. This book is the first detailed and comprehensive study that examines the role of onsets in a host of phenomena, including stress, gemination, compensatory lengthening and word minimality. Although standard phonological theory (Hyman 1985, Hayes 1989, Morén 2001, Gordon 2006) acknowledges that on the observational level onsets appear to be relevant for e.g. stress assignment in languages such as Pirahã (Everett and Everett 1984, Everett 1988), it nonetheless adopts the ‘convenient’ (Morén 2001: 8) assumption that onsets never contribute to syllable weight, i.e. they are never moraic. Topintzi (2010) challenges this assumption and shows that introduction of onset moraicity must be admitted so that we better understand and explain numerous prosodic processes and phenomena in various languages. Notably, the book has received positive reviews in esteemed journals such as Phonology (2011, Vol. 28: 141-7) and Lingua (2011, Vol. 121: 323-7), as well as in the Linguist List.

The proposed course presupposes some prior knowledge of phonology and a basic understanding of the workings of Optimality Theory (Prince and Smolensky 1993/2004). It will be of interest to students of phonology, typology and Optimality Theory. The course is scheduled to run on 4 sessions of 90 minutes each.
Onsets: Suprasegmental and prosodic behaviour

or: CORE THEORY

What’s this course about?

- Some languages (Ls) treat different types of syllables differently with respect to various phenomena, e.g. stress, tone, word minimality, etc.
- Common situation: \( CV \neq CVV, CVC \) (Hopi) or \( CV, CVC \neq CVV \) (Lenakel)
- Generalization: the presence/absence of an onset or, if present, the number of consonants in onset position is irrelevant for purposes of syllable weight
- This is true for the majority of cases, but there's a number of counterexamples
- We will look into such cases and argue that onsets can actually bear weight on a language specific basis

The main idea

- ... is simple: onsets, like codas, can be moraic (b) or not (a; the standard approach)
  a. Non-moraic onsets
  b. Moraic onsets

- A short excursus: why moraic theory?
  o Hayes' (1989) landmark paper shows how moraic theory elegantly accounts for many cases of compensatory lengthening and can be advantageous over other weight models, e.g. compare with C/V model on Ancient Greek CL: \( /esmi/ \rightarrow [emmi] \) or \( [e:mi] \) depending on the dialect
  o Morén explicitly states that onset weight does not exist, but the null hypothesis would be that it too exists and that the distinction he makes is applicable there too

Japanese Hypocoristics (Benua 1995)

Midorix Mido-čan, Mii-čan
Hanako  Hana-čan, Haa-čan, Hač-čan

- Let us for the moment assume that onsets can indeed bear moras (I will try to convince you about that later on and in coming sessions). What types are there?
- Morén (2001): distinction between coerced vs. distinctive weight
- Coerced weight: enforced by some constraint on the surface, e.g. WBYP, WDMIN
- Distinctive weight: lexically determined and contrastive, e.g. geminates
- Morén explicitly states that onset weight does not exist, but the null hypothesis would be that it too exists and that the distinction he makes is applicable there too
- This is the argument here

**Moraic Onsets**

- **Distinctive**
  - **True Geminates**
    - Surface contrast between [C] & [C'] in same position that comes from the input, i.e. /C/ → [C] vs. /C'/ → [C']
  - **Geminated**
    - Surface contrast between [C] & [C'] in same position, but debatable if this comes from the input
  - **Non-geminated**
    - Surface weight appears which must be induced by a constraint, i.e. generally /C/ → [C'], but due to onset markedness considerations, only a subset of consonants may present this pattern. The rest remain /C/ → [C]. See below for the importance of voicing for onset-moracity and sonority for coda-moracity

- **Onset weight**
  - Distinctive: Trukese [taa] ‘islet’ vs. [tto] ‘clam’
  - Coerced: Pirahã [pa] vs. [ba]
  - Geminated: mixed properties, i.e. surface weight contrast exists (cf. distinctive), but seems to be induced on the output (cf. coerced). Example: Marshallese reduplication through gemination: [ko.rap] vs. [yo.kko.rap.rap]
    - geminated Cs will be treated like true geminates
  - Any consonant can be moraic under distinctive weight → due to faithfulness
  - More conditions can be placed on coerced weight (no faithfulness protection, so markedness will regulate attested patterns)

**Coerced onset weight**

- Empirical data from stress in Karo, Pirahã and to a lesser extent Arabela, show that voiceless onsets surface as moraic, whereas voiced ones are not (the sonorants’ behaviour is variable)

- But why should voicing be important?
  - voiceless onsets usually raise the pitch of the following vowel, voiced ones lower it (cf. depressor consonants)
  - Tonogenesis: relationship between [+voi]&L and [-voi]&H
  - Synchronic data

**Kammu dialects**

- **South** (voicing contrast—no tone) vs. **North** (no voicing contrast—tone contrast)
  - klaâŋ vs. klâaŋ ‘eagle’
  - glaâŋ vs. klâaŋ ‘stone’
In some Ls, e.g. Golin (de Lacy 2002), H-tones attract stress on them

