

# “Phonological locality and constraints on exponent shape”

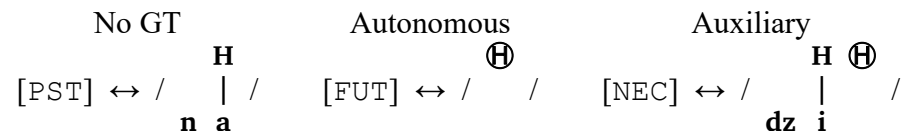
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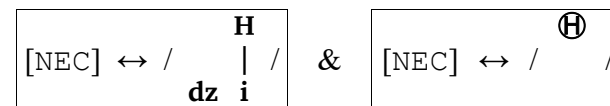
## 1 OVERVIEW

- (1) Feed-forward modular architecture: Requires translation between SYNTACTIC MODULE and PHONOLOGICAL MODULE (they speak different ‘languages’)<sup>1</sup>
- (2) EXPONENCE<sup>2</sup>
  - [synsem features] ↔ [phonological exponent]
  - [αβγ] ↔ /X/
  - [PL] ↔ /-z/
- (3) EXPONENT (≈ ‘recurrent partial’, ‘morph’): Non-decomposable morphological primitive, made of phonological vocabulary (e.g. segments, tones, signs, etc.)<sup>3</sup>
- (4) How does GRAMMATICAL TONE (GT) fit in?<sup>4</sup>
- (5) Chichewa [nyɑ]<sup>5</sup> (Note: these are forms after GT applies, not surface forms)
  - No grammatical tone  
**mu-ná-tembenuz-a** → **mu-ná-tembenuz-a**  
 2P-PST-√TURN\_OVER-FV ‘you turned over’
  - AUTONOMOUS grammatical tone  
**mu-⊕-tembenuz-a** → **mu-tembenuz-a**  
 2P-FUT-√TURN\_OVER-FV ‘you will turn over soon’
  - AUXILIARY grammatical tone  
**mu-dzí⊕-tembenuz-a** → **mu-dzí-tembenuz-a**  
 2P-NEC-√TURN\_OVER-FV ‘you should be turning over’
- (6) Item-based approach: Grammatical tone patterns due to differences in the input (Cf. Process-based approach where pattern due to differences in the grammar)
- (7) Bermúdez-Otero (2012)’s GENERALIZED NON-LINEAR AFFIXATION (GNLA)<sup>6</sup>
  - “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<sup>7</sup>

- (9) Superficial exponence rules



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



## 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<sup>8</sup>
  - 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”
  - German [deu] participle *ge-googel-t* ‘(have/be) googled’
- (13) Other examples<sup>9</sup>
  - Discontinuous morphemes (in Athabaskan)
  - Splitting verbs (in West Africa)
  - Infix-inducing verbs (in Lakhota [dak])
  - Synaffixes (i.e. combinations of affixes)
  - Auxiliary grammatical tone
- (14) **mu-dzí⊕-tembenuz-a** → **mu-dzí-tembenuz-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 exponence rule or separate exponence rules?<sup>10</sup>
  - Separate rules: [F] ↔ /æ/ & [F] ↔ /β/
  - One rule: [F] ↔ /æ...β/

(16) One vs. separate rules for Chichewa **dzi**Ⓜ (analytic possibilities)

a. i.	Processual exponence	[NEC]	↔ <b>dzi</b>	(+ [GT] via constraints)
ii.	Bipartite exponence	[NEC]	↔ <b>dzi</b> Ⓜ	
b. i.	Parallel exponence	[NEC]	↔ <b>dzi</b>	& [NEC] ↔ Ⓜ
ii.	Overlapping exponence	[NEC]	↔ <b>dzi</b>	& [NEC, F] ↔ Ⓜ
		/ [NEC, F]	↔ <b>dzi</b>	& [NEC] ↔ Ⓜ
		/ [NEC, F]	↔ <b>dzi</b>	& [NEC, G] ↔ Ⓜ
iii.	Separate exponence	[NEC]	↔ <b>dzi</b>	& [F] ↔ Ⓜ
		/ [F]	↔ <b>dzi</b>	& [NEC] ↔ Ⓜ
		/ [F]	↔ <b>dzi</b>	& [G] ↔ Ⓜ

