H-tone is not always H-tone

A register tone account of Macuiltianguis Zapotec

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Main Claim

- the assumption of **(sub-)tonal features** predicts that the same surface tones may have different (underspecified) phonological representations
- the **asymmetric behaviour of H-tones** in Macuiltianguis Zapotec follows under such an account:
  - more complex [+Upper,+raised] can only associate locally and to a single TBU
  - underspecified [+raised] can associate non-locally and changes the tone of all TBU's associated to one [±Upper]

Theoretical background: tonal features

(1) *Tonal features (Yip, 1989; Snider, 1990; Hyman, 1992)*

Extra high	**High**	**Mid**	**Low**
+r | +U	-r | +U	+r | -U	-r | -U

- register [±Upper] divides pitch range of voice in half; [±raised] subdivides register (Yip, 1980; Pulleyblank, 1986)
- arguments:
  - restrictions for contour tones (e.g. only contours in one ±U register)
  - processes between non-contiguous tones possible (e.g. Ewe: (–U,+h) becomes (+U,+h) after (+U,–h); (Odden, 1995))
  - register shift (e.g. upstep in Krachi (Snider, 1990))
  - **same surface tones may have different underlying representation** (e.g. Snider, 1998; Picanço, 2005)

Structure of the talk

Different H-tones in Macuiltianguis Zapotec

Macuiltianguis Zapotec (=MZ)

- an Otomanguean language spoken in Oaxaca, Mexico
- data based on Broadwell and Zhang (1999); Broadwell (2000); Foreman (2006), and especially Broadwell et al. (2011)

(2) *State of Oaxaca (Wikimedia, 07/01/16)*

Tone in Macuiltianguis Zapotec (=MZ)

- three level tones high (=H, á), mid (=M, a), and low (=L, à), and a downstepped H (=ꜜá)
- tone sequences HL and LH on long vowels; **TBU=μ**

(3) *Tone in MZ (Foreman, 2006, 40)*

íj꞉á	'rock'	ij꞉a	'rain'
bél꞉á	'fish'	bèl꞉à	'snake'
be꞉lia	'cave'	bê꞉lia	'star'
dă꞉	'bean'	dâ꞉	'lard'

Morphological H-association I: Potential prefix

- the prefix /gú–/ POTENTIAL causes an **additional H** on the following TBU (4)
- taken to be **morpheme-specific**

(4) *Potential (Broadwell et al., 2011, 4+8)*

	UNDERLYING	SURFACE
a.	gú-di-bìθːà-nà-nà	gú-dí-bìθːà-nà-nà
	POT-CAUS-wet-3SGS-3SGO	'S/he will wet it'
b.	gú-sìːgáʔ-nà-nà	gú-sîːgáʔ-nà-nà
	POT- push-3SGS-3SGO	'S/he will push it'
c.	gú-tùːbí-já-nà	gú-tûːbí-já-nà
	POT-roll-1SGS-3SGO	'I will roll it'
d.	gú-làpːá-nà-nà	gú-lápːˀá-ná-nà
	POT-clean.up-3SGS-3SGO	'S/he will clean it up'

Morphological H-association II: 1.Sg formation

- an additional H is realized on the verb base:
  - on a **vowel followed by** /ʔ/,
    be-tsìːga**a**ʔ-jà-nà be-tsìːgá**a**ʔ-jà-nà
    Com-get.dirty-1SgS-3SgO 'I dirtied it'
  - on the **leftmost L-toned** TBU if there is no such vowel,
    be-b**i**̀θːà-jà-nà be-b**i**́θːà-jà-nà
    Com-wet-1SgS-3SgO 'I wetted it'
  - and on the **rightmost M-toned** TBU if there is no L-toned TBU.
    be-ʃatt**a**-jà-nà be-ʃatt**á**-já-nà
    Com-iron-1SgS-3SgO 'I ironed it'

1.Sg formation

(5) *1.Singular (Broadwell et al., 2011, 6+7)*

	Underlying	Surface
a.	be-tsìːgaʔ-jà-nà Com-get.dirty-1SgS-3SgO	be-tsìːgáʔ-jà-nà 'I dirtied it'
	be-ʃuʔní-jà-nà Com-wrinkle-1SgS-3SgO	be-ʃúʔní-já-nà 'I wrinkled it'
b.	be-bìθːà-jà-nà Com-wet-1SgS-3SgO	be-bíθːà-jà-nà 'I wetted it'
	be-di-gàːsi-jà-nà Com-Caus-be.scared-1SgS-3SgO	be-di-gáːsi-ja-nà 'I scared it'
	be-detʃːù-jà-nà Com-fold-1SgS-3SgO	be-detʃːú-já-nà 'I folded it'
	be-tùːbí-jà-nà Com-roll-1SgS-3SgO	be-túːˈbí-já-nà 'I rolled it'
c.	be-ʃatːa-jà-nà Com-iron-1SgS-3SgO	be-ʃatːá-já-nà 'I ironed it'
	be-neːsi-jà-nà Com-submerge-1SgS-3SgO	be-neːsí-já-nà 'I submerged it'

