When prosody cultivates segments: The case of tone-driven epenthesis

Nicholas Rolle (Leibniz-ZAS, Berlin)

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Tones and segments

• Two true **phonological universals** (spoken languages): **Segments** and **Tones**

• Mandarin lexical tone contrasts:

• English intonation:

  ![English intonation diagram](image-url)
Tone/segment interaction

• Some aspects of **tone/segment interaction** are known to be **common**: **Depressor effects**
  ◦ “Broadly, it has been found that voiced segments lower F0, while voiceless segments raise it” (Cibelli 2015)
  ◦ Reflected in phonetic implementation, tonogenesis, tone distributions and alignment, and on occasion in intonation

• In general, **empirical landscape not settled**
A novel type: Tone-driven epenthesis

• This talk advocates for a novel type of tone/segment interaction: Tone-driven epenthesis
  ◦ The phonological insertion of a vowel solely in order to host a tone, which otherwise would not be realized

• Evidence from Africa: Two languages, Ghomala’ and Wamey
  ◦ Rising tones on CVC syllables are marked, and repaired via final vowel epenthesis
  ◦ E.g. Ghomala’ /gɔp/ ‘hen’ realized as [gɔp] or [gɔpɛ] ← Epenthesis

• Its existence adds to body of data showing prosody cultivating segmental environments best suited for realizing a pitch target
Basic roadmap

1. **The big picture**: Tonal representations and tone/segment interactions
2. **Ghomala’ case study**: The evidence for tone-driven epentheses
3. **Discussion points**: Is tone-driven epentheses expected?
4. **Summary**
The big picture

Tonal representations and tone/segment interactions
Representing tones and segments

- The **Autosegmental** Revolution (Goldsmith 1976/1990)
  - Representation as a **multi-tiered object**, whereby tones and segments are connected via **association lines**
- Toy example:

  **Autosegmental diagram of /búlù/**
  
  **segmental tier:** b u l u
  
  **tonal tier:** H   L

Diagram from Goldsmith 1990
**Autoseg. representation:** Floating tone

<table>
<thead>
<tr>
<th>a. Pre-specified</th>
<th>b. Toneless V</th>
<th>c. Floating T</th>
<th>d. Combinations…</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td></td>
<td></td>
<td>H</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a</td>
<td></td>
</tr>
</tbody>
</table>

- Kalabari – Rolle & Harry (2024) [*forthcoming*]
  - Imperative marked by right-edge floating  homeschool sequence

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<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>L</td>
<td>sò</td>
<td>L+HLL</td>
<td>sò</td>
</tr>
<tr>
<td>H</td>
<td>só</td>
<td>H+HLL</td>
<td>sô</td>
</tr>
<tr>
<td>LL</td>
<td>lègî</td>
<td>LL+HLL</td>
<td>lègî</td>
</tr>
<tr>
<td>LH</td>
<td>dûkô</td>
<td>LH+HLL</td>
<td>dûkô</td>
</tr>
</tbody>
</table>

Floating tones conventionally indicated by circle (Yip 2002)
**Autoseg. representation:** Floating tone

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<tr>
<td>H</td>
<td></td>
<td>H</td>
<td>H</td>
</tr>
<tr>
<td>á</td>
<td>a</td>
<td>a</td>
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</tr>
</tbody>
</table>

- **Floating tones:** Tones not pre-associated to a vowel
- **Toneless vowels:** Vowels not pre-associated to a tone
- **Autosegmental Conjecture:**
  - Autosegmentally, these are **parallel representations**
  - One is not more ‘abstract’/‘real’/‘primary’ than the other
## Segment-tone parallelism

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<tbody>
<tr>
<td>(H)</td>
<td>(T)</td>
<td>(\overline{H})</td>
<td>(H)</td>
</tr>
<tr>
<td>(\bar{a})</td>
<td>(a)</td>
<td>(\bar{a})</td>
<td>(\bar{a})</td>
</tr>
</tbody>
</table>

