1 Introduction to our extended issue: Representation vs. grammar

(1) Schematizing grammatical tone (GT)
   a. Baseline:  /T₁ T₂/  \rightarrow  [T₁ T₂]
   b. Grammatical tone:  /T₁ T₂/ + ?  \rightarrow  [T₁ T]

(2) ITEM-BASED vs. PROCESS-BASED analyses of GT  [In = input, Gr = grammar, Out = output]

   a. Item-based
      In:  /T₁ T₂/ / T₁ T₂ /  \leftarrow  Origin
      Gr:  T₁ T₂  T₁ T₂  \rightarrow  [T₁ T]
      Out:  [ T₁ T₂ ] [ T₁ T ]

   b. Process-based
      In:  /T₁ T₂ / / T₁ T₂ / / T₁ T₂ /  \leftarrow  Origin
      Gr:  T₁ T₂  T₁ T₂  T₁ T₂ +GT  \rightarrow  [T₁ T]
      Out:  [ T₁ T₂ ] [ T₁ T ]

(3) Range of theories for grammatical tone

   a. Item-based theories: Different representation
      - “Standard” floating tones
      - Circumfixal tones (plus colored containment)
      - [+DELETE] diacritics (‘minor rule approach’)  (Trommer 2011, 2023)
      - Grammatical tones as ontologically distinct
      - Gradient tone strength (on a [0.0] to [1.0] scale)  (Kimenyi 1978)
      - Phantom/virtual structure
      (Goldsmith 1990; Yip 2002; inter alia)

   b. Process-based theories: Different grammar
      - Construction tonology (plus reference to c-command)  (McPherson 2014; McPherson & Heath 2016)
      - Antifaithfulness (via transderivational correspondence)  (Alderete 2001a, 2001b)
      - Strata plus constraint reranking (Stratal OT)  (Anttila & Bodomo 2023)
      - Prosodic domain localization
      - Morphological class faithfulness (Indexed constraints)  (Revithiadou 1999)
      - Lexical MaxEnt (with regularization and scaling)  (Gouskova & Linzen 2015)
      (Trommer 2011, 2023)

   c. Hybrid theories:
      - Cophonologies by Phase  (Sande, Jenks, & Inkelas 2020; Sande 2023)
      - Matrix-Basemap correspondence (plus cophonologies)  (Rolle 2018)

   d. Universal suppletive allomorphy
      (Archangeli & Pulleyblank 2022)

(4) Item-based approaches to language: Complicated representations, simpler grammars
   a. Bermúdez-Otero’s GENERALIZED NON-LINEAR AFFIXATION (GNLA)¹
   b. “strives to derive all instances of non-concatenative morphology without any additional assumptions simply from affixation of nonlinear phonological representations that are independently motivated”

(5) Purely process-based approach to language
   a. Complicated grammars, simpler representations
   b. Some “Rules of Exponence” (e.g. Gregory Stump, inter alia)³
      stem, class, property  \rightarrow  f(STEM)  \leftarrow  function on stem
      X  V  {1PL}  \rightarrow  X-5  \leftarrow  French 1.plural formation
   c. In no way is there an input with some exponent -5
2 Locality and grammatical tone

(6) Let us examine some basic patterns with floating tones (circled, ⬙ - Yip 2002)

(7) Igbo [ibo] – Associated locally due to tonal density in noun of noun constructions


b. Aboh Igbo: ègbà ⬙ èŋwè → [ègbàèŋwè] ‘jaw of monkey’

(8) In this case, the floating ⬙ is ‘stuck’ between the lexical tones and has limited choices on where to dock to (if linear order is obeyed)

(9) What happens when tonal density is low?

a. Contrastive floating tone patterns in Chichewa (introduced yesterday)

b. mu-a-pez ⬙ a → mu-a-pez-á [mw-à-peéz-á]
   2P-PERF-find-FV ‘you have found’

c. tembenuz-its ⬙ a → tembenuz-its-á [tèmbènùz-íts-á]
   turn.over-INTS-FV ‘turn around a lot!’

d. ti-ku ⬙ tembenuz-a → ti-ku-tembenuz-a [tì-kù-tèmbènùùz-à]
   1P-PROG-turn.over-FV ‘we are turning over’

e. mu-sa ⬙ tembenuz-e → mu-sa-tembenuz-e [mù-sà-tèmbènùùz-è]
   1P-NEG-turn.over-SBJV ‘you should not be turning over’

(10) What prevents the floating tone from floating to the left? The floating tone has no linear precedence w/r/t the co-occurring segmental material

(11) What prevents the floating tone from always going to the least marked position?