Since:
(a) H-toned moras, i.e. moras with high pitch perturbation, may attract stress
(b) high pitch perturbation may be caused by lack of voicing
(c) pitch is one of the phonetic correlates of stress
   - we predict that in some Ls pitch perturbation due to voicing is phonologized as stress (rather than tone) in terms of moras

Proposed constraints:
- Universally fixed onset moraic markedness hierarchy
  \[ *\mu/ONS/[\text{+voi}] >> *\mu/ONS \]
- MORAIC ONSET: Onsets are moraic (see Crosswhite 2001) → to be generalized as BE MORAIC for the cluster of constraints that may induce coerced moraicity on any syllable constituent

Generated patterns
(a) most Ls, (b) Pirahã, Karo, (c) perhaps Bella Coola

Patterns of coerced onset weight
- a. \[ *\mu/ONS/[\text{+voi}] >> *\mu/ONS >> \text{BE MORAIC} \]
- b. \[ *\mu/ONS/[\text{+voi}] >> \text{BE MORAIC} >> *\mu/ONS \]
- c. \[ \text{BE MORAIC} >> *\mu/ONS/[\text{+voi}] >> *\mu/ONS \]

What about sonorants?

Unlike obstruents, sonorants do not automatically perturb pitch and thus are not anticipated to have a specific behaviour with respect to tone or onset weight

The empirical facts are compatible with this conclusion

Tone:
- Nupe L-spread is allowed across voiced obstruents and sonorants, but not across voiceless obstruents
- Bade H-spread occurs over voiceless obstruents and sonorants, but is blocked by voiced obstruents

Since in Nupe, voiceless obstruents and in Bade, voiced obstruents actively block tone spreading, one needs to refer to binary [±voi]. Unary [voi] would leave Nupe unexplained

The duality of sonorants could be captured if we claim that they are unspecified for [voice]. This is plausible when they are transparent for a process (as with tone spreading above), but not when they actively participate in one

Ls like Kotoko, show that sonorants must be [\text{+voi}]
Kotoko sonorants must be [+voice]

a. Voiceless obstruents take H tone on first syllable
   n-sáp-à ‘chase’  n-sáb-à ‘grow’
   m-páy-à ‘bury’  n-cônh-à ‘be sated’

b. Voiced obstruents take M-tone on first syllable (depressor consonants)
   n-zəg-l-à ‘carry’  n-dunkw-à ‘throw’
   m-báh-à ‘bathe’  n-gulan-à ‘laugh’

c. Sonorants take M-tone on first syllable (depressor consonants)
   n-wac-à ‘leave’  n-yey-à ‘call’
   m-mar-à ‘die’  n-law-à ‘fight’

- Upshot:

Types of sonorants
a. [+son] Lar  b. [+son] Lar
   [+voi]

- Kotoko has Type (a), Bade has Type (b) because sonorants are equally transparent for both H and L tone spreading
- This reasoning extends to stress considerations. Tomorrow we will see that sonorants in Karo pattern with voiceless obstruents but with the voiced ones in Pirahã

Where’s sonority in the picture?

- Consider coda weight: in some Ls only the more sonorous codas are weightful, e.g. Kwakwala or Lithuanian where CVV, CVS > CVO, CV or Oowekyala where CVF > CVT [where F=fricative, T=stop]
- But for onset weight, the claim has been that it is voicing that regulates the comparable patterns
- Asymmetry?
- Proposal: actually voicing regulates moraic markedness by default due to
  - economy: pitch perturbation due to voicing is typically used for tonal purposes, but since it is a constantly available cue, why not extend to stress also by means of moras?
- But why is sonority preferred in nuclei and codas?
  - unreliability: voicing is rarely contrastive in nuclei and often neutralized in codas
Is it really impossible to employ sonority instead of voicing as a regulator of onset weight? YES!

- wrong predictions, e.g. FV > TV → unattested!
- fails to capture the duality of sonorants which should consistently contribute to weight or not

![Diagram of Moraic markedness for margins and Be Moraic](image)

- Onset moraicity: \*μ/ONS/ [+voi] >> \*μ/ONS
- Coda moraicity: \*μ/CODA/ [−son] >> \*μ/CODA
Onsets: Suprasegmental and prosodic behaviour

02. STRESS

Today’s preview

- Focus on stress and interaction with onsets
- Two patterns:
  - Quality of onset effects (QO)
  - Presence of onset effects (PO)
    - Onset-On-Stress effects
    - Stress-on-Onset effects
- QO effects are due to weight
  - Ls exhibiting this pattern display the ranking
    \[ ^\mu/ONS/[-voi] >> BE MORAIC >> ^\mu/ONS \]
- PO effects are due to alignment