- If toneless Vs require association to tonal tier $\rightarrow$ **Tone Epenthesis**
- **Yoruba** (H/M/L tones) – M is *default* and inserted on toneless V

\[
\begin{array}{ccc}
\text{H} & \text{H} & \text{M} \\
\mid & \rightarrow & \mid \\
\text{kese} & \text{kese} & \text{kese} \\
\end{array}
\quad
\begin{array}{ccc}
\text{L} & \text{L} & \text{M} \\
\mid & \rightarrow & \mid \\
\text{ilu} & \text{ilu} & \text{ilu} \\
\end{array}
\]

*place name*  
*‘opener’*

---

**Yoruba:** Akinlabi 1985, Akinlabi & Liberman 2001
## Segment-tone parallelism

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</table>
| \[
\]
| á               | a            | V            | a               |

• A **natural extension** of the logical possibilities of the Autosegmental Formalism is a **parallel epenthesis**
  process for floating tones

• Such a process is **Tone-driven epenthesis**:
  ◦ The insertion of a vowel for reasons relating to the tonal tier
Possibility of tone-driven epenthesis?

• **Tone-driven epenthesis:**
  ◦ Possibility **unaddressed in major tone surveys**
  ◦ Equally **unaddressed across major works of epenthesis**

• In fact, works which posit a maximally restrictive theory of epenthesis assume tone-driven epenthesis to be **impossible/unattested**
  ◦ “Tone conditions cannot affect string structure” and therefore tone “cannot force epenthesis/syncope” (Blumenfeld 2006:41)
  ◦ “So far, a language in which a floating tone induces insertion of an epenthetic vowel has not been described” and “how to restrict the grammar in such a way that it excludes tone-triggered epenthesis is still unanswered” (Gleim 2019:3,24)
Evidence for tone-driven epenthesis

A case study from Ghomala’
Tone-driven epenthesis in Africa

  - [wæmɛʔ]
  - Santos’s (1996) original description
  - Rolle & Merrill (2022)

- **Ghomala’** [bbi] (Grassfields, Bantoid, Niger-Congo – Cameroon)
  - [yɔmáʔaʔ]
  - Nissim’s (1981) original description
  - Rolle (2024) [forthcoming]
Ghomala’ case study

• Relevant preliminaries of the grammar and lexicon
  ◦ Morphemes canonically monosyllabic (CV/CVC)
  ◦ No consonant/vowel length contrast
  ◦ Largely analytic language with little (segmental) morphology
  ◦ S-AUX-V-O
### Ghomala’ – Segment inventory

<table>
<thead>
<tr>
<th>LAB.</th>
<th>DENT.</th>
<th>PAL.</th>
<th>VEL.</th>
<th>GLOT.</th>
<th>FRONT</th>
<th>CENTRAL</th>
<th>BACK</th>
</tr>
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<tbody>
<tr>
<td>p</td>
<td>b</td>
<td>t</td>
<td>d</td>
<td>k</td>
<td>g</td>
<td>?</td>
<td>i</td>
</tr>
<tr>
<td>pf</td>
<td>bv</td>
<td>ts</td>
<td>dz</td>
<td>c</td>
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<tr>
<td>f</td>
<td>v</td>
<td>s</td>
<td>š</td>
<td>ž</td>
<td>y</td>
<td>h</td>
<td>ε</td>
</tr>
<tr>
<td>m</td>
<td>n</td>
<td>η</td>
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<td>a</td>
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<tr>
<td>l</td>
<td>y</td>
<td>ū</td>
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<td>ŵ</td>
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<td>dz</td>
<td>c</td>
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<td>e</td>
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<td>š</td>
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<td>ε</td>
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<td>ū</td>
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<td>ŵ</td>
<td>w</td>
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</table>

