Featural Spreading and Affixation in Gaahmg

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Goal of this talk

Investigate interaction and overlap

between featural affixation and spreading

in vocalic and tonal features

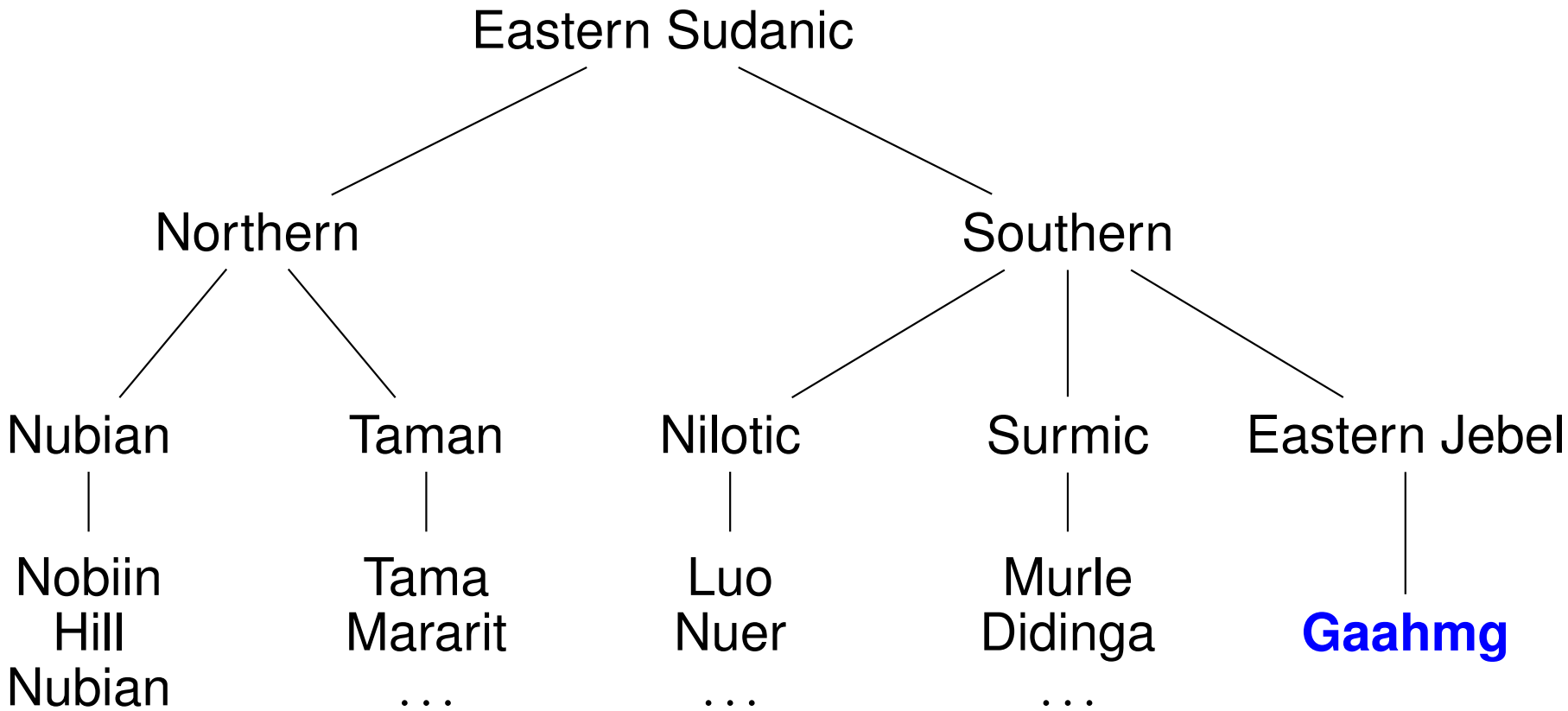
of a complex single language

Gaahmg

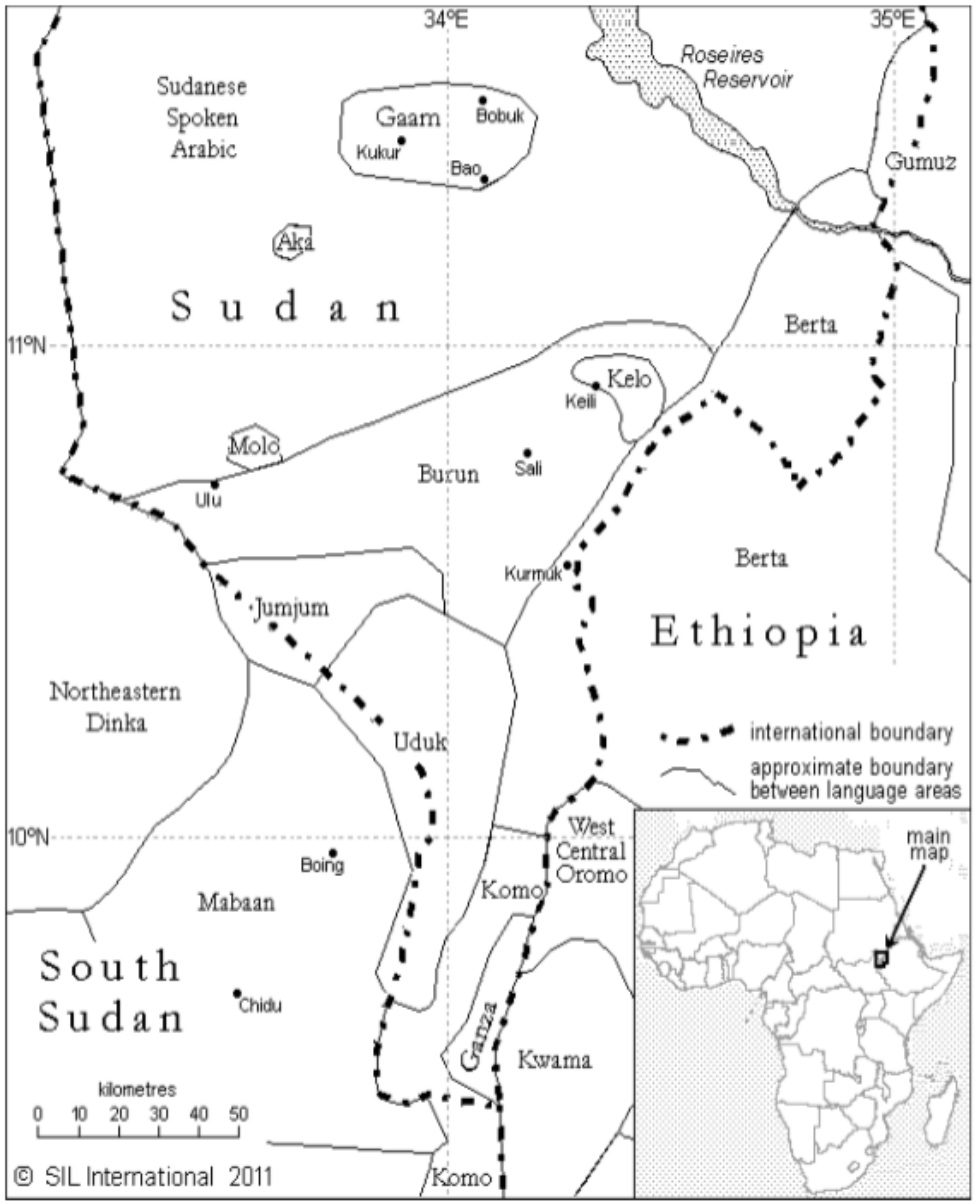
Gaahmg [gə̀ə̀mg]

- Nilo-Saharan, Eastern Sudanic language
  spoken in the Blue Nile Province of Sudan
- spoken by roughly 67.000 speakers
- All data in this talk from the detailed grammar of Stirtz (2011)

Eastern Sudanic Languages (Bender 2000)



Gaahmg [gə̀ə̀mg]



Gaahmg Phonology

- [+ATR]-dominant [ATR]-harmony
- Complex three-tone system (High + Mid + Low)
- Contour tones on heavy syllables
- Derived three-tone contours

Theoretical Assumptions

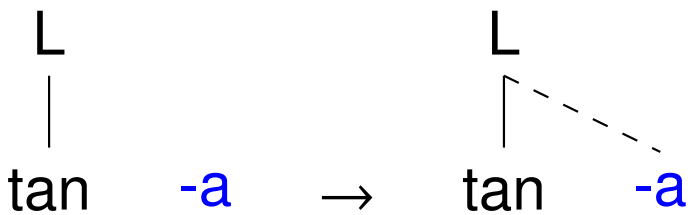
- **Autosegmental Phonology:** (Goldsmith1976, Snider 1999)
  Tonal and vocalic features are on independent tiers linked to segments and prosody via association lines
  Tones are decomposed into more atomic feature trees