H-association II: 1.Sg formation

(6) *Abstract Summary*

a. *To glottalized V*

LL.Mʔ → LL.**H**ʔ

LL.Hʔ → LL.**H**ʔ

Mʔ.H → **H**ʔ.H

b. *Else to leftmost L*

L.M → **H**.M

M.L → M.**H**

L.L → **H**.L

LL.M → **HH**.M

LL.H → **HH**.$^{!}$H

c. *Else to rightmost M*

M.M → M.**H**

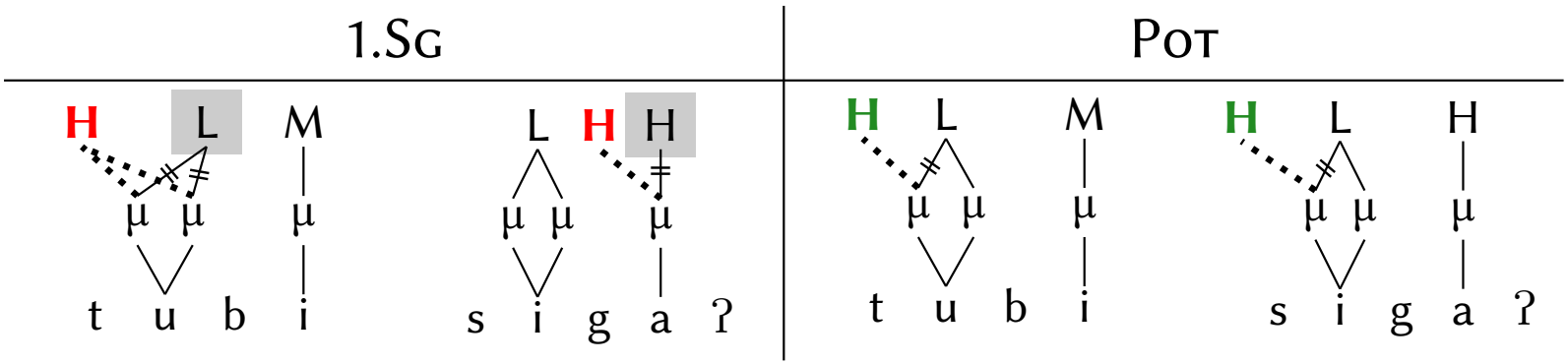
Two different High tones?

(7) *Two different High tones*

Root	1.Sg	Pot (after /gu–/)
tù:bí	tú:!bí	tû:bí
sì:gá?	sì:gá?	sî:gá?

- the Pot-H and 1Sg-H apparently show an asymmetry in the **locality** of their association and their choice of **TBU**

(8) *The riddle*



An OT-analysis for MZ

Assumption: tonal features

- three tones specified with two tone features [±Upper] and [±raised]
- underspecified tones (9-b) interpreted with a default [–raised] value

(9) *Tone in MZ*

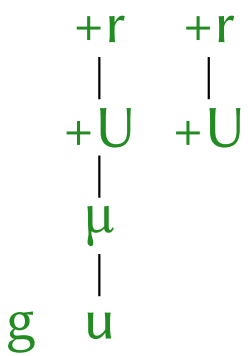
	L	**M**	**H**
a.	-r | -U	-r | +U	+r | +U
b.	-U	+U	

- H and M are a natural class: both spread root-finally to an adjacent TBU (=phonological spreading of [+U])

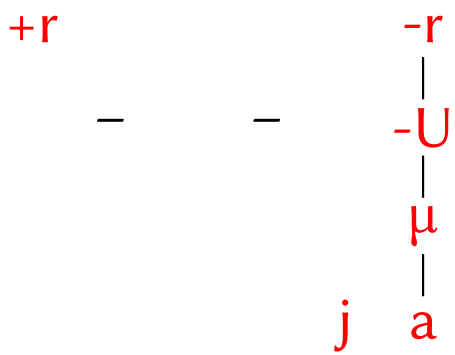
Assumption: Representation of floating High tones

(10) *Two different morphological (floating) H-tones*

Pot ↔



1.Sg ↔



➞ a circumfix; the suffixed segmental portion is not relevant in the following

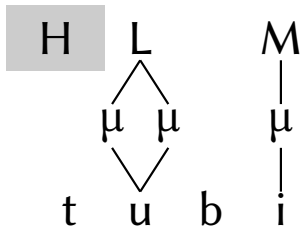
Theoretical background: Coloured Containment-based OT

(van Oostendorp, 2006; Trommer, 2011; Zimmermann, 2014; Trommer and Zimmermann, 2014)

(11) *Containment (Prince and Smolensky, 1993/2004)*
Every element of the phonological input representation is contained in the output.