(12) What prevents the floating tone from floating away? I.e. what keeps it ‘local’?
3  **Floating tone type 1: Default association**

(13) **DEFAULT ASSOCIATION**

a. The surface position of the floating tone is determined by the ambient phonological grammar (least marked surface form wins)

b. Essentially equivalent to association of pitch accents T* in intonation

(14) Makonde (of Zanzibar) – Penultimate position of word is default

a. Evidence from penultimate lengthening

b. \((CV.CV.CV.CV.CV) \rightarrow (CV.CV.CVV.CV)\)

(15) Prominence corroborated: Grammatical tone to default penultimate position

a. \(\text{káléká ngu-} \text{-takatukil-e} \rightarrow \ldots \text{ngu-takatukíil-e}\)
   \(\text{if } \text{HYP.1S-HYP-stand.up-SBJV} \rightarrow \text{‘if I stood up’}\)

b. \(\text{ni-ka} \text{-takatukil-a} \rightarrow \text{ni-ka-takatukííl-a}\)
   \(\text{1S-CONS-stand.up-FV} \rightarrow \text{‘and/if I stood up’}\)

c. \(\text{ni-nda} \text{-takatukil-a} \rightarrow \text{ni-nda-takatukííl-a}\)
   \(\text{1S-FUT-stand.up-FV} \rightarrow \text{‘I will stand up’}\)

d. \(\text{ní-ndi} \text{-takatukil-a} \rightarrow \text{ní-ndí-takatukííl-a}\)
   \(\text{1S-RPST-stand.up-FV} \rightarrow \text{‘I stood up’}\)

(16) Norwegian [nor] – Marked L tone

<table>
<thead>
<tr>
<th>Type</th>
<th>Underlying</th>
<th>H*L pitch accent</th>
<th>Boundary tone</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>(L)</td>
<td>(L)</td>
<td>(L) H%</td>
</tr>
<tr>
<td>(\text{aksel})‘shoulder’</td>
<td>(\text{á k s e l})</td>
<td>(\text{á k s e l})</td>
<td>(\text{á k s e l})</td>
</tr>
<tr>
<td>b.</td>
<td>(\text{H* L})</td>
<td>(\text{H L H%})</td>
<td></td>
</tr>
<tr>
<td>(\text{aksel})‘axle’</td>
<td>(\text{á k s e l})</td>
<td>(\text{á k s è l})</td>
<td>(\text{á k s è l})</td>
</tr>
</tbody>
</table>

(17) Indefinite superlative floating associates to the stressed syllable (non-local)

a. \(\text{ˈflott-} \text{-st} \rightarrow \text{ˈflòtt-est}\) ‘most splendid’

b. \(\text{soˈl} \text{-id-} \text{-st} \rightarrow \text{soˈl} \text{id-est}\) ‘most solid’

c. \(\text{ˈfylde-ig-} \text{-st} \rightarrow \text{ˈfýldig-} \text{-st}\) ‘plumpest’
   \(\text{ˈhedr-lig-} \text{-st} \rightarrow \text{ˈhèderlig-} \text{-st}\) ‘most honest’
   \(\text{ˈmor-som-} \text{-st} \rightarrow \text{ˈmòrsom-} \text{-st}\) ‘funniest’

(18) Default association: Derivable by standard tone constraints

a. \(\text{TONE-TO-STRESS (Tones prefer to be on a stressed TBU)}\)

b. \(\text{ALIGN-L: Each T should align with the left edge of the domain}\)
4 Floating tone type 2: Local association

(19) **LOCAL ASSOCIATION**

a. The floating tone associates to a position directly adjacent to its sponsor (without associating to it directly)

b. This may be the most common type, and often not even characterized as grammatical tone