QO effects only: Karo

*Karo phonemic consonants*

<table>
<thead>
<tr>
<th></th>
<th>bilabial</th>
<th>alveolar</th>
<th>palatal</th>
<th>velar</th>
<th>glottal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stops</td>
<td>p</td>
<td>t</td>
<td>c</td>
<td>k</td>
<td>?</td>
</tr>
<tr>
<td></td>
<td>b</td>
<td>r</td>
<td>g</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nasal</td>
<td>m</td>
<td>n</td>
<td></td>
<td></td>
<td>η</td>
</tr>
<tr>
<td>Fricative</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>h</td>
</tr>
<tr>
<td>Approximant</td>
<td>w</td>
<td>y</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Stress docks on one of the two final syllables according to the following algorithm:

1. *Priorities for Karo stress assignment*
   i) If a syllable has H tone, then it gets stress
      - yogá  ‘egg’ (G99: 43)
      - korét’ ‘guan (sp.)’ (G99: 43)
      - man‘6go’n ‘rabbit (sp.)’ (G99: 40)
   ii) If there is no H-toned syllable, but there is one with a nasal vowel, then this receives stress
      - ma?o  ‘ant (sp.)’ (G99: 42)
      - pəŋa  ‘dar’ (G98: 17)
      - moriya ‘miçanga’ (G98: 39)
      - pirö̞n ‘redondo’ (G98: 30)
      - cargk̂ ‘slow’ (G99: 23)
iii) If none of these is applicable, then the quality of the final two onsets plays a role

a. ma?pe  ‘gourd’
kọyo  ‘crab’
yq₇m₇oso  ‘yam (sp.)’
pakọ  ‘fontanel’
b. kirịwep  ‘butterfly’
kuru?cu  ‘saliva’
c. yaba  ‘rodent (sp.)’
pibe?  ‘foot’
were  ‘frog’
karọ  ‘macaw’
mọga  ‘mouse’
i?cọga  ‘quati (sp.)’

(2) Karo stress
i. General pattern:  σ σ *[+voi]

<table>
<thead>
<tr>
<th>pibe?</th>
<th>*µ/Ons/[+voi]</th>
<th>Be Moraic</th>
<th>*µ/Ons</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>p*i.be?</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>b.</td>
<td>pi.be?</td>
<td>**!</td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>p*i.be?</td>
<td>*!</td>
<td>**</td>
</tr>
</tbody>
</table>

- Data from (1.iii) shows that sonorants behave like voiceless onsets → sonorants are unspecified for [voice]
- How is onset moraicity assigned?

*µ/Ons/[+voi] >> Be Moraic >> *µ/Ons for /pibe?/

- Stress ranking:  WSP >> ALIGN-HD-R
- WSP: Heavy syllables are stressed
  ALIGN-HEAD-RIGHT: Align the head syllable of a prosodic word to the right edge of the prosodic word
- Let us consider tableaux for the combinations:
  - −[+voi] & −[+voi]
  - [+voi] & −[+voi]
  - −[+voi] & [+voi]
- What about [+voi] & [+voi]?
\( \sigma_{\text{vol}} \sigma_{\text{rel}} \) words: exceptions for Gabas, norm for current account (G99: 41)

a. \textit{kiribop} \ (*kiribop) ‘frog (sp.)’
b. \textit{miriri} \ (*miriri) ‘toad (sp.)’

(3) Onsetless syllables

a. \textit{i.ya} \ ‘Brazil nut’
i.\textit{ci} \ ‘water’
a.\textit{me:k:ɔ} \ ‘jaguar’
b. \textit{wi:up} ‘native, non-domesticated’
\textit{eγ.a:be?} ‘bow’
c. \textit{ɛ.rom} ‘lumber’
i.\textit{ya} ‘bird’
d. \textit{i.ɔt’} ‘pescoço’
e.\textit{i} ‘irara’

PO effects only

- Constraint responsible for this pattern is:
  \text{ALIGN-\textit{ò}:} \text{Align-L (\textit{ø}, C)}, i.e. align left edge of every stressed \( \sigma \) with a consonant
- Two subtypes
  - Onset-on-stress (OS), e.g. stress the first syllable if onsetful, otherwise stress the second one. Ls with this pattern include: Aranda, Alyawarra, Lamalama, Mbabaram, Umbuygamu, Umbindhamu, Linngithig, Uradhi, Kuku-Thaypan, Kaytetj and Agwamin [Australia], Iowa-Oto, Banawá, Juma [Americas] \( \rightarrow \) \text{ALIGN-\textit{ò} causes minimal prosodic misalignment for better stress satisfaction} \( \rightarrow \) \text{ALIGN-\textit{ò}, DEP-C} \( \rightarrow \) \text{ALIGN-L (PRWD, FT)}
  - Stress-on-onset (SO), e.g. in cases of hiatus, insert a consonant on the stressed syllable to render it onsetful. Ls with this pattern include: Dutch, Ainu, British English (marginally) \( \rightarrow \) \text{ALIGN-\textit{ò} does not alter the stress algorithm but forces insertion of an onset on an otherwise onsetless syllable} \( \rightarrow \) \text{ALIGN-\textit{ò} \( \gg \) DEP-C}

