

# “Grammatical tone and current linguistic theory”

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## 1 Introduction to our extended issue: Representation vs. grammar

(1) Schematizing grammatical tone (GT)

a. Baseline:  $/T_1 T_2/ \rightarrow [T_1 T_2]$

b. Grammatical tone:  $/T_1 T_2/ + ? \rightarrow [T_1 \mathbb{T}]$

(2) ITEM-BASED VS. PROCESS-BASED analyses of GT [In = input, Gr = grammar, Out = output]<sup>1</sup>

a.	Item-based	b.	Process-based
In:	$/ T_1 T_2 /$	$/ T_1 \mathbb{T} T_2 /$	$\leftarrow Origin$
Gr:	$T_1 T_2$	$T_1 \mathbb{T}$	$\leftarrow Origin$
Out:	$[ T_1 T_2 ]$	$[ T_1 \mathbb{T} ]$	

(3) Range of theories for grammatical tone

a.	Item-based theories: Different representation	
	“Standard” floating tones	(Goldsmith 1990; Yip 2002; <i>inter alia</i> )
	Circumfixal tones (plus colored containment)	(Trommer 2011, 2023)
	[+DELETE] diacritics (‘minor rule approach’)	(Poser 1984; Melvold 1986; Blevins 1993)
	Grammatical tones as ontologically distinct	(Kimenyi 1978)
	Gradient tone strength (on a [0.0] to [1.0] scale)	(Zimmermann 2017; Kushnir 2018)
	Phantom/virtual structure	(Rolle & Lionnet 2020)
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 & Bodo 2023)
	Prosodic domain localization	(Rolle & Kari 2022)
	Morphological class faithfulness (Indexed constraints)	(Revithiadou 1999)
	Lexical MaxEnt (with regularization and scaling)	(Gouskova & Linzen 2015)
c.	Hybrid theories:	
	Cophonologies by Phase	(Sande, Jenks, & Inkelas 2020; Sande 2023)
	Matrix-Base map 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)<sup>2</sup>

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*)<sup>3</sup>

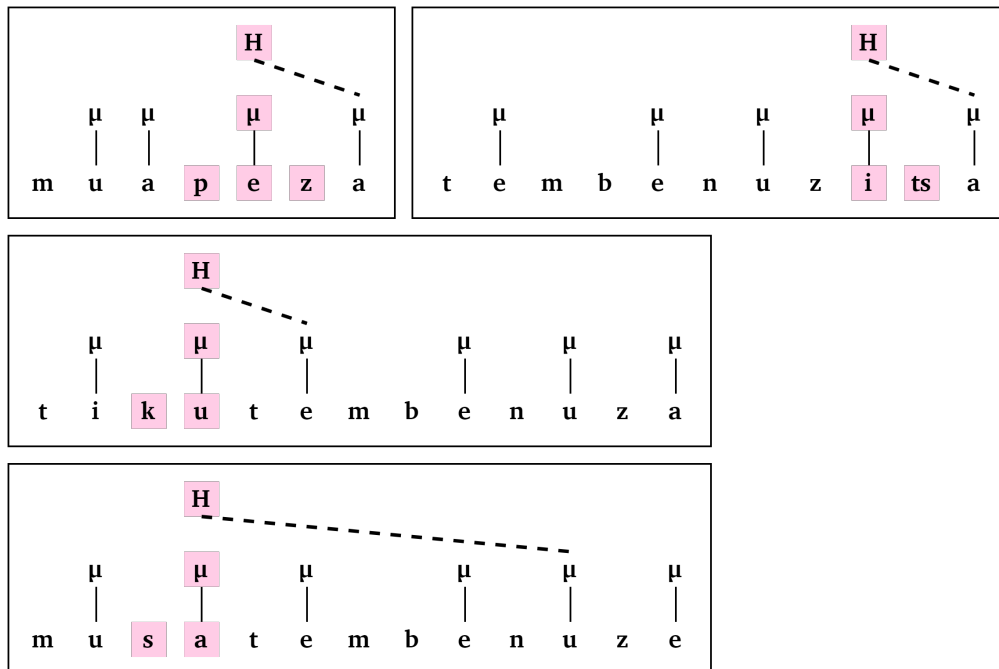
stem, class, property  $\rightarrow f(\text{STEM}) \leftarrow \text{function on stem}$