1. **No deletion**: unrealized elements are not integrated under the highest prosodic node (=Stray Erasure, McCarthy, 1979; Steriade, 1982; Itô, 1988)
   - ➙ for tone: unassociated high has no effect on adjacent tones (in the languages under discussion); unassociated low may cause downstep

(12) *Marking conventions: phonetically unrealized elements*

Phonological structure	Phonetic interpretation
	[tù:bi]

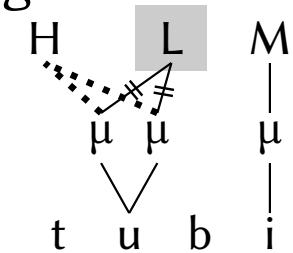
Theoretical background: Coloured Containment-based OT

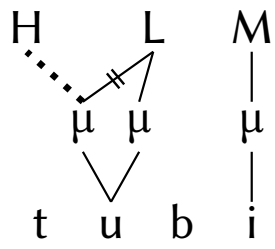
2. **No deletion of association lines**: they can only be marked as 'phonetically invisible' (=not interpreted)

(13) *Marking conventions: different types of association lines*

Morphological association lines		Epenthetic association lines	
phonetically visible:	phonetically invisible:	phonetically visible:	phonetically invisible:
a.	b. 	c.	d. 

(14) *Marking conventions: phonetically unrealized elements II*

a.  [túːbi]

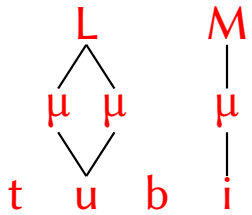
b.  [tûːbi]

➙ Constraints: sensitive to only the phonetically visible or all structure
(='constraint cloning' Trommer, 2011; Trommer and Zimmermann, 2014)

Theoretical background: Coloured Containment-based OT

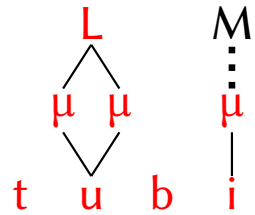
3. All morphemes have a **'colour'** (=affiliation); epenthetic elements are colourless

(15) *Marking conventions: morphological colours*

a. 

[tù:bi]

➙ two underlying tones

b. 

[tù:bi]

➙ insertion of an epenthetic M

Tonal overwriting in containment

- in correspondence-theoretic OT, realization of underlyingly unassociated elements ensured by, for example, *Float (Wolf, 2007)
- in containment-theory, constraints like (16-a) ensure that all elements are integrated into the prosodic structure (via *some* association line)

(16)