(4) OS effect in Iowa-Oto

a. Consonant-initial words
   \begin{align*}
   \text{pécc} & \quad \text{‘fire’} \\
   \text{náwe} & \quad \text{‘leaf’} \\
   \text{hérota} & \quad \text{‘morning’} \\
   \text{páxočė} & \quad \text{‘Iowa’} \\
   \text{wíwaθočė} & \quad \text{‘machine’}
   \end{align*}

b. Vowel-initial words
   \begin{align*}
   \text{aḥáta} & \quad \text{‘outside’} \\
   \text{iθá} & \quad \text{‘there’}
   \end{align*}
(5) Relevant ranking for Iowa-Oto
\[ \text{ALIGN-}\ddot{O}, \text{DEP-C} \gg \text{ALIGN-L (PrWD, Ft)}, \text{FtBin} \gg \text{PARSE-}\sigma \]

(6) Dutch ʔ-insertion under hiatus when \( V_1 = /a/ \)

a. ʔ-insertion

\[
\begin{array}{lll}
\text{/pa\v{e}lja/} & [\text{pa.}\ddot{\v{e}}\text{l.ja}] & \text{‘paella’} \\
\text{/a\v{o}rta/} & [\text{a.}\ddot{\v{o}}\text{r.ta}] & \text{‘aorta’} \\
\text{/ka\v{u}nda/} & [\text{ka.}\ddot{\v{u}}\text{n.d}a] & \text{Kaunda [Zambia’s first president]} \\
\end{array}
\]

b. no ʔ-insertion

\[
\begin{array}{ll}
\text{/xa\v{o}s/} & [\text{xá.}\ddot{o}s] & \text{‘chaos’} \\
\text{/fa\v{a}ro/} & [\text{fá.}\ddot{a}r.o]\text{\textsuperscript{2b}} & \text{‘Pharaoh’} \\
\end{array}
\]

(7) Relevant ranking for Dutch
\[ \text{STRESS CONSTRAINTS} \gg \text{DEP-ʔ}_{\text{init-d}} \gg \text{ALIGN-}\ddot{O} \gg \text{DEP-C} \]

(8) ʔ-insertion

\[
\begin{array}{|c|c|c|c|}
\hline
/\text{a\v{o}rta}/ & \text{STRESS CONSTR} & \text{ALIGN-}\ddot{O} & \text{DEP-ʔ} \\
\hline
\text{a. a.}\ddot{\text{o}}\text{r.tá} & \ddagger_{\text{NON-FIN}} & & \\
\text{b. a.}\ddot{\text{o}}\text{r.ta} & & \ddagger & \\
\text{c. a.}\ddot{\text{t}r.ta} & & & \\
\hline
\end{array}
\]

(9) Lack of ʔ-insertion

\[
\begin{array}{|c|c|c|}
\hline
/\text{xa\v{o}s}/ & \text{STRESS CONSTR} & \text{DEP-ʔ} \\
\hline
\text{NONFIN} & \text{WSP} & \text{ALIGN-}\ddot{O} \\
\hline
\text{a. xa.(\ddot{o}s)} & \ddagger & * \\
\text{b. xa.(\ddot{t}o}s) & \ddagger & * \\
\text{c. (xá:.}\ddot{o}s) & \ddagger_{\text{WSP}} & * \\
\text{d. (xá:.}\ddot{o}s) & \ddagger_{\text{WSP}} & * \\
\hline
\end{array}
\]

- Why ALIGN-\ddot{O}?
- Could PO effects be subsumed under QO effects?
PO & QO effects combined in a single language

- Pirahã stress algorithm: stress the rightmost heaviest syllable within a trisyllabic window at the right edge
- The following weight scale applies:

(10) *Pirahã weight scale*
PVV > BVV > VV > PV > BV
[P=voiceless obstr.; B=voiced obstr. or sonorant]

(11) *Pirahã examples*

a. PVV > BVV
   *ká̄.bá.á́i*  ‘almost fell’
   *pa.há.á́i*  ‘proper name’
   *pi.á.á́i*  ‘deep water’

b. BVV > VV
   *bá̄.ó.á́i*  ‘tired [literally: being without blood]’
   *po.ó.á́i*  ‘banana’

c. VV > PV
   *pía.hó.ai.so.ai.pi*  ‘cooking banana’

d. PV > BV
   *á̄.ba.gí*  ‘toucan’
   *ti.pó.gí*  ‘species of bird’

c. rightmost heaviest stress
   *á̄.ba.pá*  ‘Amapá’ (city name)  *á̄.ba.pá*
   *ho.á.ó.í*  ‘shotgun’  *ho.á.ó.í*
   *ti.pó.gi*  ‘species of bird’  *ti.pó.gi*
   *pá̄.ho.a.hái*  ‘anaconda’  *pá̄.ho.a.hái/*pá̄.ho.a.hái

- 3 factors regulate stress
  - QO effect: PVV > BVV and PV >BV
  - PO effect: BVV > VV
  - vocalic weight: (C)VV > (C)V and VV > PV
- The QO effect is handled similarly to Karo. Voiceless onsets are moraic, voiced ones are not
- Difference with Karo: sonorants
  Pirahã sonorants are allophones of voiced obstruents. When they appear, stress applies as normal, assuming that sonorants pattern with voiced obstruents
Some of the constraints needed
- (a) needed for the rightmost effect
- (b) required for the trisyllabic window