*Red = Permissible Coda*
Ghomala’ – Tone contrasts

- Tone contrasts on open syllables

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<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>High</td>
<td>H</td>
<td>fé</td>
<td>[fě]</td>
<td>↓</td>
<td>→</td>
</tr>
<tr>
<td>b.</td>
<td>Mid</td>
<td>M</td>
<td>tsō</td>
<td>[tsō]</td>
<td>↓</td>
<td>→</td>
</tr>
<tr>
<td>c.</td>
<td>Low</td>
<td>L</td>
<td>tà</td>
<td>[tà]</td>
<td>↓</td>
<td>→</td>
</tr>
<tr>
<td>d.</td>
<td>Falling</td>
<td>HL</td>
<td>bu̯ë</td>
<td>[bu̯ë]</td>
<td>↓</td>
<td>→</td>
</tr>
<tr>
<td>e.</td>
<td>Rising</td>
<td>LH</td>
<td>bvṹ</td>
<td>[bvṹ]</td>
<td>↓</td>
<td>→</td>
</tr>
</tbody>
</table>

Nissim 1981:150,153; See Rolle 2024 [forthcoming] for discussion of a marginal contrast with downstepped /ʰH/, and for interpreting the M as a level low tone (L⁰)
Ghomala’ – Tone contrasts

- Tone contrast on syllables closed by **sonorant**

<table>
<thead>
<tr>
<th>Tone Level</th>
<th>Symbol</th>
<th>Syllable</th>
<th>Pronunciation</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>H</td>
<td>kóm</td>
<td>[kóm]</td>
<td>‘crab’</td>
</tr>
<tr>
<td>Mid</td>
<td>M</td>
<td>lêm</td>
<td>[lêm]</td>
<td>‘condiment’</td>
</tr>
<tr>
<td>Low</td>
<td>L</td>
<td>lèm</td>
<td>[lèm]</td>
<td>‘dry season’</td>
</tr>
<tr>
<td>Falling</td>
<td>HL</td>
<td>fâm</td>
<td>[fâm]</td>
<td>‘plantation’</td>
</tr>
<tr>
<td>Rising</td>
<td>LH</td>
<td>bèmes</td>
<td>[bèmes]</td>
<td>‘destiny’</td>
</tr>
</tbody>
</table>
Ghomala’ – Tone contrasts

- Tone contrast on syllables closed by **obstruent**

<table>
<thead>
<tr>
<th>Tone</th>
<th>Symbol</th>
<th>Syllable</th>
<th>Representation</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>H</td>
<td>káp</td>
<td>[káp]</td>
<td>‘pipe’</td>
</tr>
<tr>
<td>Mid</td>
<td>M</td>
<td>bāp</td>
<td>[bāp]</td>
<td>‘animal’</td>
</tr>
<tr>
<td>Low</td>
<td>L</td>
<td>pāp</td>
<td>[pāp]</td>
<td>‘wing’</td>
</tr>
<tr>
<td>Falling</td>
<td>HL</td>
<td>lāp</td>
<td>[lāp]</td>
<td>‘elegance’</td>
</tr>
<tr>
<td>Rising</td>
<td>LH</td>
<td>lāp</td>
<td>[lāp ~ lāṕ]</td>
<td>‘pool of water’</td>
</tr>
</tbody>
</table>

**Tone-driven epenthesis!**
Ghomala’ – Tone-driven epenthesis

- Tone-driven epenthesis applies to all final **obstruents**
- Epenthetic vowel depends on phonological context

<table>
<thead>
<tr>
<th>Obstruent</th>
<th>English Meaning</th>
<th>Tone-Driven Vowel</th>
<th>Audio</th>
</tr>
</thead>
<tbody>
<tr>
<td>/gɔp/</td>
<td>‘hen’</td>
<td>/gɔʔ/</td>
<td><img src="audio" alt="Audio" /></td>
</tr>
<tr>
<td>/ŋkɔp/</td>
<td>‘money’</td>
<td>/ŋkɔʔ/</td>
<td><img src="audio" alt="Audio" /></td>
</tr>
<tr>
<td>/mɔk/</td>
<td>‘fire’</td>
<td>/pũʔ/</td>
<td><img src="audio" alt="Audio" /></td>
</tr>
<tr>
<td>/sɔk/</td>
<td>‘wall’</td>
<td>/gũʔ/</td>
<td><img src="audio" alt="Audio" /></td>
</tr>
</tbody>
</table>