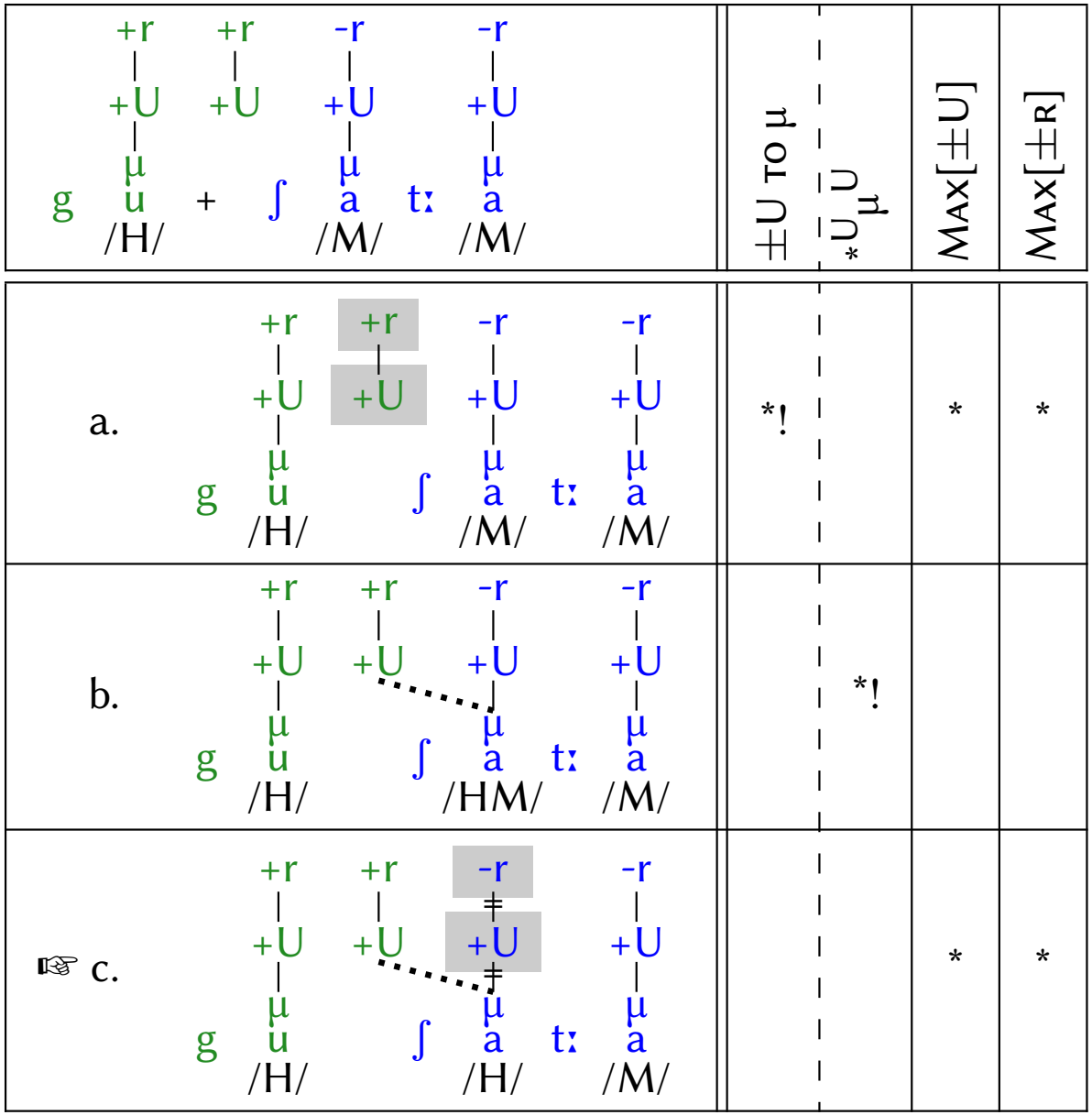
a. ±U to μ
Assign a violation mark for every [±U] that is not associated to a μ.

b. $*^{U}\mu^{U}$
Assign a violation mark for every μ that is phonetically visibly associated to more than one feature [±U].

c. Max[±U]
Assign a violation mark for every phonetically invisible [±U].

Overwriting: Pot-H

(17)



Preferred realization site for a high tone

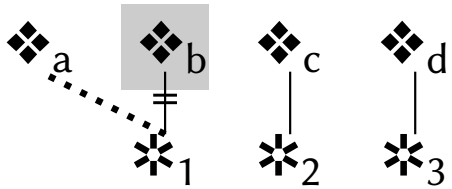
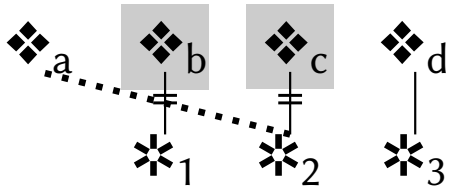
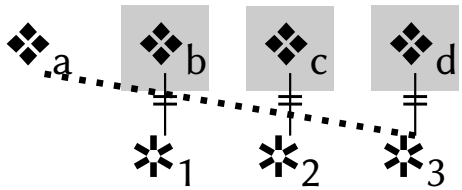
- the 1.Sg-H showed a preference for being realized on a vowel followed by /ʔ/
- a standard case of consonant-tone interaction (Lee, 2008; Tang, 2008)

(18) *–cg/H
Assign a violation mark for every phonetically visible vowel not followed by a [+cg]-sound that is associated to [+r].

Theoretical background: Locality of association under containment

- phonetically visible association lines can not cross (Goldsmith, 1976); but a **phonetically invisible one might be 'crossed'**
- penalized by a markedness constraint *Cross (20-a): ensures preference for **local association**
- the 'crossed' element remains invisible: a violation of Have-❖

(19)

	*Cross	*Have-❖	Max-❖
☞ a. 			*
b. 	*!	*!	**
c. 	*!*	*!*	***

No non-local realization (=line-crossing) for the Pot-H

- the preference for a /VʔV/ landing site for H's has **no effect for the Pot-H** since *Cross[U–μ] is high-ranked

(20) a. *Cross[U–μ]
Assign a violation mark for every instance of crossing association lines linking features [±U] with μ's.
Assign a violation mark for every pair of features $[U]_1$ followed by $[U]_2$ on tier [±Upper] if $[U]_1$ is associated to μ_2 and $[U]_2$ to μ_1 if μ_1 precedes μ_2 on the moraic tier.