- **ALIGN-HEAD-RIGHT**: Align the head syllable of a prosodic word to the right edge of the prosodic word (McCarthy and Prince 1993)

- **EXTENDED LAPSE RIGHT**: No sequences of more than two consecutive stressless syllables at the right edge of the word (Elenbaas and Kager 1999; Gordon 2005)

\[(12)\] \(PVV > BVV \lor PV > BV\)

<table>
<thead>
<tr>
<th>(tɔ^i)ba^i(i)</th>
<th>WSP</th>
<th>ALIGN-HD-R</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. t^o^iˌbaˌi(i)</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>b. t^o^iˌpaˌi(i)</td>
<td>**!</td>
<td></td>
</tr>
</tbody>
</table>

\[(13)\] \(BVV > VV\)

<table>
<thead>
<tr>
<th>ga^o^iˌ(i)mu</th>
<th>ALIGN-(\sigma)O</th>
<th>ALIGN-HD-R</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ga^o^ˌiˌp (i)</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. ga^o^ˌiˌp (i)</td>
<td>**!</td>
<td></td>
</tr>
</tbody>
</table>

- The ranking formed so far is WSP, ALIGN-\(\sigma\)O >> ALIGN-HD-R
- Can it derive a word like [ho.af.pi] ‘type of fish’?
- Need for additional constraint so that \(VV > PV\)
  - WSP(N) >> WSP >> ALIGN-\(\sigma\)O >> ALIGN-HD-R
Onsets: Suprasegmental and prosodic behaviour

03. ONSET GEMINATES

Today’s preview

- Look at Ls that have geminates which either appear initially or medially and are best analysed as being syllabified as onsets
- We deal with distinctive weight here
- Offer some advantages over other representations of geminates

Pattani Malay

- Has geminates only in word-initial position; their presence is important in stress
- Usually they appear through reduplication, first syllable deletion and subsequent CL or in loanwords

(1) Stress in Pattani
i) Words lacking geminates
   a. jàlê ‘road, path’ (Yupho 1989: 133)
   b. dàlê ‘in, deep’ (Yupho 1989: 134)
   c. màkènê ‘food’ (Yupho 1989: 135)
   b. sipìnô ‘perfect, complete’ (Yupho 1989: 128; stress here constructed given algorithm)
   c. bilàkê ‘back’ (Yupho 1989: 134)
ii) Words with initial geminates
   a. màtô ‘jewellery’ (Yupho 1989: 135)
   b. jálê ‘to walk’ (Yupho 1989: 133)
   b) kidá ‘shop’ vs. kídâ ‘to the shop’ [from /ki+kida/] (Yupho 1989: 133)

- While default stress is final, it is however weight-sensitive (cf. heavy vs. light os) and also quality-sensitive (cf. full vs. weak vowel i)
- Heavy syllables: C:V
- Light syllables: CVC, CV(V) [N.B: V length seems to be purely phonetic]
- The claim is that geminates in P.Malay have the structure

  \[
  \sigma \\
  \mu \\
  \mu \\
  # C: V
  \]

- Pattani thus has distinctive weight w.r.t onsets; contrast with Karo or Pirahà
Summary of stress patterns

a. i) Non-geminate, non-\( /\i/ \) words

\[ \text{[bùwɔh]} \quad (\ddot{\alpha})_{\mu} (\ddot{\alpha})_{\mu} \]

ii) Non-geminate, \( /\i/ \) words

\[ \text{[pimɔtɔ]} \quad (\ddot{\alpha})_{\mu} (\ddot{\alpha})_{\mu} \]

b. i) Geminate, non-\( /\i/ \) words

\[ \text{[bùwɔh]} \quad (\ddot{\alpha})_{\mu\mu} (\ddot{\alpha})_{\mu} \]

ii) Geminate, \( /\i/ \) words

\[ \text{[kɔdɔ]} \quad (\ddot{\alpha})_{\mu\mu} (\ddot{\alpha})_{\mu} \]

- The default pattern, cf. (2.a.i)
  - Align-R (PrWd, HdFt): The right edge of the prosodic word aligns with the right edge of the head foot (McCarthy and Prince 1993)
  - Also, to get strictly monosyllabic feet in Pattani, we need Align-L (Ft, FtHd): Align the L edge of every Ft with the L edge of a Ft-Hd Align-R (Ft, FtHd): Align the R edge of every Ft with the R edge of a Ft-Hd [abbreviated as Ft-Hd-L and Ft-Hd-R, respectively (Prince 1997)]

\[ \text{[bùwɔh]}: \text{Ft-Hd-L, Ft-Hd-R, Parse-σ, Align-R (PrWd, HdFt) >> FtBin, *Clash} \]