(17) Predictions of separate rules

- Appearance: The conditions governing the (non-)appearance of one co-exponent (α) never affect that of the other co-exponent (β)
- Allomorphy: Suppletive allomorphy that is triggered by or targets one of the co-exponents (α) does not necessarily reference or affect the other (β)
- Derivedness: When the co-exponents (α and β) 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 (α and β) are evaluated separately

(18) 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.

(20) German participle marking *ge-...-t*, e.g. used in past (perfect), passives

- *googeln* → *ge-google-t* [gə-gugəl-t] '(have/be) googled'

(21) Quirk 1: Irregular suffixal allomorphy

- *geben* → *ge-geb-en* [gə-geb-ən] '(have/be) given'

(22) Quirk 2: Prefix *ge-* can only appear before stress

- *antworten* → *ge-antwort-et* [gə-ʔantvɔxt-ət] '(have/be) answered'
- *probieren* → *probier-t* [pʁo'biɪ-t] '(have/be) tried/tasted'
- Cf. \**ge-probier-t* \* [gə-pʁo'biɪ-t] ~ \* [gə-'pʁobɪɪ-t]

(23) Shape of suffix *never* determines whether prefix appears

- *sprech-en* → *ge-sproch-en* [gə-'ʃpɔx-ən] '(have/be) spoken'
- No verb with irregular form akin to \**sproch-en* which prohibits *ge-*

(24) Presence or absence of prefix *never* determines shape of suffix

- *ver-sprech-en* → *ver-sproch-en* [fɛɐ-'ʃpɔx-ən] '(have/be) promised'
- No verb which reverts to default in absence of *ge-*, e.g. \**ver-sprech-t*

(25) Type 2: CONJOINT CIRCUMFIXATION – Does not comply

- The components act as a single unit co-dependent upon each other with respect to morphological distribution, patterns, forms, etc.

(26) German *Ge-...-e* deverbal nominalization for repeated action (pejorative)<sup>11</sup>

- *brüll-* 'roar, shout' → *Ge-brüll-e* [gə-bryl-ə] 'shouting'
- *Hört doch endlich mit eurem sinnlosen Gebrülle auf!*
- 'Stop with your pointless **shouting!**'

(27) Ineffability: Without initial stress, forms are ungrammatical/questionable/odd

- *telefonier-* [teləfo'niɪ-] 'telephone (v.)' → ?*Ge-telefonier-e* ~ \**Telefonier-e*

(28) Cross-linguistically:

- Evidence for disjoint circumfixation is robust ← Separate exponence rules
- Evidence for conjoint type is much harder to find ← One exponence rule

**3 ASSESSING GRAMMATICAL TONE**

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

3.1 Data point 1: Appearance

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

(31) TONAL CIRCUMFIXES in Liko [lik]<sup>12</sup>

- Adjectives are derived from verbs by circumfix Ⓛ ... Ⓜ around verb stem
- H-toned verb root: **ʒúng-** 'lose'  
 mò-ʒúkò    mú-Ⓛ-ʒúng-à-Ⓜ    →    mòʒúkò mú'ʒúngǒ  
 3-quiver    3-DER-lose-FV-DER  
 'a lost quiver'
- L-toned verb root: **ʒàk-** 'carve'  
 dàgǎ-tò    tí-Ⓛ-ʒàk-à-Ⓜ    →    dàgǎtò tíʒàkǎ  
 13.arrow-13    13-DER-carve-FV-DER  
 'carved arrows'

(32) However, while non-derived adjectives do not occur with  $\text{L-}$ , all do end in H