(20) Caddo [cad] – Morphemes idiosyncratically sponsor a ⱦ, which docks to immediately preceding vowel

a. ?a-wiht-ߨnt-hayas-ʔnih-ah \[ \rightarrow \] ?a-ʔi-n't-a's-ʔnih-ah
   DEFOCUS.AGT/IRR-DU-APPL-money-make-PERF ‘did they pay them two?’

b. kak#ʔu-kaki-ߨnt-n-ʔah \[ \rightarrow \] kah#ʔu-kaki-ʔn-ʔnah
   SUB#DEFOC.DAT-VAR-APPL-song-be ‘someone’s various songs’

c. ?ícuda-wa-hak-ߨʔiʔn-ʔah \[ \rightarrow \] ?isda-wa-háh-ʔn-ʔah
   in.a.pile-PL-stand-CAUS-PERF ‘they piled it’

d. ci-kan-ba = sisih-ߨʔn-ʔcah \[ \rightarrow \] ci-kam-ba = sisih-ʔn-i-ʔcah
   1AGT-liquid-boil-CAUS-INTENT ‘I’m going to boil water’

(21) The floating tone does not appear in a consistent phonologically-defined position

(22) Process based: Have a constraint akin to LOCAL (albeit morphologically restricted)

a. "LOCAL: If an input tone T has an output correspondent T', some edge of T must correspond to some edge of T'."

<table>
<thead>
<tr>
<th>T</th>
<th>(Markedness)</th>
<th>LOCAL</th>
<th>(Faithfulness)</th>
</tr>
</thead>
<tbody>
<tr>
<td>/</td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>\u \u \u \u</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| a. T'      | *            |       |                |
| [ \u \u ] | *            |       |                |

| b. T'      | *            |       |                |
| [ \u \u \u \u ] | *         |       |                |

| c. T'      | *            |       |                |
| [ \u \u \u \u ] |           |       |                |

| d. T'      | *            | *     |                |
| [ \u \u \u \u ] |           |       |                |
(23) How might we capture this within a representational theory (i.e. complying w/ GNLA)?

(24) Option 1: Contrastive morphological colors
   a. Morphological Color Theory\(^\text{12}\)
   b. “every morpheme has a unique color shared by all its phonological elements (segments, features, and, of course, tones)”
   c. “…cannot change the colour of any phonological element: it cannot give colour to epenthetic material, and it cannot alter the colours of underlying material”

(25) A simple phrase like *the red dogs* is rendered:

```
\[ i \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet / \delta \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \delta \]
```

(26) When association is local, the floating tone and co-occurring segment have same color

(27) Option 1 representations:

<table>
<thead>
<tr>
<th>Local association</th>
<th>Default association</th>
</tr>
</thead>
<tbody>
<tr>
<td>( H_a )</td>
<td>( H_b )</td>
</tr>
<tr>
<td>( \bullet_a )</td>
<td>( \bullet_b )</td>
</tr>
<tr>
<td>( \mu_a )</td>
<td>( \mu_a )</td>
</tr>
<tr>
<td>( \bullet_a )</td>
<td>( \bullet_a )</td>
</tr>
<tr>
<td>( k_a u_a s_a a_a )</td>
<td></td>
</tr>
</tbody>
</table>

(28) Phonological material of the same color is as local as possible, *without associating*

(29) Formalized as a constraint ALTERNATION (van Oostendorp 2007)
   a. “if an association line links two elements of colour \( \alpha \)” (i.e. the same morpheme index), then “the line should also have colour \( \alpha \)” (i.e. not be epenthetic)
   b. In short, phonology should not associate phonological structure of the same color

(30) Option 2: Contrastive association lines
   a. Pre-association: Underlying *linked* line
   b. Local association: Underlying *delinked* line (ontologically distinct from no line)

(31) Stems from original early OT ideas involving Containment Theory
   a. “Original version of OT in Prince and Smolensky (1993) based on the assumption that phonological operations never truly delete underlying material”\(^\text{13}\)
   b. “Underparsing Phonetically Realized as Deletion: An input segment unassociated to a syllable position (‘underparsing’) is not phonetically realized.”\(^\text{14}\)
(32) How can this be represented? Consider Rimi [rim] tone shift\textsuperscript{15}
   a. “A high tone in Rimi is regularly shifted one syllable to the right of its underlying position”
   b. \texttt{rá-mu-ntu} $\rightarrow$ \texttt{ra-mú-ntu} ‘of a person’ etc.

