1 OVERVIEW

(1) Feed-forward modular architecture: Requires translation between SYNTACTIC MODULE and PHONOLOGICAL MODULE (they speak different ‘languages’)

(2) EXPONENT:
   - [synsem features] ↔ [phonological exponent]
   - [aβγ] ↔ /X/
   - [PL] ↔ /z/

(3) EXPONENT (≈ ‘recurrent partial’, ‘morph’): Non-decomposable morphological primitive, made of phonological vocabulary (e.g. segments, tones, signs, etc.)

(4) How does GRAMMATICAL TONE (GT) fit in?

(5) Chichewa [nya]

   - No grammatical tone
     mu-ná-tembenz-a → mu-ná-tembenz-a
     2P-PST- √ TURN_OVER-FV ‘you turned over’

   - AUTONOMOUS grammatical tone
     mu百强tembenz-a → mu百强tembenz-a
     2P-FUT- √ TURN_OVER-FV ‘you will turn over soon’

   - AUXILIARY grammatical tone
     mu-dz百强tembenz-a → mu-dz百强tembenz-a
     2P-NEC- √ TURN_OVER-FV ‘you should be turning over’

(6) Item-based approach: Grammatical tone patterns due to differences in the input

(7) Bermúdez-Otero (2012)’s GENERALIZED NON-LINEAR AFFIXATION (GNLA)
   - “strives to derive all instances of non-concatenative morphology without any additional assumptions simply from affixation of nonlinear phonological representations that are independently motivated”

(8) PARITY OF EXPONENCE PRINCIPLE: All grammatical features can be mapped to segmental exponents, tonal exponents, or their combination

(9) Superficial exponence rules

<table>
<thead>
<tr>
<th></th>
<th>No GT</th>
<th>Autonomous</th>
<th>Auxiliary</th>
</tr>
</thead>
<tbody>
<tr>
<td>PST</td>
<td>/</td>
<td>/</td>
<td></td>
</tr>
<tr>
<td>FUT</td>
<td>/</td>
<td>/</td>
<td></td>
</tr>
<tr>
<td>NEC</td>
<td>/</td>
<td>/</td>
<td></td>
</tr>
</tbody>
</table>

(10) Central claim today: Such auxiliary grammatical tone patterns constitute two separate (but non-competing) exponence rules

(11) Autonomous grammatical tone appear to be a type of BIPARTITE MORPHEME

   - Discontinuity: Single linguistic category expressed discontinuously, /æ...β/
   - Non-compositionality: Meaning not (prima facie) composed of that meaning corresponding to /æ/ plus that meaning corresponding to /β/

(12) CIRCUMFIX: “A circumfix is a good example of a bipartite morpheme, a single realization of a feature or bundle of features or of a derivational category”

(13) Other examples

   - Discontinuous morphemes (in Athabaskan)
   - Splitting verbs (in West Africa)
   - Infix-inducing verbs (in Lakhota [da])
   - Synaffixes (i.e. combinations of affixes)
   - Auxiliary grammatical tone

(14) mu-dz百强tembenz-a → mu-dz百强tembenz-a
     2P-NEC- √ TURN_OVER-FV ‘you should be turning over’

2 GRAMMATICAL TONE AS A BIPARTITE MORPHEME

2.1 What are bipartite morphemes?

(11) Autonomous grammatical tone appear to be a type of BIPARTITE MORPHEME

   - Discontinuity: Single linguistic category expressed discontinuously, /æ...β/
   - Non-compositionality: Meaning not (prima facie) composed of that meaning corresponding to /æ/ plus that meaning corresponding to /β/

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   - Auxiliary grammatical tone

(14) mu-dz百强tembenz-a → mu-dz百强tembenz-a
     2P-NEC- √ TURN_OVER-FV ‘you should be turning over’

2.2 One exponent rule or two? Four predictions

(15) Major research question: Do bipartite morphemes constitute a single exponent rule or separate exponent rules?