Only local realization for the Pot-H

(21)

		±U to μ	*U μ U	*Cross[U–μ]	*–cg/H	Max[±U]	Max[±R]
	+r +r -r +r | | | | +U +U -U +U | | | | μ μ μ | | | g u + l a p: a ʔ /H/ /L/ /H/						
☞ a.	+r +r -r +r | | ≠ | +U +U -U +U | ≠ | μ μ μ | | | g u l a p: a ʔ /H/ /H/ /H/				*	*	*
b.	+r +r -r +r | | ≠ ≠ +U +U -U +U | ≠ | μ μ μ | | | g u l a p: a ʔ /H/ /ø/ /H/			*!		**	**

Non-local realization possible for the 1.Sg-H

- the 1.Sg-H, however, is only a [+r] and since *Cross[r–U] is lower-ranked, the preference for /V?/ is visible on the surface

(22) a. *Cross[r–U]
Assign a violation mark for every instance of crossing association lines linking features [±r] with features [±U].
Assign a violation mark for every pair of features $[r]_1$ followed by $[r]_2$ on tier [±raised] if $[r]_1$ is associated to $[U]_2$ and $[r]_2$ to $[U]_1$ if $[U]_1$ precedes $[U]_2$ on tier [±Upper].

b. ±r to ±U
Assign a violation mark for every [±r] that is not associated to a [±U].

Preference for glottalized V in the 1.SG: second TBU

(23)

	±R to ±U	*Cross[U–μ]	*–CG/H	Max[±R]	*Cross[R–U]
+r -r +r / -U +U / μ μ μ / + s iː g a ʔ / /LL/ /H/					
a. +r -r +r / -U +U / μ μ μ / s iː g a ʔ / /LL/ /H/	*!			*	
b. +r -r +r / -U +U / μ μ μ / s iː g a ʔ / /LL/ /H/			*!	*	
☞ c. +r -r +r / -U +U / μ μ μ / s iː g a ʔ / /LL/ /H/				**	*

Non-local association of the 1.Sg-H II: preference for overwriting an L

- if [+r] overwrites an underlying low tone, a change of the [-U] to [+U] is implied (=*(-U,+r) is an illicit feature combination in MZ)
- this implies a violation of DEP[±U] but allows to avoid a violation of DEPAL(U–μ) (24-b) that only penalizes epenthetic associations between underlying elements
  (=unavoidable if [+r] is realized on a mid tone)

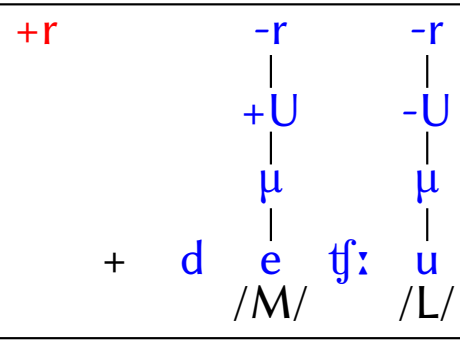
(24)

a. DEP[±U]
   Assign a violation mark for every colourless [±U].

b. DEPAL(U–μ)
   Assign a violation mark for every colourless association line between a morphologically coloured [±U] and a morphologically coloured μ.

Non-local association of the 1.SG-H II: preference for overwriting an L

(25)

		±R to ±U	DEPAL(R–U)	DEP[±U]	MAX[±R]	*CROSS[R–U]
	+r -r -r; +U -U; μ μ; + d e tʃ: u; /M/ /L/					
a.	+r -r -r; +U -U; μ μ; d e tʃ: u; /H/ /L/		*!		*	
☞ b.	+r -r -r; +U +U -U; μ μ; d e tʃ: u; /M/ /H/			*	**	*

Non-local association of the 1.Sg-H III: rightmost M

- that the second M is overwritten in MM bases follows from Align constraint preferring M's in initial position

(26) InitM
Assign a violation mark for every phonetically visible M (+U,–r) that is not associated to the leftmost vowel of the stem.

Preference for initial M's: overwriting of second M

(27)

	±R to ±U	InitM	Max[±R]	*Cross[R–U]
+r -r -r | | | +U +U | | μ μ | | + ʃ a t: a /M/ /M/				
a. +r -r -r | ∓ | +U +U | | μ μ | | ʃ a t: a /H/ /M/		*!	*	
☞ b. +r -r -r | ∓ ∓ | +U +U | | μ μ | | + ʃ a t: a /M/ /H/			**	*

The V:-asymmetry between 1.Sg-H and Pot-H

- two tones on a single V are dispreferred (28)
- the two moras of a long V are associated to a single feature [±U]