X V {1PL}  $\rightarrow \mathbf{X}\tilde{5} \leftarrow \text{French 1.plural formation}$

c. In no way is there an input with some exponent  $\tilde{5}$

## 2 Locality and grammatical tone

- (6) Let us examine some basic patterns with FLOATING TONES (circled,  $\textcircled{H}$  - Yip 2002)
- (7) Igbo [ibo] – Associated locally due to tonal density in noun of noun constructions<sup>4</sup>
- Central Igbo: àgbà  $\textcircled{H}$  èṅwè → [àgbá  $\textcircled{H}$  èṅwè] ‘jaw of monkey’
  - Aboh Igbo: ègbà  $\textcircled{H}$  èṅwè → [ègbà  $\textcircled{H}$  èṅwè] ‘jaw of monkey’
- (8) In this case, the floating  $\textcircled{H}$  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?
- Contrastive floating tone patterns in Chichewa (introduced yesterday)<sup>5</sup>
  - mu-a-pe $\textcircled{H}$ z-a** → **mu-a-pe-á** [mw-à-pèéz-á]  
2P-PERF-find-FV ‘you have found’
  - tembenuz-its $\textcircled{H}$ -a** → **tembenuz-its-á** [tèmbènùz-iíts-á]  
turn.over-INTS-FV ‘turn around a lot!’
  - ti-ku $\textcircled{H}$ -tembenuz-a** → **ti-ku-tém $\textcircled{H}$ benuz-a** [tì-kù-témbénùz-à]  
1P-PROG-turn.over-FV ‘we are turning over’
  - mu-sa $\textcircled{H}$ -tembenuz-e** → **mu-sa-tembenú $\textcircled{H}$ z-e** [mù-sà-tèmbènùz-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<sup>6</sup>

- 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<sup>7</sup>

- a. Evidence from penultimate lengthening
- b. (CV.CV.CV.CV.CV) → (CV.CV.CV.CVV.CV)

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

- a. **káléká ngu- $\textcircled{L}$ -takatukil-e** → ... **ngu-takatukìl-e**  
if HYP.1S-HYP-stand.up-SBJV ‘if I stood up’
- b. **ni-ka $\textcircled{H}$ -takatukil-a** → **ni-ka-takatukíil-a**  
1S-CONS-stand.up-FV ‘and/if I stood up’
- c. **ni-nda $\textcircled{L}$  $\textcircled{H}$ -takatukil-a** → **ni-nda-takatukíil-a**  
1S-FUT-stand.up-FV ‘I will stand up’
- d. **ní-ndi $\textcircled{L}$  $\textcircled{H}$  $\textcircled{L}$ -takatukil-a** → **ní-ndí-takatukíil-a**  
1S-RPST-stand.up-FV ‘I stood up’

(16) Norwegian [nor] – Marked L tone<sup>8</sup>

Type	Underlying	H*L pitch accent	Boundary tone
a. Accent 1: <i>aksel</i> ‘shoulder’	<b>L</b>   à k s ε l	<b>L</b>   à k s ε l	<b>L H%</b>         à k s é l
b. Accent 2: <i>aksel</i> ‘axle’	<b>L</b>   a k s ε l	<b>H* L</b>         á k s è l	<b>H L H%</b>         á k s ě l

(17) Indefinite superlative floating  $\textcircled{L}$  associates to the stressed syllable (non-local)

- a. **flott- $\textcircled{L}$ st** → **flòtt-est** ‘most splendid’
- b. **so<sup>l</sup>id- $\textcircled{L}$ st** → **so<sup>l</sup>id-est** ‘most solid’
- c. **fylde-ig- $\textcircled{L}$ st** → **fýldig-st** ‘plumpest’
- hedr-lig- $\textcircled{L}$ st** → **hèderlig-st** ‘most honest’
- mor-som- $\textcircled{L}$ st** → **mòrsom-st** ‘funniest’

(18) Default association: Derivable by standard tone constraints

- a. TONE-TO-STRESS (Tones prefer to be on a stressed TBU)
- b. ALIGN-L: Each T should align with the left edge of the domain<sup>9</sup>

## 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  $\text{\textcircled{H}}$ , which docks to immediately preceding vowel<sup>10</sup>