   - One rule: [F] ↔ /æ...β/
One vs. separate rules for Chichewa dzi

(a) Processual exponence
- [NEC] ↔ dzi ( + [GT] via constraints)

(b) Bipartite exponence
- [NEC] ↔ dzi

- Parallel exponence
- [NEC] ↔ dzi & [NEC] ↔ dzi

- Overlapping exponence
- [NEC, F] ↔ dzi & [NEC, F] ↔ dzi

- Separate exponence
- [NEC] ↔ dzi & [F] ↔ dzi
- / F] ↔ dzi & [NEC] ↔ dzi

- / F] ↔ dzi & [G] ↔ dzi

(16) Predictions of separate rules
- Appearance: The conditions governing the (non-)appearance of one co-exponent (Æ) never affect that of the other co-exponent (ß)
- Allomorphy: Suppletive allomorphy that is triggered by or targets one of the co-exponents (æ and ß) does not necessarily reference or affect the other (ß)
- Derivedness: When the co-exponents (æ and ß) are incidentally local, they act as a derived environment w.r.t. morpho-phonological processes
- Minimality: If there is minimality-based faithfulness (e.g. don’t delete vowel of 1σ ‘morphemes’), co-exponents (æ and ß) are evaluated separately
- What are the results with the more familiar category “circumfix”?  

2.3 Predictions applied to circumfixes

(19) Pattern 1: DISJOINT CIRCUMFIXATION – Complies with our predictions
- The components of the circumfix act independently from one another with respect to their morphological distribution, patterns, forms, etc.

- German participle marking ge-….t, e.g. used in past (perfect), passives
  - googeln → ge-google-t [ga-gugəl-t] ‘(have/be) googled’

- Quirk 1: Irregular suffixal allomorph
  - geben → ge-geb-en [ga-gəbən] ‘(have/be) given’

- Quirk 2: Prefix ge- can only appear before stress
  - änworten → ge-antwort-et [ga-ʔantvərt-ət] ‘(have/be) answered’
  - probieren → probier-t [prəbiər-t] ‘(have/be) tried/tasted’

- Cf. *ge-probiert- *[ga-prəbiət-] ~ *[ga-prəbiər-t]

(20) When exponents involve grammatical tone in a bipartite construction, it behaves like disjoint circumfixation (i.e. separate exponence rules)

3.1 Data point 1: Appearance

- Appearance: The conditions governing the appearance or non-appearance of one co-exponent (æ) does not affect that of the other co-exponent (ß)

- TONAL CIRCUMFIXES in Liko [lik]  
  - Adjectives are derived from verbs by circumfix ñ around verb stem
  - H-toned verb root: bung- ‘lose’
    - mʊ̀bʊ̀kʊ mʊ̀-bung-à → mʊ̀bʊ̀kʊ mʊ̀bungʊ 3-quiver 3-DER-lose-FV-DER ‘a lost quiver’
  - L-toned verb root: båk- ‘carve’
    - dågå-tʊ ti-å-båk-ʊ → dågåtʊ tîbåkā 13.arrow-13 13-DER-carve-FV-DER ‘carved arrows’
However, while non-derived adjectives do not occur with ꠋ-, all do end in ꠋH, ꠋL.

- ꠋkúdú ‘short’ - ꠋdíngi ‘big’ ꠋHL ꠋLL
- ꠋkódé ‘small’ - ꠋliyá ‘too well-done’
- ꠋkóngó ‘tall, high’ - ꠋndá ‘long’
- ꠋkúkúkú ‘short’ (PL) - ꠋtí ‘heavy’
- ꠋkékéké ‘small’ (PL) - ꠋísí ‘raw, new’

(33) Supports treating the two components as separate exponence rules

Exponence rule 1
(derived Adj)

[ADJ, (F)] ↔ ꠋ-

Exponence rule 2
(derived & non-derived Adj)