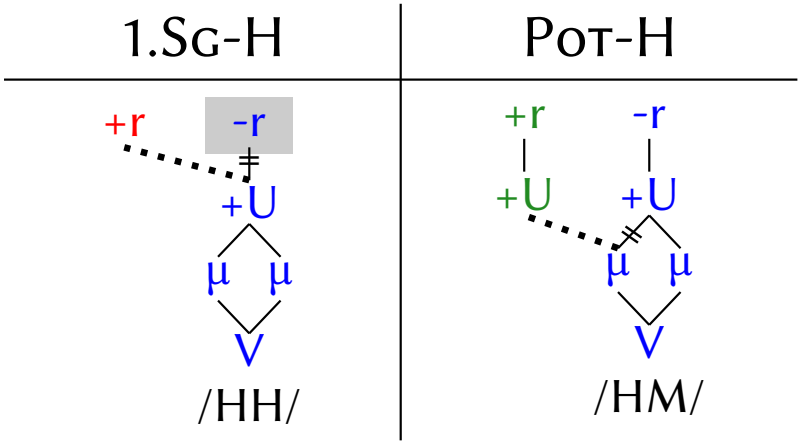
1.Sg association of a new [+r] changes the tone specification for both TBU's

Pot association of a new [+U−+r] changes only the first tone of a long V since it associates to a TBU on its own

(28) *ContV

Assign a violation mark for every phonetically visible V associated to two different tones.

(29) *Association of the floating H-tones to M: TBU-asymmetry*



The Vː-asymmetry between 1.Sg-H and Pot-H

- for L-tones, the asymmetry mainly follows from DepAL(U–μ): if [+r] is realized, an epenthetic [+U] needs to be inserted and the constraint is irrelevant; a contour can hence be avoided

(30) DepAL(U–μ)
Assign a violation mark for every colourless association line between a morphologically coloured [±U] and a morphologically coloured μ.

Vː-Asymmetry: Contour creation for the Potː-H

(31)

	±R to ±U	±U to μ	DepAL(U–μ)	*ContV	Dep[±U]	Max[±U]	Max[±R]
+r +r -r +r +U +U -U +U μ μ μ μ g u + s i g a ʔ /H/ /L/ /H/							
☞ a. +r +r -r +r +U +U -U +U μ μ μ μ g u s i g a ʔ /H/ /HL/ /H/			*	*			
b. +r +r -r +r +U +U -U +U μ μ μ μ g u s i g a ʔ /H/ /HH/ /H/			**!			*	*

V:-Asymmetry: Complete overwriting for the 1.Sg-H

(32)

	±R to ±U	±U to μ	DepAL(U–μ)	*ContV	Dep[±U]	Max[±U]	Max[±R]
+r -r -r / -U +U / μ μ μ / + g a s i / /L/ /M/							
a. +r -r -r / +U -U +U / μ μ μ / g a s i / /HL/ /M/				*!	*		
☞ b. +r -r -r / +U -U +U / μ μ μ / g a s i / /H/ /M/					*	*	*

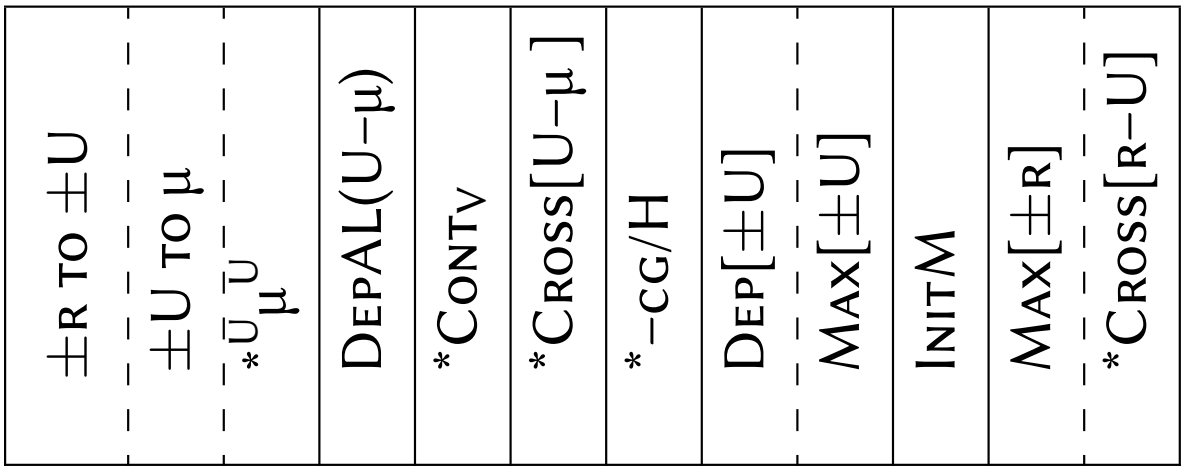
Summary: Analysis for MZ

Asymmetry of 1.Sg-H and Pot-H follows from their **different specification**:

- the tonal feature [+r] can associate 'across' other [±r] specifications to reach a preferred TBU; the more complex [+U,+r] cannot
- realization of [+r] overwrites the tone specification of both μ's of a long V:that are associated to a single [±U]; the more complex [+U,+r] associates to a TBU on its own