Audio files from Larry M. Hyman, recorded in 1970s/1980s
Ghomala’ – Tone-driven epenthesis

• No epenthesis with other tonal contrasts
  ◦ pàp ‘wing’ → only [pàp]  Cf. *[pàpè]
  ◦ káp ‘pipe’ → only [káp]  Cf. *[kápó]
  ◦ lâp ‘elegance’ → only [lâp]  Cf. *[lâpè]
  ◦ bāp ‘animal’ → only [bāp]  Cf. *[bāp̥]
  ◦ lōʔ ‘yam’ → only [lōʔ]  Cf. *[lōʔə]

• Demonstrates epenthesis not due purely to markedness of obstruent codas → Tone drives the insertion process
Ghomala’ – Active alternations

• Further evidence comes from active morphophonological alternations

• Demonstrates complete co-variation between rising tones and epenthetic vowels

  ◦ If you lose the LH rising tone  →  Bleeds epenthesis
  ◦ If you gain a LH rising tone  →  Feeds epenthesis
Ghomala’ – Active alternations

• **Deverbal nominalization** mirrors the static distributions of the monomorphemic lexicon (Nissim 1981: 288-289)

• Lexical tone of root overwritten with LH tone
  - tʉ̀ ɔ̀ ̀ \(\rightarrow\) tʉ̄ ɔ́ \(\rightarrow\) tʉ̀ ɔ̀ ̀ ̀ \(\rightarrow\) tʉ̀ ɔ̀ ̀ ̀ ̀ ̀ “be strong” \(\rightarrow\) “iron”
  - sū ‘(to) weed’ → sū ‘hoe’
  - tùŋ ‘dig inside’ → ntùŋ ‘throat’
  - tóm ‘push’ → tôm ‘fruit’

• If this involves a coda obstruent, an **epenthetic vowel must be added**
  - tsèʔ ‘twist’ → dzéʔá ‘liana (vine)’
  - fók ‘blow (cold)’ → fóké ‘cold’
Ghomala’ – Active alternations

• **Noun class system:** 6 classes in 3 SG-PL pairings

• Evidence from **distinct concord patterns**
  ◦ Class 2 (PL) msǎŋ ‘birds’ → msǎŋ pé-puó ‘two birds’
  ◦ Class 4 (PL) mkwē ‘feet’ → mkwē mé-buó ‘two feet’
  ◦ Class 6 (PL) dzé ‘goats’ → dzé tsé-puó ‘two goats’

• **The relevant context for our purposes:**
  ◦ Morpho-phonological alternation in [N of N] constructions
  ◦ Used for possession, compounds, and other meanings of association
Ghomala’ – Active alternations

• Different concord patterns in [N of N] constructions depending on the class of the first noun
• Class 1 mú ‘child’ vs. Class 3 thé ‘head’
  ◦ mú child[CL1] of.CL1 bvũa → [mû bvũa] ‘the child of the dog’
  ◦ thé head[CL3] of.CL3 bvũa → [thé ‘bvũa] ‘the head of the dog’

• Floating ⬛ affects first noun, floating ♂ affects second
  ◦ Results in tonological alternations – Relevant for us are second noun

Nissim 1981: 153, 264
### Ghomala’ – \([N_1 \text{ of } N_2]\) constructions

<table>
<thead>
<tr>
<th>N class</th>
<th>(N_1)</th>
<th>‘of’</th>
<th>(N_2)</th>
<th>‘(N_1) of (N_2)’</th>
<th>‘(X) of the hen’ (Cf. /gɔ́p/ [gɔ̀pə] ‘hen’)</th>
</tr>
</thead>
<tbody>
<tr>
<td>class 1</td>
<td>mú</td>
<td>☹️</td>
<td>gɔ́p</td>
<td>[ mú gɔ́pə ]</td>
<td>‘the child of the hen’</td>
</tr>
</tbody>
</table>