\begin{center}
\begin{tabular}{|c|c|c|}
\hline
H & H & \\
\hline
| & | & + \\
| & | & |
\hline
/ & \texttt{μ} & \texttt{μ} & \texttt{μ} & $\rightarrow$ [ & \texttt{μ} & \texttt{μ} & \texttt{μ} & \texttt{μ} ] \\
\hline
\texttt{r a - m u - n t u} & \texttt{r a - m u - n t u} \\
\hline
\end{tabular}
\end{center}

(33) While this is not pronounced – i.e. it is not interpreted as gestural instructions at the phonology-phonetics interface – delinked association lines are \textit{phonologically real}

(34) It is a short move then to say that they can be used as a \textit{unit of contrast}, i.e. in the underlying representation rather than merely derived

(35) Option 2 representations:

\begin{center}
\begin{tabular}{|c|c|c|}
\hline
Pre-association & Local association & Default association \\
\hline
H & H & H \\
\hline
| & | & \\
| & | & |
\hline
\texttt{μ} & \texttt{μ} & \texttt{μ} & \texttt{μ} & \\
\hline
\texttt{n a} & \texttt{k u} & \texttt{s a} \\
\hline
\end{tabular}
\end{center}

(36) Tableau

\begin{center}
\begin{tabular}{|c|c|c|c|c|}
\hline
T & / & \texttt{μ} & \texttt{μ} & \texttt{μ} & \texttt{μ} \\
\texttt{μ} & \texttt{μ} & \texttt{μ} & \texttt{μ} \\
\texttt{μ} & \texttt{μ} & \texttt{μ} & \texttt{μ} \\
\end{tabular}
\end{center}

a. \texttt{T' [ \texttt{μ} \texttt{μ} \texttt{μ} \texttt{μ} ]} $\ast$

b. \texttt{T' [ \texttt{μ} \texttt{μ} \texttt{μ} \texttt{μ} ]} $\ast$

c. \texttt{T' [ \texttt{μ} \texttt{μ} \texttt{μ} \texttt{μ} ]} $\ast$

6
5 Floating tone type 3: Anchored association

(37) PROSODICALLY-ANCHORED ASSOCIATION (or simply ANCHORED ASSOCIATION)
   a. The floating tone appears neither in a consistent phonologically-defined position (cf. default association) nor does its position depend on the location of co-occurring segmental material (cf. local association)
   b. The floating tone associates to a numerically-defined position within a prosodic constituent

(38) Kuria [kuj] – Contrastive and idiosyncratic positions relative to the (prosodic) stem
   a. Hortatory imperative
      ⊗ to-tá-[tururuŋana]ε ‘let us welcome’
   b. Habitual past (FOC)
      H-to-μ₁ n-to-ogá-{tururuŋaini}ε ‘we used to welcome (then)’
   c. Hodiernal past progressive (FOC)
      H-to-μ₂ n-to-oga-{tururuŋaini}ε ‘(indeed) we have been w. (today)’
   d. Remote future (FOC)
      H-to-μ₃ n-to-re-{tururuŋana}ε ‘we will welcome (then)’
   e. Hortatory imperative inceptive
      H-to-μ₄ to-ra-{tururuŋana}ε ‘we are about to welcome’
   f. Narrative past
      H-to-μ₁+4 to-gá-{tururuŋana}ε ‘(and) we welcomed’

(39) Given that a H seems to count up to 4 moras from the left edge, causes us to reassess the received wisdom that ‘grammars don’t count’

(40) A process based version with an overt counting constraint ‘μ4’
   a. “μ₄: Assign one violation for each floating tone that does not surface four moras from its input location.”