Summary: The ranking for MZ

(33)



- (tested with the help of OTHelp (Staubs et al., 2010))

Further implications

Non-local association of H in Sierra Juárez Zapotec

Bickmore and Broadwell (1998); Tejada (2012)

- difference to MZ: 1.Ps-H realized on **stressed** syllable (usually initially)
- in incorporated N-V structures, the H surfaces on the first (34-c), the second (34-d), or both stems (34-e)

(34) *1.S intransitive H-tone (Bickmore and Broadwell, 1998, 50,52,57)*

a.	gú-ʃuʔnì-luʔ 'You will wrinkle'	gú-ʃúʔnì-ʔàʔ 'I will wrinkle'
b.	gú-deʧu '(S/he) will fold'	gú-déʧù-ʔaʔ 'I will fold'
c.	gú-kàá-ló '(S/he) will stick out his/her head'	gú-káa-lú-áʔ 'I will stick out his/her head'
d.	é-dákːaʔ-latsiʔ '(S/he) will be happy'	é-dákːaʔ-látsaʔ-aʔ t'I will be happy'
e.	gú-ni-latsiʔ '(S/he) will seem to be'	gú-ní-látsaʔ-àʔ '(S/he) will seem to be'

A tone feature analysis for Sierra Juárez Zapotec

- only the contours MH and HM are attested: only [+U] (associated V:) may have two tonal features

(35) *Tones in SJZ*

L	M	H	MH	HM
-r | or -U -U	-r | or +U +U	+r | +U	-r +r \/ +U	+r -r \/ +U

- the 1.Sg is a floating [+r] that associates to non-local TBU's under pressure of *−RAISED/HD (cf. *L/HD in de Lacy, 2002)

→ solves locality problem discussed in Bickmore and Broadwell (1998) as an argument against a circumfixation analysis (H–Σ–ʔàʔ) and for the assumption of the Morphemic Tier Hypothesis

Locality asymmetry of tone-demanding suffixes in Bora

(Seifart, 2005; Thiesen and Weber, 2012; Roe, 2014)

- Witotoan language, spoken in Northern Peru
- two tone levels H and L; H is assumed to be the default
- some suffixes impose L: on the **final or penult TBU** of their base
- OCP: no realization of an additional L if two adjacent L's would result

(36) *Suffixes imposing L on final or penult base σ*

a. o ma^{x}ʧ^{h}o-**^{L}**t^{h}ɛ-ʔi
I eat-go.do
ó má^{x}ʧ^{h}**ò**-t^{h}é-ʔì
'I go to eat'
(Thiesen and Weber, 2012, 77)

b. a꞉nɯ-kpa-**^{L}**ma
cassava.shoot-slab-Soc
á꞉nɯ́-kp**à**-mà
'with a cassava.shoot for planting'
(Roe, 2014, 92)

c. ma^{x}ʧ^{h}o-**^{Lø}**mɛ
eat-An.Pl
mà^{x}ʧ^{h}ó-mɛ̀
'they ate'
(Thiesen and Weber, 2012, 77)

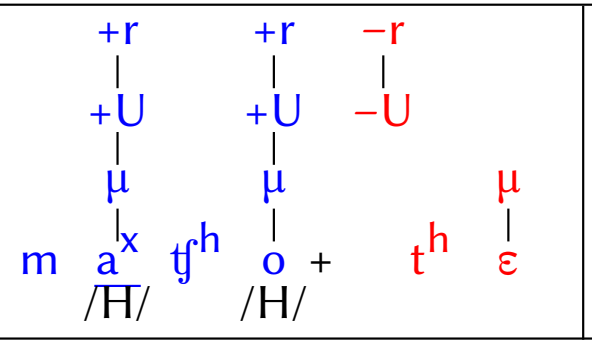
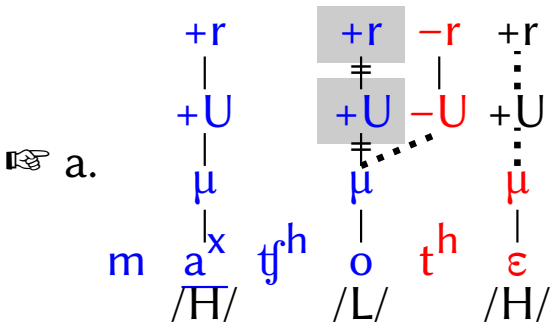
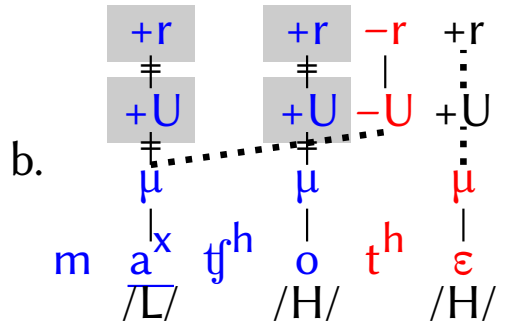
d. imipa^{x}ʧ^{h}o-**^{Lø}**mɛ
fix-An.Pl
ímíp**à**^{x}ʧ^{h}ó-mɛ̀
'they fix'
(Thiesen and Weber, 2012, 77)