<table>
<thead>
<tr>
<th></th>
<th>Ft-Hd-L</th>
<th>Ft-Hd-R</th>
<th>Parse-σ</th>
<th>Align-R (PrWd, HdFt)</th>
<th>FtBin</th>
<th>*Clash</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. (bùwɔh)</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. (bùwɔh)</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. bu(ɔwɔh)</td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>d. (bù)(ɔwɔh)</td>
<td></td>
<td></td>
<td></td>
<td>*!</td>
<td>**</td>
<td>*</td>
</tr>
<tr>
<td>e. (bù)(ɔwɔh)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>**</td>
<td>*</td>
</tr>
</tbody>
</table>

- To get the quantity effect of (2.b.i), we just need to add
  - WSP\textsubscript{PrWd}: Heavy syllables receive primary stress (McGarrity 2003)
Quality effect

- /i/ is cross-linguistically weak; low sonority-wise; behaves like schwa which also repels stress
- This behaviour can be captured by *P/i (cf. Kenstowicz 1994)
- If *P/i >> FtForm, ALIGN-R (PrWD, HdFt): then when no geminates occur, all σs will be footed apart from the one that includes /i/
- If WSP_{PrWD} >> *P/i >> FtForm, ALIGN-R (PrWD, HdFt): then quantity will win over quality, so that if the σ with the geminate happens to include /i/, it will receive stress

Marshallese

- If geminates initially can be analysed as onsets, then why couldn’t they do so also medially?
- Claim: in some Ls they do!
(3) Marshallese word stress

a. Trisyllabic words LLL: Antepenultimate stress

- ekajet  ‘to judge’
- nukileb  ‘to have a big family’
- jekaru  ‘coconut syrup’
- lakatib  ‘to make angry’

b. Trisyllabic words LHL or (L)HL: Stress H

- jec.uru  ‘commotion, excitement’
- jec.ro.a:n  ‘to waste’
- körä:  ‘woman’
- jelä:  ‘to know’
- kije:k  ‘fire’

c. Disyllabic words (either LL or HH): Penultimate stress

- nebar  ‘to praise’
- ma:ja:j  ‘to be clear of underwood’

- Some general features: Stress (in boldface) assigned within trisyllabic window at the right edge. (At least) the final coda is non-moraic, e.g. ékajet *ekajét. If all syllables are equally stressable, then leftmost stress is preferred (cf. (3c))
- In light of the above, what kind of syllabification do the data below suggest?

(4) Stress when geminates are involved

- jibbuŋ  ‘morning’
- (y)emman  ‘good’
- emmer  ‘to be ripe’

Some typology

- Geminates word-medially in /VC:V/

a. Moraic onsets  b. ‘Flopped’ structure  *c. Avoidance of onsetless σs

- (a) violates *MORAIC ONSET; (b) violates NoCODA; (c) violates NoCODA as well as ONSET, so it is harmonically bounded by (b)
Depending on the ranking of \(*\text{MORAIC ONSET} \text{ and NOCODA}\) we should be able to tell whether a language will get a flopped or an onset geminate word-medially.

**Medial geminate factorial typology**

<table>
<thead>
<tr>
<th></th>
<th>/VC(^p)V/</th>
<th>ONSET</th>
<th>(*\text{MORAIC ONSET})</th>
<th>NOCODA</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i)</td>
<td>VC(^p_i),C(_i)V</td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>a.</td>
<td>VC(^p_i).V</td>
<td>*!</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>b.</td>
<td>V,C(_i)^p.V</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>/VC(^p)V/</th>
<th>ONSET</th>
<th>NOCODA</th>
<th>(*\text{MORAIC ONSET})</th>
</tr>
</thead>
<tbody>
<tr>
<td>(ii)</td>
<td>VC(^p_i),C(_i)V</td>
<td></td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>a.</td>
<td>VC(^p_i).V</td>
<td>*!</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>b.</td>
<td>V,C(_i)^p.V</td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>c.</td>
<td>V,C(_i)^p.V</td>
<td></td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

**Advantages over other representations**

(5) **Other representations of initial geminates**

a. *Davis (1999b)*

\[
\begin{array}{c}
\sigma \\
\mu \\
\mu \\
C: V
\end{array}
\]

b. *Curtis (2003)*

\[
\begin{array}{c}
\sigma \\
\mu \\
\mu \\
C: V
\end{array}
\]

- Problem for (5a): Trukese word minimality
  - CVV, C:V is good; CV, CVC is not
  - How can this be captured if the initial geminate is not linked to higher prosodic structure?

- (5b) handles this, but new problem
  - Geminate here is identified with unsyllabified consonants appearing in Ls like Piro and Bella Coola
Onsets: Suprasegmental and prosodic behaviour

04. COMPENSATORY LENGTHENING

Compensatory Lengthening (CL) and rule ordering

- CL typically involves the deletion of a segment and the lengthening of a neighbouring one to compensate for its loss.
- Consider the following instance of CL in the Oromo word [feena] 'we wish' and how moraic phonology would analyse it à la Hayes (1989) in a serial framework.

\[
\begin{array}{cccc}
\sigma & \sigma & \sigma & \sigma \\
\mu & \mu & \mu & \mu \\
/f\text{e}n\text{a}/ & \rightarrow & f\text{e}n\text{a} & \rightarrow & f\text{e}n\text{a} \\
\end{array}
\]

- Which steps/rules are assumed here and in which order?