<table>
<thead>
<tr>
<th>/to-ra^H-[ω roma] [ω eyetőške]/</th>
<th>μ₄</th>
<th>H, R</th>
<th>ID-T</th>
<th>H</th>
<th>Obs</th>
<th>Pred</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [[ω toraroma] [ω eyetőške]]</td>
<td>1</td>
<td>9</td>
<td>1</td>
<td>9</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>b. r^[ω toraroma] [ω eyetőške]]</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(41) Representational alternatives the H-to-μ₄ pattern in the Hortatory imperative inceptive
   a. Construction-specific prosodic alignment (Marlo et al. 2015 for dismissal)
   b. Floating sequence ▼▼▼▼ (Trommer forthcoming)
   c. Phantom structure (Rolle & Lionnet 2020)
Phantom structure (or “virtual structure” – Trommer’s term)

a. Phonological units of contrast (segments, features, tones, etc.) exist largely on a substantive plane but also a parallel phantom/virtual plane, to which phonological substance can pre-associated in its lexical entry.

Substantive plane

<table>
<thead>
<tr>
<th>H-to-μ₁</th>
<th>H-to-μ₂</th>
<th>H-to-μ₃</th>
<th>H-to-μ₄</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>H</td>
<td>H</td>
<td>H</td>
</tr>
<tr>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

Substantive structure (front) vs. Phantom structure (back)

<table>
<thead>
<tr>
<th>H-to-μ₁</th>
<th>H-to-μ₂</th>
<th>H-to-μ₃</th>
<th>H-to-μ₄</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>H</td>
<td>H</td>
<td>H</td>
</tr>
<tr>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

This is akin to more familiar theories of subcategorization

a. “Phantom structure is phonological structure that is needed for the full realization of the lexical entry, but which the lexical entry cannot provide itself – it is a ‘desire’ for missing structure, so to speak.”

b. Appropriate to even call this a ‘reification’ of a subcategorization frame

c. E.g. Latin =que ‘and’ must be right-adjacent to following phonological word (ω)

\( \text{diu} = \text{que } \text{noctu} \rightarrow \text{diu noctu=que} \)

day and night ‘by day and by night’

Hortatory imperative inceptive

a. H-to-μ₄ to-ра-{турунάна}ε ‘we are about to welcome’

b. High-ranking Phantom-Output faithfulness for tone association of phantom μ’s

Not literal counting: ‘Counting’ as pre-specification

a. Same mechanism – faithfulness – that preserves tone in itʃiimbusąyo ‘hedges’
Part of a long OT history using multiple faithfulness relations in competition

a. Base-Reduplicant Correspondence (BR-Corr)
b. Agreement By Correspondence (ABC)
c. Output-Output Correspondence (OO-Corr)
d. Sympathy Theory (Candidate–Candidate Correspondence)
e. Output-Underlying Representation Correspondence (O-UR-Corr)

Three-dimensional phonology (3DΦ)

a. Prosodic Morphology: \( \sqrt{\text{ktb}} (\sqrt{\text{write}}) \Rightarrow k-t-atab \) ‘was registered’

Vocalic melody tier

\textit{t}-morpheme tier

Prosodic template tier

Root tier

6 Summary

Five representations for five different patterns

7 References

See my website (www.nicholasrolle.com)
1. Item and process framing from Hockett 1954, and many since (e.g. see Sande 2023 for recent state-of-the-art)

2. Bermúdez-Otero 2012, building on important earlier work (e.g. Stonham 1994, Lieber 1992:ch.5, Trommer & Zimmermann 2010); Quote that follows from Zimmermann 2013:2


5. Downing & Mtenje 2017


8. Wetterlin 2010:21-22,75


10. Melnar 2004:20,138,142,208

11. Myers 1997:876


13. Quote: Trommer 2022

14. Prince and Smolensky 1993:97


18. Sande, Jenks, & Inkelas 2020:1237

19. Quote: Rolle & Lionnet 2020


21. IO-Corr McCarthy & Prince 1995); BR-Corr (McCarthy & Prince 1995, Ussishkin 1999); ABC (Rose & Walker 2004); OO-Corr (Benua 1997, Alderete 2001a, 2001b, Rolle 2018a,b); Sympathy Theory (McCarthy 1999); O-UR-Corr (Hauser & Hughto 2020); Other models with competing faithfulness: Matrix-Basemap Correspondence (Rolle 2018); Output-Variant Correspondence (Kawahara 2002); Template-Text Correspondence (Blumenfeld 2015)