- **-kúdíú** ‘short’      **-dĩngĩ** ‘big’      \*HL      \*LL
- **-kédě** ‘small’      **-lilā** ‘too well-done’
- **-kóngú** ‘tall, high’      **-ndā** ‘long’
- **-kúkúkú** ‘short’ (PL)      **-tĩ** ‘heavy’
- **-kékéké** ‘small’ (PL)      **-fĩsĩ** ‘raw, new’

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

Exponence rule 1 (derived Adj) [ADJ, (F)] ↔ $\text{L-}$	Exponence rule 2 (derived & non-derived Adj) [ADJ] ↔ $-\text{H}$
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### 3.2 Data point 2: Suppletive allomorphy

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

(35) Cilungu [mgr] grammatical tone<sup>13</sup>

(36) Our baseline: No allomorphy

- Far Past Tense: A prefix **a-** plus a (non-local) GT  $\text{H}^{2-F}$
- **yá-a-sukilil-a**       $\text{H}^{2-F}$        $\text{T}$       →      **yá-a-sukílíl-á**      [yáásúkílílá]  
3P-T-accompany-FV      ‘they have already accompanied’
- **tú-a-sópolol-a**       $\text{H}^{2-F}$        $\text{T}$       →      **tú-a-sópólól-á**      [twáásópólólá]  
1P-T-untie-FV      ‘they have already untied’
- **u-a-yá-sukilil-il-e**       $\text{H}^{2-F}$        $\text{T}$       →      **u-a-yá-sukíl-ííl-é**      [wááyású!kílílé]  
3S-T-3P-accompany-ASP-FV      ‘he/she accompanied them’

(37) Our focus: Handful of inflectional contexts showing GT allomorphy<sup>14</sup>

- Recent Past Tense: A prefix **á-** plus a (non-local) GT  $\text{H}^F \sim \emptyset$
- Whether word-final GT surfaces depends on word-initial tone (boxed)<sup>15</sup>
- **yá-á-sópolol-a**       $\text{H}^F$        $\text{T}$       →      **yá-á-sópolol-á**      [yáásópólólá]  
3P-T-untie-FV      ‘they have just untied’
- **u-á-sópolol-a**       $\emptyset$       →      **u-á-sópolol-a**      [wáásópólólà]  
3S-T-untie-FV      ‘he/she has just untied’

(38) Cilungu generalization:  $\text{H}^F$  appears only when initial subject marker (SM) is high

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

$$[\text{T} : \text{RECENT}] \leftrightarrow \{ \mathbf{\acute{a}-} \} \quad \& \quad [\text{T} : \text{RECENT}] \leftrightarrow \left\{ \begin{array}{l} \text{H}^F / [\text{H} \_ ] \\ \emptyset \text{ (elsewhere)} \end{array} \right\}$$

$$[\text{ASP} : \text{PERFECT}] \leftrightarrow \{ \mathbf{-il} \} \quad \& \quad [\text{ASP} : \text{PERFECT}] \leftrightarrow \left\{ \begin{array}{l} \text{H}^{2-F} / [\text{H} \_ ] \\ \text{H}^2 \text{ (elsewhere)} \end{array} \right\}$$

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

- Tonal allomorphy has a long-distance effect on segmental prefix: absence of  $\text{H}^F$  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 ( $\alpha$  and  $\beta$ ) are incidentally local, they act as a derived environment with respect to morpho-phonological processes

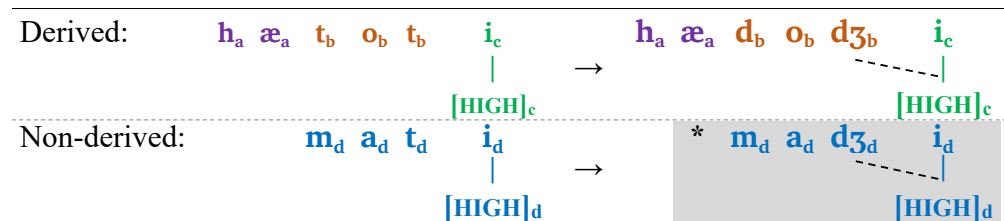
(42) Argument involves DERIVED ENVIRONMENT EFFECTS (DEEs): Phonological processes that apply across but not within ‘morphemes’