CL à la Hayes is non-translatable in OT

- Hypothetical example:
  /kan/ → [ka:]
  /kani/ → [kani]

- (1) CL as mora preservation. Moraic input

<table>
<thead>
<tr>
<th>/ka\text{\textsuperscript{\textmu}}n\text{\textmu}/</th>
<th>NOCODA</th>
<th>MAX-\mu</th>
<th>MAX-SEG</th>
<th>DEP-\mu</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ka\text{\textmu\textmu}</td>
<td>*!</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. ka\text{\textmu\textmu\textmu}</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- (2) CL as mora preservation. Non-moraic input

<table>
<thead>
<tr>
<th>/ka\text{\textsuperscript{\textmu}}n\text{\textmu}/</th>
<th>NOCODA</th>
<th>MAX-\mu</th>
<th>MAX-SEG</th>
<th>DEP-\mu</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ka\text{\textmu\textmu}</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. ka\text{\textmu\textmu\textmu}</td>
<td>*</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Consideration of both possible inputs (with and without moraicity) is what RotB commands us to do (on RotB see Kager 1999 §1.4.1 & 380-1).
- To deal with CL under mora preservation, we thus run into a dilemma:
  - (i) either impose input moraicity, but violate ROTB.
(ii) or conform to ROTB, but then half of the time, produce the incorrect results

- Serialist frameworks avoid this problem, because they permit intermediate stages whereby syllabification and moraification can happen prior to CL no matter what the moraicity of the input is, i.e. /kan/ → [ka"n"] → [ka"∅"] → [ka"µ"]
- Moral: CL as mora preservation (Hayes 1989) cannot be directly implemented in OT

**CL as position preservation**

- A solution: CL is not about mora preservation but about *position* preservation through a mora
- Claim: segmental positions in a string require a correspondent on the surface. Two ways to achieve this
  - segment preservation (with total or partial featural identity towards the input)
  - segment loss but prosodic correspondent of it by means of a mora
- Constraint introduced: Position Correspondence (PosCorr)
  - PosCorr: An input segment must have an output correspondent either segmentally by means of a root node or prosodically by means of a mora
- Application of CL schematically, e.g. /kan/ → [ka:], /kani/ → [kani]

### A

<table>
<thead>
<tr>
<th>(3) /kan/ &gt; [ka:]</th>
<th>NoCoda</th>
<th>PosCorr</th>
<th>Uniformity</th>
<th>Dep-µ</th>
</tr>
</thead>
<tbody>
<tr>
<td>/kaₐ₃nₐ₃/</td>
<td>a. kaₐ₃nₐ₃</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b. kaₐ₃nₐ₃</td>
<td>*!</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>c. kaₐ₃</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>d. kaₐ₃</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>e. kaₐ₃</td>
<td>*!</td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

- Uniformity: No element of the output has more than one correspondent in the input, i.e. no coalescence (McCarthy and Prince 1995)

### B

<table>
<thead>
<tr>
<th>(4) /kan-a/ &gt; [kana]</th>
<th>NoCoda</th>
<th>PosCorr</th>
<th>Uniformity</th>
<th>Dep-µ</th>
</tr>
</thead>
<tbody>
<tr>
<td>/kaₐ₄nₐ₄aₐ₄/</td>
<td>a. kaₐ₄nₐ₄aₐ₄</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b. kaₐ₄nₐ₄aₐ₄</td>
<td>*!</td>
<td></td>
<td>*!</td>
</tr>
<tr>
<td></td>
<td>c. kaₐ₄aₐ₄</td>
<td>*!</td>
<td></td>
<td>*!</td>
</tr>
</tbody>
</table>

- We can also generate the lack of CL!
(5) Lack of CL: /kan/ > [ka]

<table>
<thead>
<tr>
<th>/kaₐn₃¹/</th>
<th>No Coda</th>
<th>Dep-µ</th>
<th>Uniformity</th>
<th>PosCorr</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. kaₐn₃³</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. kaₐn₃⁵</td>
<td>*!</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. kaₐ₃</td>
<td>*!</td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>d. kaₐ₃₁</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. ka₃₂</td>
<td>*!</td>
<td></td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

(6) Lardil

a. /ŋaluk/ [ŋalu] *[ŋaluː] ‘story’

b. [thuraraŋ] [thurara] *[thuraraː] ‘shark’

(7) Lack of CL: /kan/ > [kã]

<table>
<thead>
<tr>
<th>/kaₐ₃¹/</th>
<th>No Coda</th>
<th>PosCorr</th>
<th>Dep-µ</th>
<th>Uniformity</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. kaₐ₃¹</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. kaₐ₃₅</td>
<td>*!</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. kaₐ₃</td>
<td>*!</td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>d. kaₐ₃₁</td>
<td>*!</td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>e. ka₃₂</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