Nissim 1981: 157-158, 250-252
## Ghomala’ – $[N_1 \text{ of } N_2]$ constructions

<table>
<thead>
<tr>
<th>N class</th>
<th>$N_1$</th>
<th>‘of’</th>
<th>$N_2$</th>
<th>‘$N_1$ of $N_2$’</th>
<th>‘$X$ of the hen’ (Cf. /gɔ̀p/ [gɔ̀pɛ] ‘hen’)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$N_1 =$</td>
<td>mú</td>
<td>.Optional</td>
<td>gɔ̀p</td>
<td>[ mú  gɔ̀pɛ ]</td>
<td>‘the child of the hen’</td>
</tr>
<tr>
<td>class 1</td>
<td>kɔʔ</td>
<td>Optional</td>
<td>gɔ̀p</td>
<td>[ kɔʔ  gɔ̀pɛ ]</td>
<td>‘the rooster of the hen’</td>
</tr>
<tr>
<td></td>
<td>gì</td>
<td>Optional</td>
<td>gɔ̀p</td>
<td>[ gì  gɔ̀pɛ ]</td>
<td>‘the voice of the hen’ [audio]</td>
</tr>
<tr>
<td></td>
<td>dyɛ</td>
<td>Optional</td>
<td>gɔ̀p</td>
<td>[ dyɛ  gɔ̀pɛ ]</td>
<td>‘the house of the hen’</td>
</tr>
</tbody>
</table>

Nissim 1981: 157-158, 250-252
Ghomala’ – \([N_1 \text{ of } N_2]\) constructions

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<th>(N_1)</th>
<th>‘of’</th>
<th>(N_2)</th>
<th>‘(N_1) of (N_2)’</th>
<th>‘X of the hen’ (Cf. /gɔ̃p/ [gɔ̃p] ‘hen’)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(N_1 = mû)</td>
<td>(mû)</td>
<td>(gɔ̃p)</td>
<td>([mû \quad gɔ̃p̥])</td>
<td>‘the child of the hen’</td>
<td></td>
</tr>
<tr>
<td>class 1</td>
<td>(kôʔ)</td>
<td>(gɔ̃p)</td>
<td>([kôʔ \quad gɔ̃p̥])</td>
<td>‘the rooster of the hen’</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(gì)</td>
<td>(gɔ̃p)</td>
<td>([gì \quad gɔ̃p̥])</td>
<td>‘the voice of the hen’</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(dyê)</td>
<td>(gɔ̃p)</td>
<td>([dyê \quad gɔ̃p̥])</td>
<td>‘the house of the hen’</td>
<td></td>
</tr>
<tr>
<td>(N_1 = thê)</td>
<td>(thê)</td>
<td>(gɔ̃p)</td>
<td>([thê \quad ʰgɔ̃p̥])</td>
<td>‘the head of the hen’</td>
<td></td>
</tr>
</tbody>
</table>