(43) Korean palatalization<sup>16</sup>

- Non-derived: /**mati**/ ‘knot’ → [**madi**]      \***[madzi]**
- Derived: /**hæ-tot-i**/ ‘sun-rise-NOM’ → [**hæ-dodz-i**]      \***[hæ-dod-i]**

(44) DEEs can be formalized with a constraint ALTERNATION within the framework of Morphological Color Theory<sup>17</sup>

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



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

- Tone docks to vowel adjacent to accompanying segments

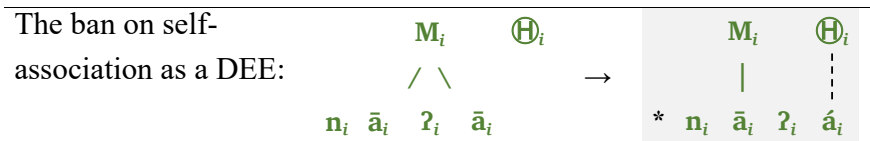
(46) Southeastern Nochixtlán Mixtec [mxy]<sup>18</sup>

- **βē²ē**      **jājà<sup>n</sup>**      →      [**βē²ē jājà<sup>n</sup>**]  
house      coyote      ‘the coyote’s house’
- **nā²ā<sup>H</sup>**      **jājà<sup>n</sup>**      →      [**nā²ā jājà<sup>n</sup>**]  
hand      coyote      ‘the coyote’s front paw’

(47) What happens in isolation? → Complete neutralization

- $\beta\bar{e}^2\bar{e}$  →  $[\beta\bar{e}^2\bar{e}]$  ‘house’
- $n\bar{a}^2\bar{a}(\textcircled{H})$  →  $[n\bar{a}^2\bar{a}]$  ‘hand’ \* $[n\bar{a}^2\acute{a}]$  ~ \* $[n\bar{a}^2\bar{a}]$

(48) This floating tone cannot SELF-ASSOCIATE (typologically, very common ban)<sup>19</sup>



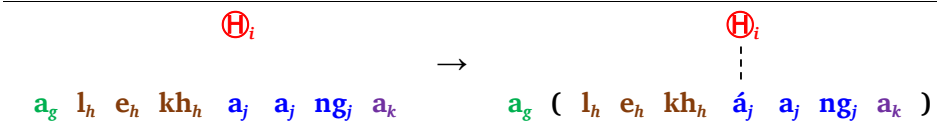
(49) Compare a bipartite morpheme with grammatical tone in Idakho  $[ida]$ <sup>20</sup>

- The IMPERFECTIVE is expressed via a suffix **-aang** and a floating tone  $\textcircled{H}^2$ , which docks to 2<sup>nd</sup> mora of stem
- **a-(ree $\beta$ - $\textcircled{H}^2$ -aang-a)** → **a-(re $\acute{e}\beta$ -aang-a)**  $[\text{àrè}\acute{e}\beta\text{áàngà}]$   
3S-ask-ASP-ASP-FV ‘s/he asks’
- **a-(kalushits- $\textcircled{H}^2$ -aang-a)** → **a-(kalúshits-aang-a)**  $[\text{àkàlúshits\grave{a}àngà}]$   
3S-return-ASP-ASP-FV ‘s/he returns’
- **a-(sebulukhanyiny- $\textcircled{H}^2$ -aang-a)** → **a-(sebúlukhanyiny-aang-a)**  $[\text{àsèbùlúk\grave{h}ànyiny\grave{a}àngà}]$   
3S-scatter-ASP-ASP-FV ‘s/he is scattering’