(8) Portuguese nasalised vowels

a. V-initial stems
   acabado ‘finished’ inacabado [inakabádu] ‘unfinished’
   oportuno ‘opportune’ inoportuno [inopurtúnu] ‘inoportune’

b. C-initial items
   capaz ‘able’ incapaz [ikapáʃ] ‘unable’
   posto ‘put in place’ imposio [ipóʃtu] ‘tax’

Modifying Dep-µ

- Recall: previously moraic specification was needed to generate CL
- New problem (the reverse of the one above): to generate the lack of CL, the absence of moraic specification is imperative
  - what if we had an input /kaₐn/ for the output [ka]?
  - we would incorrectly predict [kaː]!
- Upshot: need to dissociate the ban on lengthening from the underlying moraic specification
Proposal: modification of DEP-μ using the concept of Positional μ-licensing (Bermúdez-Otero 2001; Campos-Astorkiza 2004)

- Positional μ-licenser = a mora that is the only prosodic unit dominating a given segment Α
- Non-positional μ-licenser = a mora that is not the sole prosodic unit immediately dominating Α

P-DEP-μ: A non-positional μ-licenser mora in the output has a correspondent in the input

- the constraint gets to violated by lengthened segments, but not by long or short ones

(9) DEP-μ vs. P-DEP-μ

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
<th>Positional μ-licenser</th>
<th>P-DEP-μ</th>
<th>DEP-μ</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td></td>
<td></td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td></td>
<td>μ₁₁ μ₁₂</td>
<td>μ₁₁ μ₁₂</td>
<td>No</td>
<td>✔️</td>
</tr>
<tr>
<td></td>
<td>V V</td>
<td>V V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td></td>
<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>μ₁₁ μ₁₂</td>
<td>μ₁₁ μ₁₂</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td></td>
<td>V V</td>
<td>V V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td></td>
<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>μ₁₁ μ₁₂</td>
<td>μ₁₁ μ₁₂</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td></td>
<td>V C</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td></td>
<td></td>
<td>*</td>
<td>✔️</td>
</tr>
<tr>
<td></td>
<td>μ₁₁ μ₁₂</td>
<td>μ₁₁ μ₁₂</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td></td>
<td>V C</td>
<td>V</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The important contrast is between (9c) and (9d):

- violation of DEP-μ in (c) due to μ-insertion, but not in (d)
- violation of DEP-μ in both, since the non-positionally μ-licensed μ₂ linked to V has no correspondent linked to the same segment in the input

Summary of analysis

Deletion of a segment followed by CL – final version:

M, UNIFORMITY, PosCORR >> P-DEP-μ

Deletion of a segment not followed by CL – final version:

i) no trace of deleted position: M, UNIFORMITY, P-DEP-μ >> PosCORR
   cf. Lardil

ii) segmental correspondent: M, PosCORR, P-DEP-μ >> UNIFORMITY
   cf. Portuguese
Other advantages

- (A) Since CL is not about mora preservation, but about position preservation, any segment can in principle cause CL (whether we assume input moraicity or not)
  - onset loss, cf. Samothraki Greek (SamG)
  - unsyllabified segments, cf. Piro

- In SamG (simplified data), onset /r/ gets deleted and causes lengthening of following V; coda /r/ does not delete
  - ruuxa > úuxa  ‘clothes’  réma > é:ma  ‘stream’
  - xróma > xó:ma  ‘colour’  ódéru > ódédu:  ‘tree-GEN’
  - fanár  ‘lantern’  karpós  ‘seed’

(10) CL in /rasu/ > [a:su]

| a. k₁| a₂h₁ | | *! | |
| b. a₁| a₂h₂ | | *! | |
| c. a₂h₂ | | | *! | |
| d. a₂h₁ | | | * | |

(11) No CL in /karpos/ > [karpos]

| a. k₁| a₂h₂ | | *! | |
| b. k₁| a₂h₂ | | *! | |
| c. k₁| a₂h₂ | | *! | |
| d. k₁| a₂h₂ | | *! | |

- (B) In the system proposed here, whereby onsets can be moraic and whereby onset geminates are allowed, we also expect to find Ls where onsets serve as targets of CL after the deletion of a V or a whole syllable
  - Pattani Malay
    buwi ~ wi ‘give’, sidadu ~ d:adu ‘police’, pimatɔ ~ m:atɔ ‘jewellery’
  - Trukese

*Final mora deletion causing C-gemination*

<table>
<thead>
<tr>
<th>Suffix form</th>
<th>Unaffixed form</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. fita-mw</td>
<td>fit ‘package’</td>
</tr>
<tr>
<td>b. kikki-k</td>
<td>kkik ‘move’</td>
</tr>
<tr>
<td>c. kunnu-n</td>
<td>kkun ‘rotate’</td>
</tr>
<tr>
<td>d. Trigue dialects</td>
<td></td>
</tr>
<tr>
<td>Dialect 1</td>
<td>Dialect 2</td>
</tr>
</tbody>
</table>
| yana         | n:a           | ‘loft’
| yuwe         | w:e           | ‘century plant’