all other classes

Nissim 1981: 157-158, 250-252
## Ghomala’ – [N₁ of N₂] constructions

<table>
<thead>
<tr>
<th>N class</th>
<th>N₁</th>
<th>‘of’</th>
<th>N₂</th>
<th>‘N₁ of N₂’</th>
<th>‘X of the hen’ (Cf. /gɔ̀p/ [gɔ̀pá] ‘hen’)</th>
</tr>
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<tbody>
<tr>
<td>N₁ = μ́</td>
<td>gɔ́p</td>
<td>→</td>
<td>[ μ́ gɔ́p]</td>
<td>‘the child of the hen’</td>
<td></td>
</tr>
<tr>
<td>class 1</td>
<td>kòʔ</td>
<td>gɔ́p</td>
<td>→</td>
<td>[ kòʔ gɔ́p]</td>
<td>‘the rooster of the hen’</td>
</tr>
<tr>
<td></td>
<td>gì</td>
<td>gɔ́p</td>
<td>→</td>
<td>[ gì gɔ́p]</td>
<td>‘the voice of the hen’          [audio]</td>
</tr>
<tr>
<td></td>
<td>dý̩</td>
<td>gɔ́p</td>
<td>→</td>
<td>[ dý̩ gɔ́p]</td>
<td>‘the house of the hen’</td>
</tr>
<tr>
<td>N₁ = thé</td>
<td>gɔ́p</td>
<td>→</td>
<td>[ thé ‘gɔ́p]</td>
<td>‘the head of the hen’</td>
<td></td>
</tr>
<tr>
<td>all other</td>
<td>mkòʔ</td>
<td>gɔ́p</td>
<td>→</td>
<td>[ mkòʔ gɔ́p]</td>
<td>‘the roosters of the hen’         [audio]</td>
</tr>
<tr>
<td>classes</td>
<td>kwé</td>
<td>gɔ́p</td>
<td>→</td>
<td>[ kwé gɔ́p]</td>
<td>‘the foot of the hen’</td>
</tr>
<tr>
<td></td>
<td>tǎŋ</td>
<td>gɔ́p</td>
<td>→</td>
<td>[ tǎŋ ‘gɔ́p]</td>
<td>‘the ear of the hen’</td>
</tr>
</tbody>
</table>

Nissim 1981: 157-158, 250-252
Discussion points

Is tone-driven epenthesis expected?
Discussion points: Is T-D E expected?

• Despite its typological rarity as well as the previous maximally-restrictive statements, **is tone-driven epenthesis expected?**

• **Yes** for three reasons (our discussion points)
  ◦ **Disc’n 1**: Support from phonetic markedness of [cũk]
  ◦ **Disc’n 2**: A parallel tone-driven vowel retention already exists without controversy
  ◦ **Disc’n 3**: A parallel intonation-driven vowel epenthesis has a growing body of support as well
Disc’n 1: Phonetic markedness of [cũk]

• We can posit a **tonotactic constraint** ‘*[cũk]*’ to account for the patterns in Ghomala’

• Schematic derivational steps:

<table>
<thead>
<tr>
<th>L H</th>
<th>L H</th>
<th>L H</th>
</tr>
</thead>
<tbody>
<tr>
<td>\</td>
<td>→</td>
<td>→</td>
</tr>
<tr>
<td>v ŋ p</td>
<td>v ŋ p</td>
<td>v ŋ p ó</td>
</tr>
</tbody>
</table>

- **Tonotactic *[cũk]* constraint**
- **Tone-driven epenthesis**
Disc’n 1: Phonetic markedness of [cفك]

• A constraint *[cفك] is well-motivated based on phonetic markedness

• Contour markedness: Rising contours more marked than falling contours
  ◦ More restrictions on the kinds of syllables which can host rising contours
  ◦ Languages with rising contours but no falling contours are very rare

• Tone-bearing markedness:
  ◦ Scale of a syllable’s ability to host a tone contour: CVV > CVN > CVK

• Phonetic underpinnings:
  ◦ Rising pitch takes longer to execute than falling pitch → Consequently has greater duration (on average)
  ◦ Sonorous segments (e.g. vowels and sonorants) possess richer harmonic structures than obstruents → Make for better tone-bearing units

• Taken all together, [cفك] structures may not provide enough sonorous material to adequately realize the rising tone target within the allotted duration target

Disc’n 2: Tone-driven V retention exists

- **Tone-driven vowel retention**: Vowels which are otherwise expected to delete/reduce are retained *iff* they bear tone.

- Schematically: \( \ldots \text{cvc} \ldots \rightarrow \ldots \text{cc} \ldots \)
  - *but* \( \ldots \text{cv}c \ldots \rightarrow \ldots \text{cv}c \ldots \) (Cf. *\ldots \text{cc} \ldots *).