- a. **?a-wiht- $\text{\textcircled{H}}$ nt-hayas-?nih-ah** → **?a- $\text{\textcircled{H}}$ i-n-t-a's-?nih-ah**  
DEFOCUS.AGT/IRR-DU-APPL-money-make-PERF      ‘did they pay them two?’
- b. **kak#?u-kaki- $\text{\textcircled{H}}$ nt-n-?ah** → **kah#?u-kaki- $\text{\textcircled{H}}$ n-?nah**  
SUB#DEFOC.DAT-VAR-APPL-song-be      ‘someone’s various songs’
- c. **?icuda-wa-hak- $\text{\textcircled{H}}$ i?n-ah** → **?isda-wa- $\text{\textcircled{H}}$ háh-?n-ah**  
in.a.pile-PL-stand-CAUS-PERF      ‘they piled it’
- d. **ci-kan-ba = sisih- $\text{\textcircled{H}}$ i?n-čah** → **ci-kam-ba = sisih- $\text{\textcircled{H}}$ ?n-i-čah**  
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)<sup>11</sup>

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

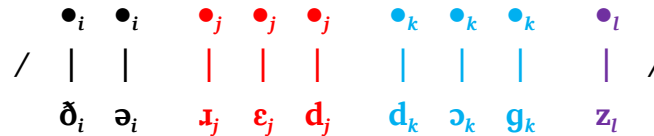
	T /   / ú μ μ μ	(Markedness)	LOCAL	(Faithfulness)	...
a.	T' [   ] ú μ μ μ	*			
b.	T' [   \ ] ú ú μ μ	*			
c.	T' [ \ ] μ ú μ μ			*	
d.	T' [ \ ] μ μ ú μ		*	*	

(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<sup>12</sup>
- 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:



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

(27) Option 1 representations:

Local association		Default association	
	<b>H<sub>a</sub></b>		<b>H<sub>b</sub></b>
	• <sub>a</sub>		• <sub>b</sub>
	<b>μ<sub>a</sub></b>		<b>μ<sub>a</sub></b>
	• <sub>a</sub>		• <sub>a</sub>
<b>k<sub>a</sub></b>	<b>u<sub>a</sub></b>	<b>s<sub>a</sub></b>	<b>a<sub>a</sub></b>

(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

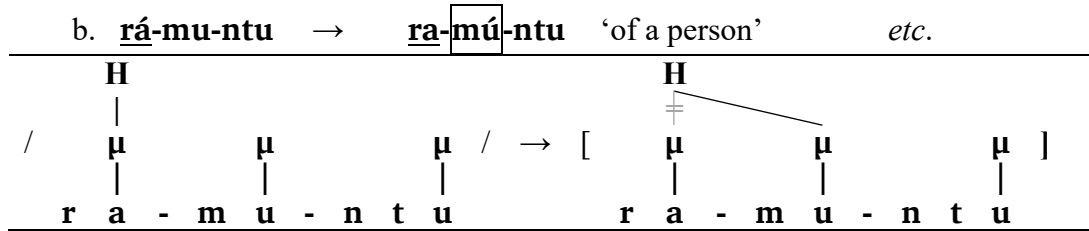
- a. Pre-association: Underlying *linked* line
- b. Local association: Underlying *delinked* line (ontologically distinct from no line)

(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”<sup>13</sup>
- b. “Underparsing Phonetically Realized as Deletion: An input segment unassociated to a syllable position (‘underparsing’) is not phonetically realized.”<sup>14</sup>

(32) How can this be represented? Consider Rimi [rim] tone shift<sup>15</sup>

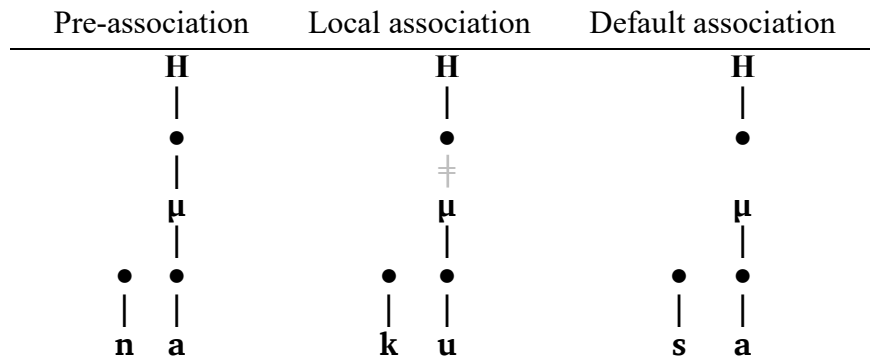
a. “A high tone in Rimi is regularly shifted one syllable to the right of its underlying position”



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

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

(35) Option 2 representations:



(36) Tableau

	<b>T</b> / † / μ μ μ μ	(Markedness)	NOGAP	...
a.	<b>T'</b> [ †                    ] μ μ μ μ	*		
b.	<b>T'</b> [ † - - -           ] μ μ μ μ			
c.	<b>T'</b> [ † - - -           ] μ μ μ μ		*	

### 5 Floating tone type 3: Anchored association

- (37) PROSODICALLY-ANCHORED ASSOCIATION (or simply ANCHORED ASSOCIATION)
- 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)
  - 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<sup>16</sup>

- Hortatory imperative  
 $\emptyset$                     **to-tá- $\{\text{turuu}\eta\text{ana}\}$  $\Sigma$**                     ‘let us welcome’
- Habitual past (FOC)  
 H-to- $\mu_1$             **n-to-ogá- $\{\text{turuu}\eta\text{aini}\}$  $\Sigma$**                     ‘we used to welcome (then)’
- Hodiernal past progressive (FOC)  
 H-to- $\mu_2$             **n-to-oga- $\{\text{turuu}\eta\text{aini}\}$  $\Sigma$**                     ‘(indeed) we have been w. (today)’
- Remote future (FOC)  
 H-to- $\mu_3$             **n-to-re- $\{\text{turuu}\eta\text{ana}\}$  $\Sigma$**                     ‘we will welcome (then)’
- Hortatory imperative inceptive  
 H-to- $\mu_4$             **to-ra- $\{\text{turuu}\eta\text{ana}\}$  $\Sigma$**                     ‘we are about to welcome’
- Narrative past  
 H-to- $\mu_{1+4}$         **to-gá- $\{\text{turuu}\eta\text{ana}\}$  $\Sigma$**                     ‘(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’<sup>17</sup>

(40) A process based version with an overt counting constraint ‘ $\mu_4$ ’

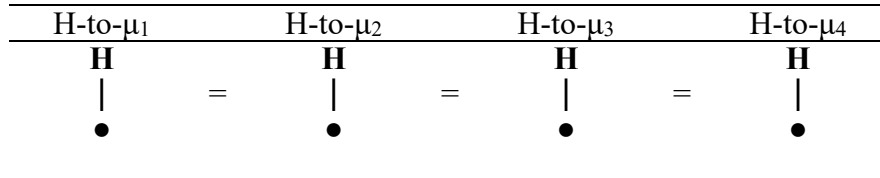
- “ $\mu_4$ : Assign one violation for each floating tone that does not surface four moras from its input location.”<sup>18</sup>

/to-ra <sup>H</sup> -[ $\omega$ roma] [ $\omega$ eyetóóke]/	$\mu_4$	H, R	ID-T			
	9	9	1	<b>H</b>	<b>Obs</b>	<b>Pred</b>
a. [[ $\omega$ toraroma] [ $\omega$ eyetóóke]]	1			9	0	0
b.  [[ $\omega$ toraroma] [ $\omega$ eyetóóke]]			1	1	1	1

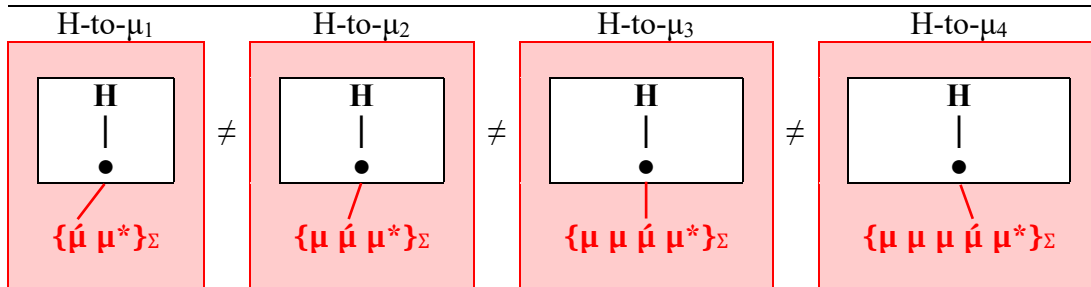
- (41) Representational alternatives the H-to- $\mu_4$  pattern in the Hortatory imperative inceptive
- Construction-specific prosodic alignment (Marlo *et al.* 2015 for dismissal)
  - Floating sequence  $\textcircled{L}\textcircled{L}\textcircled{L}\textcircled{H}$  (Trommer *forthcoming*)
  - Phantom structure (Rolle & Lionnet 2020)