Locality asymmetry for tone-demanding suffixes in Bora

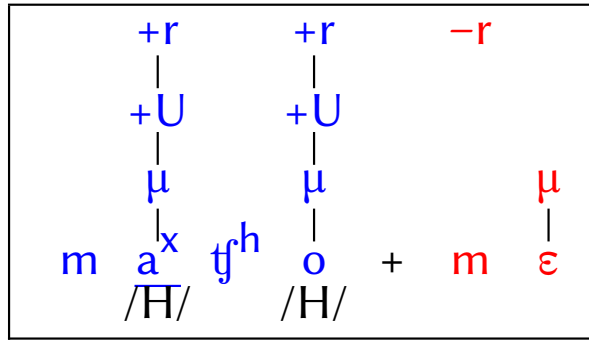
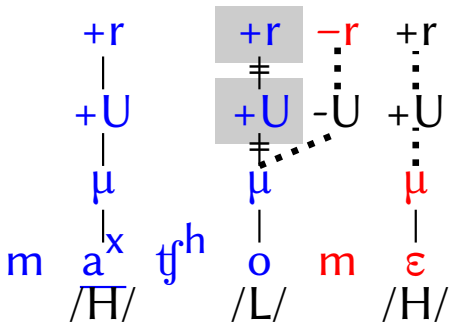
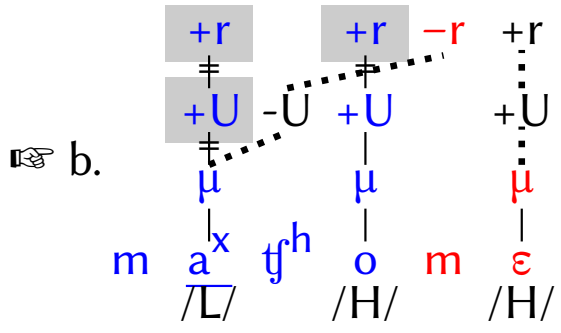
- there is a preference for L-tones to be realized on the penultimate TBU of the base (ALIGN(L;L), stress (*–U,–R/NHD (de Lacy, 2002), ?)
- some floating L's ([–U,–r]) can reach this preferred position and others ([–r]) not
- (implicit: default-H already assigned to tone-less TBU's of the base (Stratal OT Trommer, 2011; Bermúdez-Otero, in preparation))

Locality asymmetry of tone-demanding suffixes in Bora

(37) *Local association for /-^{L}t^{h}ɛ/*

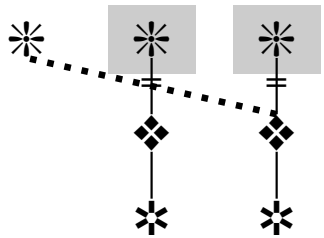
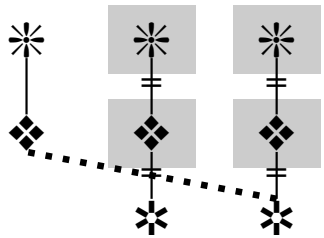
		*Cross[U–μ]	*–U,–R/NHD	*Cross[R–U]
				
☞ a.			*	
b.		*!		

(38) *Local association for /-^{Lø}mɛ/*

		*Cross[U–μ]	*–U,–R/NHD	*Cross[R–U]
				
a.			*!	
☞ b.				*

Non-local association: general predictions

(39)

	Max-❖	Max-✳	*Cross ❖✳	*Cross ✳❖
1. 		**		*
2. 	**	**	*	

- non-local association of the more complex structure: a **superset** of the structure remains phonetically invisible
- the 'crossed' elements are **neutralized to default** structure or take the value of the 'crossing' element (=spreading)

Summary

Summary

- the asymmetric behaviour of different morphological H-tones in MZ follows under the assumption of **tonal features** and underspecification
- **non-local association** of (non-complex) floating tone features under the pressure of higher-ranked markedness constraints is possible in a containment-based system
- extends the argument that phonetically identical tones may have **different phonological specification** in a tone feature account
  - two different M's in Bimoba (Snider, 1998): downstepped H vs. underlying M
  - two different L's in Mundurukú (Picanço, 2005)
  - **two different H-tones in MZ**

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