- **Tone languages**: Barain, Sumi Naga, Arapaho, Cheyenne, Acoma, Konso, Shanghainese, Japanese, etc.

- If vowels can be **retained** exceptionally for the sole purpose of realizing tone, then vowels should also be able to be **inserted** exceptionally, under the right conditions.

Barain (Lovestrand 2012); Sumi Naga (Teo 2009); Arapaho (Cowell & Moss 2008, Gleim 2019); Cheyenne, Acoma, Konso, Shanghainese, Japanese (Roettger & Grice 2019)
Disc’n 3: A parallel from intonation

• Let’s connect **tone-driven epenthesis** to a similar phenomenon: **Intonation-driven driven epenthesis**

• If there is some **mismatch** between the **segments** and **intonational melody**, usually **melody accommodates**
  ◦ E.g. via compression, simplification, truncation of melody, etc.

• However, growing literature shows opposite pattern:
  ◦ Manipulating the segments to **accommodate the intonational melody**

Evidence for manipulating the segments to accommodate intonation: Roettger 2017, Grice et al. 2018, Roettger & Grice 2019
Disc’n 3: A parallel from intonation

- **Tunisian Arabic intonation** (Hellmuth 2022)
  - Yes-no questions realized with rise-fall complex (i.e. \(L^*+H\ H-L\%\))
  - Appears at the right edge of an intonational phrase

- The falling part of this intonational complex can be realized on a co-occurring epenthetic vowel \([ə]\)

- \(nkemmil\ tˤuːl\ → [ nkemmil \ tˤuːlaː ]\)
  - \(L^*H\ H-L\%\)
  - I-continue straight.ahead ‘Should I go straight ahead?’

- **Co-variation of \([ə]\) with melody, not meaning:**
  - Epenthesis **never** appears when there is only a **simple** rise or **simple** fall, even in the context of a yes/no question
Disc’n 3: A parallel from intonation

• Taken together, these findings support tone-intonation parallelism:
  ◦ Both types of prosodic systems – Tone systems and Intonational systems – make use of the same phonological substance (i.e. H/L tonemes) and architecture (e.g. autosegmental representations)
  ◦ Both have the same functional pressures to cultivate segmental environments best suited for realizing pitch targets

For more tone-intonation parallelism, see Ladd 2008, inter alia; Intonation-driven retention also mentioned in Roettger & Grice 2019 for E. Portuguese, Bulgarian, Greek, Atl-Sidhar Rifian Berber, Moroccan Arabic, Bonaara Oromo, and Tunica
Summary
To summarize

1. Made the case for a novel tone/segment interaction: **Tone-driven epenthesis**
2. Evidence from languages Ghomala’ (and Wamey), where tonotactic constraint *[c̥v̆k]* repaired via epenthesis (e.g. /g̥ɔ̌p/ ‘hen’, realized as [gɔ̌p] or [gɔ̆p̥])
3. Despite pronouncements of its impossibility, the existence of tone-driven epenthesis falls out naturally from **Autosegmental representations**, with the tonal tier showing clear parallels with the segmental tier (i.e. **segment-tone parallelism**)
4. When coupled together with a parallel **Intonation-Driven Epenthesis**, demonstrates ability of prosody to cultivate segmental environments best suited for realizing pitch target (**tone/intonation parallelism**)
References

• List of references: [link]
• Bibtex file: [link]
Extra slides
Tone-driven epenthesis and variation

• **Variation consistent** across Ghomala’ literature/recordings
  ◦ Data from previous description
  ◦ Recordings from 1970s
  ◦ Recordings on YouTube by Ghomala’ language teachers

• Same word, different transcription:
  ◦ vɔ̀pá ‘dust’ (Nissim source)
  ◦ vɔ̌p ‘dust’ (Moguo source)

• Note: **No contrast** between such forms

Modern recordings on YouTube, e.g. https://www.youtube.com/watch?v=M5S1Pmw4ND8; Word for ‘dust’: Nissim 1981:198 and Moguo 2021:141
Against a deletion alternative