- (42) Phantom structure (or “virtual structure” – Trommer’s term)
- 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

(43) Substantive plane



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



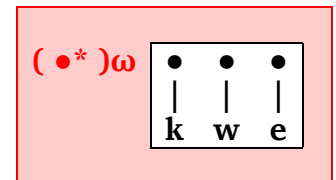
(45) This is akin to more familiar theories of SUBCATEGORIZATION<sup>19</sup>

- “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<sup>20</sup>

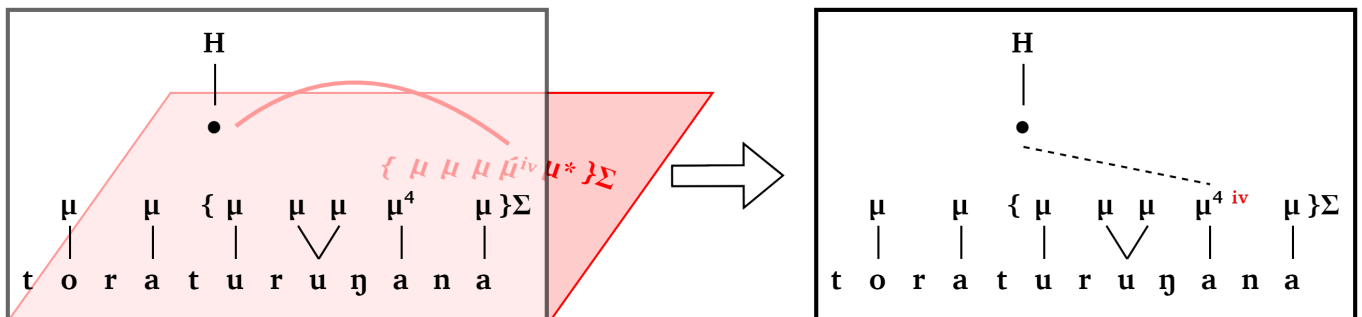
- E.g. Latin =*que* ‘and’ must be right-adjacent to following phonological word ( $\omega$ )

*diu* =*que* *noctu* → *diu noctu=que*  
 day and night ‘by day and by night’



(46) Hortatory imperative inceptive

- H-to- $\mu_4$  **to-ra-turuuáana** $\Sigma$  ‘we are about to welcome’



- High-ranking Phantom-Output faithfulness for tone association of phantom  $\mu$ ’s

(47) Not literal counting: ‘Counting’ as pre-specification

- Same mechanism – FAITHFULNESS – that preserves tone in **itʃiimbáyo** ‘hedges’

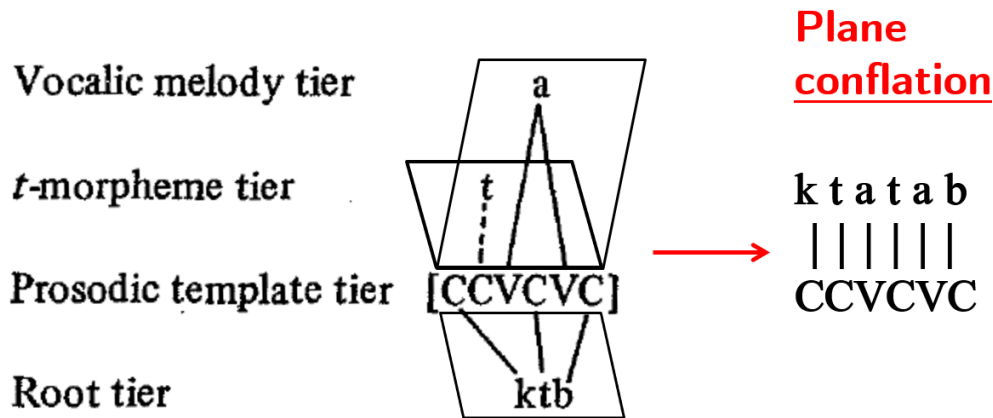


(48) Part of a long OT history using multiple faithfulness relations in competition<sup>21</sup>

- 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)