(50) When **-aang** itself is incidentally in 2<sup>nd</sup> mora position,  $\textcircled{H}^2$  can associate to it

- **a-(lekh- $\textcircled{H}^2$ -aang-a)** → **a-(lekh- $\acute{a}$ aang-a)**  $[\text{àlèkh\acute{a}àngà}]$   
3S-leave-ASP-ASP-FV ‘s/he leaves’

(51) If the two constitute separate exponents (w/ distinct morphological ‘colors’), correctly predicts not subject to self-association bans – Cf. (47)



(52) 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 1<sup>st</sup> rather than the 2<sup>nd</sup>)

**4 A RESTRICTIVE THEORY OF EXPONENT SHAPE**

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

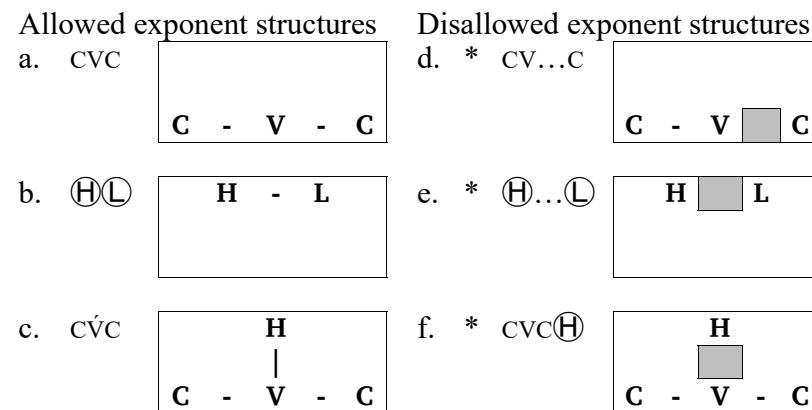
(54) Two distinct behavioral profiles for floating tones

- Idakho type: **a-(kalushits- $\textcircled{H}$ aang-a)** → **a-(kalúshits-aang-a)**
- S.N. Mixtec type: **nā<sup>2</sup>ā $\textcircled{H}$  jājà<sup>n</sup>** → **nā<sup>2</sup>ā jājà<sup>n</sup>**

Idakho type (Bipartite morpheme)	S. N. Mixtec type
a. Non-local Tonal co-exponent $\textcircled{H}$ can appear non-local to segmental co-exponent <b>V</b>	Local Tonal co-exponent $\textcircled{H}$ must appear on a position adjacent to segmental co-exponent <b>V</b>
b. No derived environment affect No prohibition on “self-association” (i.e. $\textcircled{H}$ - <b>V</b> okay)	Derived environment affect Bans on self-association possible (i.e. * $\textcircled{H}$ - <b>V</b> )
c. Insertion independence (Non-)Appearance of one should not involve the other	Insertion co-dependence (Non-)Appearance should always involve both <b>V</b> and $\textcircled{H}$ ( <i>modulo</i> above)
d. Form independence (Suppletive) Allomorphy involving one should not affect the other	Form co-dependence Allomorphy should always affect both <b>V</b> and $\textcircled{H}$
e. Separate exponent rules $[F] \leftrightarrow V_i$ $[F] \leftrightarrow \textcircled{H}_j$	One exponent rule $[F] \leftrightarrow V_i \textcircled{H}_i$

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

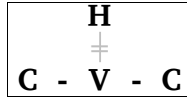
(56) Restriction on exponence: NO UNDERLYING GAPS HYPOTHESIS



(57) If this principle holds, how then do we account for an exponent rule like “[F] ↔  $V_i \textcircled{H}_i$ ” where the segmental and tonal components have the same morphological identity and appear in a local relationship