[ADJ] ↔ - ragazzo

3.2 Data point 2: Suppletive allomorphy

(34) Allomorphy: Suppletive allomorphy that is triggered by or targets one co-
exponent (ae) does not necessarily reference or affect the other (b)

Cilungu [mgr] grammatical tone13

(35) Our baseline: No allomorphy

- Far Past Tense: A prefix a- plus a (non-local) GT ꠋ-

- ꠋyá-a-sukílil-a ꠋ- ꠋyá-a-sukílil-á [yáásukililá]
  3p-T-accompany-FV T ‘they have already accompanied’

- ꠋtá-sópolol-a ꠋ- ꠋtá-sópolol-á [táasópolólá]
  1p-T-untie-FV T ‘they have already untied’

- ꠋu-a-yá-sukílil-e ꠋ- ꠋu-a-yá-sukílil-é [uáysukililé]
  3s-T-3p-accompany-ASP-FV T ‘he/she accompanied them’

(37) Our focus: Handful of inflectional contexts showing GT allomorphy14

- Recent Past Tense: A prefix á- plus a (non-local) GT ꠋ-

- Whether word-final GT surfaces depends on word-initial tone ꠋ-

- ꠋyá-a-sópolol-a ꠋ- ꠋyá-a-sópolol-á [yáásópolólá]
  3p-T-untie-FV T ‘they have already untied’

- ꠋuí-sópolol-a ꠋ- ꠋuí-sópolol-á [uíásópolólá]
  3s-T-untie-FV T ‘he/she has just untied’

(38) Cilungu generalization: ꠋ-

(39) Tonal allomorphy does not affect segmental co-exponents


(40) What would a canonical counter-example look like?

- Tonal allomorphy has a long-distance effect on segmental prefix: absence of ꠋ would cause absence of á- prefix, and vice versa (complete co-variation)

3.3 Data point 3: Derived environment effects

(41) Derivedness: When the co-exponents (ae and b) are incidentally local, they act

as a derived environment with respect to morpho-phonological processes

(42) Argument involves DERIVED ENVIRONMENT EFFECTS (DEEs): Phonological

processes that apply across but not within ‘morphemes’

(43) Korean palatalization16

- Non-derived: ꠋmati/ ‘knot’ → ꠋ[madi] *[madʒi]

(44) DEEs can be formalized with a constraint ALTERNATION within the framework

of Morphological Color Theory17

- In short, do not create new associations with structure of the same color

Derived: ꠋha aæ t áo tó i ci → ꠋha aæ d b d śb i ci

Non-derived: ꠋm d a d t d i d → ꠋm d a d d śb i d

(45) This theory can be applied to cases of local floating tone:

- Tone docks to vowel adjacent to accompanying segments

Southeastern Nochixtlán Mixtec [mxy]18

- ꠋbę́e jāǰaⁿ → ꠋ[bę́e jāǰaⁿ]
  house coyote ‘the coyote’s house’

- ꠋnā’a[纪检监察] jāǰaⁿ → ꠋ[nā’a jāǰaⁿ]
  hand coyote ‘the coyote’s front paw’
What happens in isolation? → Complete neutralization

- \[ \beta ë ë \rightarrow [\beta ë ë] \] ‘house’
- \[ nà ë ë \rightarrow [nà ë ë] \] ‘hand’

This floating tone cannot SELF-ASSOCIATE (typologically, very common ban)\(^19\)

The ban on self-

<table>
<thead>
<tr>
<th>M&lt;sub&gt;i&lt;/sub&gt;</th>
<th>ㄷ</th>
<th>M&lt;sub&gt;i&lt;/sub&gt;</th>
<th>ㄷ</th>
</tr>
</thead>
<tbody>
<tr>
<td>n&lt;sub&gt;i&lt;/sub&gt;</td>
<td>ㅏ</td>
<td>i&lt;sub&gt;i&lt;/sub&gt;</td>
<td>ㅏ</td>
</tr>
</tbody>
</table>