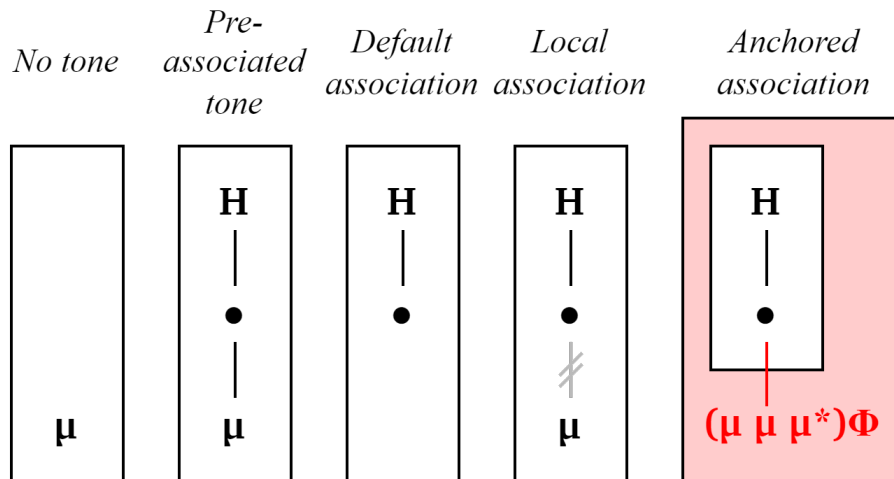
(49) Three-dimensional phonology (3DΦ)<sup>22</sup>

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



## 6 Summary

(50) Five representations for five different patterns



## 7 References

See my website ([www.nicholasrolle.com](http://www.nicholasrolle.com))

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- <sup>1</sup> Item and process framing from Hockett 1954, and many since (e.g. see Sande 2023 for recent state-of-the-art)
- <sup>2</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>3</sup> Stump 2016:48-50, citing Zwicky 1985, Anderson 1992, Stump 2001, *inter alia*
- <sup>4</sup> Hyman & Schuh 1974:98,105
- <sup>5</sup> Downing & Mtenje 2017
- <sup>6</sup> Could also be called ‘prominence-based association’, or “phonological association” – Rolle & Lionnet 2020; Intonation: Gussenhoven 2004:23, *inter alia*; Data from Mwita 2008:305-336
- <sup>7</sup> Manus 2014:267-268
- <sup>8</sup> Wetterlin 2010:21-22,75
- <sup>9</sup> Yip 2002:83ff.
- <sup>10</sup> Melnar 2004:20,138,142,208
- <sup>11</sup> Myers 1997:876
- <sup>12</sup> van Oostendorp 2006, 2007, Revithiadou 2007, Trommer 2015, 2022, Zimmermann 2017, Paschen 2018, Zaleska 2018; Quote 1: Trommer *forthcoming*; Quote 2: van Oostendorp 2007:3
- <sup>13</sup> Quote: Trommer 2022
- <sup>14</sup> Prince and Smolensky 1993:97
- <sup>15</sup> Data and quote from Myers 1997:875ff. (citing Olson 1964, Schadeberg 1978, 1979, Goldsmith 1984)
- <sup>16</sup> Odden 1987, Cammenga 1994, 2004, Mwita 2008, Marlo, Mwita, & Paster 2014, 2015, Rolle & Lionnet 2020, Sande, Jenks, & Inkelas 2020, Trommer *forthcoming*
- <sup>17</sup> On counting effects: McCarthy & Prince 1986, Kenstowicz 1994:372, Smith & Tsimpli 1995:312, Hayes 1995:307, Isac & Reiss 2008:65, Graf 2017, Paster 2019, Kawahara & Kumagai 2023 (see these last two works for extensive references)
- <sup>18</sup> Sande, Jenks, & Inkelas 2020:1237
- <sup>19</sup> Quote: Rolle & Lionnet 2020
- <sup>20</sup> Subcategorization & clitics sample: Inkelas 1990, Zec 2005, Paster 2006, 2009, Yu 2003, 2007, Bennett et al. 2018, Rolle & Hyman 2019, Tyler 2019, Rolle & O’Hagan 2019, *inter alia*
- <sup>21</sup> 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-Base-map Correspondence (Rolle 2018); Output-Variant Correspondence (Kawahara 2002); Template-Text Correspondence (Blumenfeld 2015)
- <sup>22</sup> 3Dφ: Halle & Vergnaud 1980, 1987, Rubach 1986, 1993; Tier conflation: McCarthy 1981, 2018, Archangeli 1984, 1985, Steriade 1986, Cole 2018 [1991]; Also, see ‘Single Melody Theory’ of reduplication: Mester 1988:171ff.; Raimy 2000, Raimy & Cairns 2009