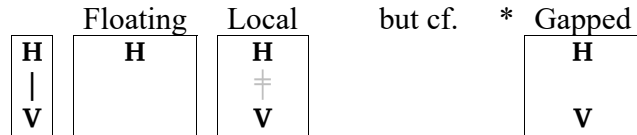
(58) Floating tone which docks locally: Underlying delinked association lines

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



## 5 TAKE-AWAY

(59) Point 1: Exponents involving tone obey 'No Underlying Gaps Hypothesis'



(60) Point 2: Although tonal and segmental inflection expose 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"<sup>21</sup>

## 6 REFERENCES

(61) Posted on my website ([www.nicholasrolle.com](http://www.nicholasrolle.com))

## 7 ENDNOTES

<sup>1</sup> "[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

<sup>2</sup> Especially in Distributed Morphology, e.g. Embick 2015, *inter alia*

<sup>3</sup> Hockett 1947:322, Crysmann & Bonami 2016:314, Haspelmath 2020, *inter alia*

<sup>4</sup> For extensive references on grammatical tone, see Lionnet, McPherson, & Rolle 2023 (introduction to special issue of *Phonology*)

<sup>5</sup> Downing & Mtenje 2017:145,162,184; The second example (near future) was created based on other examples to create a minimal pair

<sup>6</sup> 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

<sup>7</sup> Hyman 2011; "[T]onal morphology... exhibits essentially the same range of morphological properties as in all of segmental morphology" – Hyman & Leben 2000:588

<sup>8</sup> Harris 2017:17, citing Kuryłowicz 1966 [1945-1949]; Marušič 2003 on non-compositionality; Quote on circumfixes below is from Harris 2017:19 (my underlining)

<sup>9</sup> Discontinuous morphemes: Navajo [nav] – Spencer 1991:210-211; Witsuwit'en [bcɾ] – Hargus 2017; Splitting verbs (in West Africa): Yoruba [yor] – Awobuluyi 1971, Sebba 1987, Parrish & Feldscher 2019; Edo [bin] – Ogie 2009:167; Guébie [gie] – Sande 2017:37ff.; Infix-inducing verbs: Boas & Deloria 1941, Buechel 1970, Albright 2000; Synaffixes: Bauer 1988, Hall 2000; Circumfixes: Bergenholtz & Mugdan 1979:59, Greenberg 1980, Mel'čuk 1982:84f., Bauer 1988:20f., Anderson 1992:53, Spencer 1991:12-13, Hall 2000, Marušič 2003, Lieber 2017, Zingler 2022

<sup>10</sup> Single rule camp: tacitly in Kurisu 2001:198; overtly in Caballero & Harris 2012: 171, Trommer 2015:100, 2022, Harris 2017:19, Zingler 2022; Separate rule camp: Marušič 2003, Crysmann & Bonami 2016:347, Haspelmath 2020; for German *ge-...-t*: Drijkoningen 1999, Wiese 2000:89, Newell 2008:191

<sup>11</sup> Kurth 1953, Plank 1986, Olsen 1991, Adamzik 2001. This circumfix is very productive, e.g. with recent loanwords *Ge-chatt-e* 'chatting', *Ge-fax-e* 'faxing', *Ge-rav-e* 'raving', *inter alia* – Adamzik 2001:154. The sample example here is from Olsen 1991:353.

<sup>12</sup> Data is from de Wit 2015:162-163,219

<sup>13</sup> Data is from Bickmore 2007, Rolle & Bickmore 2022

<sup>14</sup> 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').

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<sup>15</sup> 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

<sup>16</sup> Korean data: van Oostendorp 2007, citing Iverson 1993, Polgárdi 1998, Rhee 2002; for DEEs generally, see Inkelas 2014, Chong 2019, *inter alia*

<sup>17</sup> van Oostendorp 2007

<sup>18</sup> Data is from McKendry 2013:136-137

<sup>19</sup> 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”.

<sup>20</sup> Idakho data: Ebarb 2014:144,161,322

<sup>21</sup> Palancar 2016:112, underlining mine