Compare a bipartite morpheme with grammatical tone in Idakho [i-\(\text{ida}\)]\(^20\)

- The IMPERFECTIVE is expressed via a suffix -aang and a floating tone توقيع، which docks to 2nd mora of stem
- \[ a-((\beta ë ë)\rightarrow a-(\beta ë ë)aang-a)\] 3S-ask-ASP-ASP-FV
  ‘s/he asks’
- \[ a-((\text{k}álúshits-\(\beta ë ë\))\rightarrow a-(\text{k}álúshits-aang-a)\] 3S-return-ASP-ASP-FV
  ‘s/he returns’
- \[ a-((\text{s}ebúlukhanyiny-\(\beta ë ë\))\rightarrow a-(\text{s}ebúlukhanyiny-aang-a)\] 3S-scatter-ASP-ASP-FV
  ‘s/he is scattering’

When -aang itself is incidentally in 2nd mora position, توقيع can associate to it

- \[ a-((\text{lekh-}\(\beta ë ë\))\rightarrow a-(\text{lekh-aang-a})\] 3S-leave-ASP-ASP-FV
  ‘s/he leaves’

What would a canonical counter-example look like?

- A language whose non-local floating tone would never associate to its co-
  exponent, resulting in tone deletion, ineffability, or in exceptional
  association to another position (i.e. to the 1st rather than the 2nd)

A RESTRICTIVE THEORY OF EXPONENT SHAPE

How can we tie all these independent observations and data together?

Two distinct behavioral profiles for floating tones

- Idakho type: \[ a-(\text{k}álúshits-\(\beta ë ë\))aang-a \] → \[ a-(\text{k}álúshits-aang-a) \]
- S.N. Mixtec type: \[ nà ë ë \rightarrow nà ë ë \]

<table>
<thead>
<tr>
<th>Idakho type (Bipartite morpheme)</th>
<th>S. N. Mixtec type</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Non-local</td>
<td>Local</td>
</tr>
</tbody>
</table>
| Tonal co-exponent توجه can appear non-local to segmental co-
  exponent | Tonal co-exponent توجه must appear on a position adjacent to segmental co-exponent |
| b. No derived environment affect | Derived environment affect |
| No prohibition on ‘self-
  association’ (i.e. توجه –okay) | Bans on self-association possible (i.e. توجه –okay) |
| c. Insertion independence | Insertion co-
  dependence |
| (Non-)Appearance of one should not involve the other | (Non-)Appearance should always involves both V and توجه (modulo above) |
| d. Form independence | Form co-
  dependence |
| (Suppletive) Allomorphy involving one should not affect the other | Allomorphy should always affect both V and توجه |
| e. Separate exponent rules | One exponent rule |
| [F] \(\leftrightarrow\) V | [F] \(\leftrightarrow\) توجه |

How do we guarantee this kind of behavior? A theory on exponent shape

Restriction on exponent: NO UNDERLYING GAPS HYPOTHESIS

<table>
<thead>
<tr>
<th>Allowed exponent structures</th>
<th>Disallowed exponent structures</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. CVC</td>
<td>d. * CV…C</td>
</tr>
<tr>
<td>[ C - V - C ]</td>
<td>[ C - V _ C ]</td>
</tr>
<tr>
<td>b. (\text{توجه}_\text{توجه})</td>
<td>e. * (\text{توجه}_\text{توجه})</td>
</tr>
<tr>
<td>[ H - L ]</td>
<td>[ H _ L ]</td>
</tr>
<tr>
<td>c. CVC</td>
<td>f. * CVC(\text{توجه})</td>
</tr>
<tr>
<td>[ H _ ]</td>
<td>[ H _ ]</td>
</tr>
<tr>
<td>[ C - V - C ]</td>
<td>[ C - V - C ]</td>
</tr>
</tbody>
</table>