- Competing analyses:
  - We have proposed an epenthesis process: 
    \[ \text{/c} \text{v} \text{c}/ \rightarrow [\text{c} \text{v} \text{c} \text{á}] \] (Cf. \text{/c} \text{v} \text{c}/ \rightarrow *[\text{c} \text{v} \text{c} \text{á}])
  - Must argue against a deletion alternative: 
    \[ \text{/c} \text{v} \text{c} \text{á}/ \rightarrow [\text{c} \text{v} \text{c}] \] (Cf. \text{/c} \text{v} \text{c} \text{á}/ \rightarrow *[\text{c} \text{v} \text{c}])

1) Evidence from root phonotactics (in both Ghomala’ and Wamey)
   - Vast majority of roots in language are monosyllabic (e.g. CV/CVC shapes)
   - The major exception to this generalization are surface [cvcá] forms (and loanwords)

2) Evidence from stem phonotactics (in Wamey)
   - Stems cannot otherwise end in ə → Epentheses of [ə] happens at the word-level phonology

3) The [cvcá] forms pattern as consonant-final /cvc/ in phonological alternations
   - In Ghomala’, restrictions on vowels in closed [cvc] syllables apply in [cvcá] contexts too
   - In Wamey, consonant cluster reduction in closed [cvc] syllables apply in [cvcá] contexts too

In short, all available evidence points to them acting like consonant-final units
Wamey: Similar arguments and data

- Exhaustive search of Santos’ 1996 lexicon shows restriction on stem-final [ə] \( (n = 3518 – \text{Rolle} & \text{Merrill} 2022) \)
  - Only appears on **consonant-final** stems with a LH tone melody
  - Complete **complementary distribution**

<table>
<thead>
<tr>
<th>Tone</th>
<th>Example</th>
<th>Alternation</th>
<th>Morpheme</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>High  H</td>
<td>/cæw̃/</td>
<td>→ [cæw̃]</td>
<td>*[cæw̃ǎ]</td>
<td>‘urinating’</td>
</tr>
<tr>
<td>Low   L</td>
<td>/cæw̃/</td>
<td>→ [cæw̃]</td>
<td>*[cæw̃ə]</td>
<td>‘hiding’</td>
</tr>
<tr>
<td>Falling HL</td>
<td>/cæw̃/</td>
<td>→ [cæw̃]</td>
<td>*[cæw̃ə]</td>
<td>‘domestic animal’</td>
</tr>
<tr>
<td>Rising LH</td>
<td>/nkæw̃/</td>
<td>→ *[nkæw̃]</td>
<td>[nkæw̃ə]</td>
<td>‘dance’ (n.)</td>
</tr>
</tbody>
</table>

- As in Ghomala’, comparable alternations also exist in Wamey
Another parallel: Tone-driven $\mu$-insertion

- A similar process of **tone-driven $\mu$-insertion** (~lengthening) is well-known
  - When a floating tone docks to a vowel, a mora is added to accommodate it (e.g. $t_{\mu}k_{\mu} + \HH \rightarrow t_{\mu}k_{\mu}a_{\mu}$)
- If one can **insert a mora** to realize tone, then it is a short move to allow the insertion of a mora + vowel complex
Another parallel: Tone-driven μ-insertion

- **Gokana** (Hyman 2011): Mora inserted to realize floating tone

<table>
<thead>
<tr>
<th>Isolation tone</th>
<th>N of N</th>
<th>Surface pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>H té ‘tree’ té Ø nēn → [tē nēn] ‘tree of person’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L gè ‘knife’ gè Ø nēn → [gè nēn] ‘knife of person’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M tō ‘house’ tō Ø nēn → [tṑ nēn] ‘house of person’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MM kīgī ‘axe’ kīgī Ø nēn → [kīgì nēn] ‘axe of person’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cf. * [kīgū nēn]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Gokana from Hyman 2011: 74; Another tone-driven mora insertion in Kuria (Marlo et al. 2015: 256ff.)