If this principle holds, how then do we account for an exponent rule like ‘[F] \(\leftrightarrow\) V \(\text{توجه}\)’ where the segmental and tonal components have the same morphological identity and appear in a local relationship
Floating tone which docks locally: Underlying delinked association lines

- This does not count as a gapped structure (i.e. the floating tone isn’t actually floating, you just can’t see the string)

\[
\begin{array}{c}
H + \\
C - V - C
\end{array}
\]

5 TAKE-AWAY

59) **Point 1:** Exponents involving tone obey ‘No Underlying Gaps Hypothesis’

<table>
<thead>
<tr>
<th>Floating</th>
<th>Local</th>
<th>but cf.</th>
<th>* Gapped</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>H</td>
<td>+</td>
<td>H</td>
</tr>
<tr>
<td>v</td>
<td>+</td>
<td>V</td>
<td>v</td>
</tr>
</tbody>
</table>

60) **Point 2:** Although tonal and segmental inflection expone the same linguistic categories (i.e. the ‘Parity of Exponence Principle’ above), they show considerable independence from one another in their morphological behavior

- On the Oto-Manguean family of Mexico: “a verb may simultaneously belong to various inflectional classes: one for its endings, another for its stem changes and a third for its tonal changes”

6 REFERENCES

61) Posted on my website (www.nicholasrolle.com)

7 ENDNOTES

1 “[T]he translational process cannot take place in either morpho-syntax or phonology: the Translator's Office has access to the structure and the labels of both sides” – Scheer 2011:352
2 Especially in Distributed Morphology, e.g. Embick 2015, *inter alia*
4 For extensive references on grammatical tone, see Lionnet, McPherson, & Rolle 2023 (introduction to special issue of *Phonology*)
5 Downing & Mtenje 2017:145,162,184; The second example (near future) was created based on other examples to create a minimal pair
6 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
7 Hyman 2011; “[T]onal morphology... exhibits essentially the same range of morphological properties as in all of segmental morphology” – Hyman & Leben 2000:588
8 Harris 2017:17, citing Kuryłowicz 1966 [1945-1949]; Marušič 2003 on non-compositionalism; Quote on circumfixes below is from Harris 2017:19 (my underlining)
12 Data is from de Wit 2015:162-163,219
13 Data is from Bickmore 2007, Rolle & Bickmore 2022
14 The idiosyncrasy of this allomorphy is discussed in detail in Rolle & Bickmore 2022. Briefly, the same grammatical tone allomorphy always appears with Recent Past prefix á-, which appears in several related tense designations (e.g. the ‘Yesterday Past’, the ‘Yesterday Past Progressive’, the ‘Recent Past Progressive’, and the ‘Recent Perfect’). At the same time, this grammatical tone allomorphy appears only in the context of the Recent Past prefix á-; other comparable tense/aspect/mood (TAM) contexts (with other morphology) show no grammatical tone allomorphy. In other words, the alternation is not phonologically general. Importantly, for our argument, other TAM contexts in Cilungu which show grammatical tone allomorphy also show the morphological independence of tonal and segmental components (e.g. the plain ‘Perfect’ with a suffix –Il, and the ‘Subjunctive’/‘Imperative’).
This is informally called ‘first-last tone harmony’ in the Bantu literature – See Rolle & Bickmore 2022 and Hyman & Nyamwaro 2023 for details and many references.


van Oostendorp 2007

Data is from McKendry 2013:136-137

Self-association bans are prevalent in literature, e.g. Myers & Carleton’s 1996 *DOMAIN, Revithiadou 1999:75-80, Wolf’s 2007 no ‘tautomorphemic docking’ constraint, Trommer’s 2011 ‘incest taboo problem’, McPherson’s 2014:89 parameterization of ‘self-control’, *inter alia*. As Trommer 2022 summarizes, “floating features show a strong tendency to associate to segmental material which is not part of the same morpheme”.

Idakho data: Ebarb 2014:144,161,322

Palancar 2016:112, underlining mine