- **Stratal OT:** (Bermúdez-Otero 2012)
  Root-Level Stem-Level, and Word-Level Evaluations feed each other serially. Different levels have potentially different optimality-theoretic constraint rankings

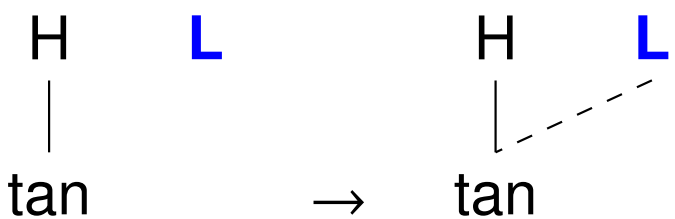
- **Colored Containment:** (van Oostendorp 2006, Trommer 2011)
  Underlying material (i.e. nodes and association lines)
  is never literally deleted, but retained in the output,
  and marked as phonetically invisible.

Autosegmental Phonology (Goldsmith 1976)

Featural Spreading

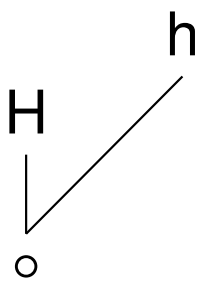


Featural Affixation

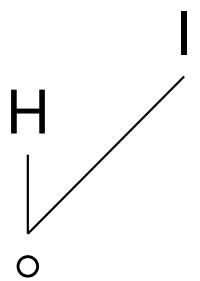


Tone in Register Tier Theory (Snider 1999)

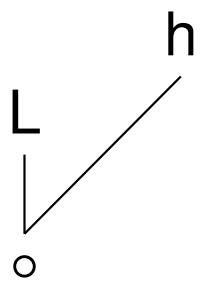
High



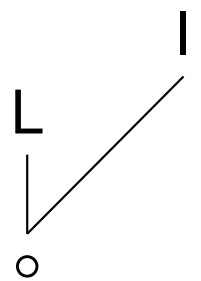
Mid$_1$



Mid$_2$



Low



Stratal Organization

Stratal Organization

- **Stem-Level:** Vowel Harmony, VCV-Lenition, C#-Vocalisation
- **Word-Level:** Vowel Harmony, (VCV-Lenition), –
- **Phrase-Level:** –

Stem-Level Consonant Lenition

(4) **Final consonants in various environments re-presented**

	UR	3sN INCP	3sN CONT.P	3sN COMP.D		
(a)	/ab/ L	àɔ̄	àw-án	àb-bāggā	[àbāgā]	'sit'
(b)	/kaɟ/ H	káɛ́	káy-án	káɟ-ɟággā	[káɟágā]	'bring'
(c)	/cig/ M	cīī	cī-ɔ́n	cig-gɔ́ggɔ̄	[cigɔ́gɔ̄]	'wear'
(d)	/cuḍ/ M	cūḍ	cūḍ-ɔ́n	cūḍ-ḍúggū	[cūḍúgū]	'climb'
(e)	/lɔf/ L	lɔ̃f	lɔ̀f-án	lɔ̀f-fɔ̄ggɔ̄	[lɔ̀fɔ̄gɔ̄]	'do magic'
(f)	/las/ M	lās	lās-án	lās-sággā	[lāságā]	'roll-up'
(g)	/ɲam/ M	ɲām	ɲām-án	ɲām-mággā	[ɲāmágā]	'break'
(h)	/gɔn/ L	gɔ̀n	gɔ̀n-án	gɔ̀n-nɔ̄ggɔ̄	[gɔ̀nɔ̄gɔ̄]	'grab'
(i)	/guɲ/ L	gūɲ	gùɲ-ɔ́n	gùɲ-ɲūggū	[gùɲūgū]	'agree'
(j)	/mal/ M	māl	māl-án	māl-lággā	[mālágā]	'gather'
(k)	/wɛr/ M	wēr	wēr-án	wēr-rággā	[wērágā]	'watch'
(l)	/ɲaw/ H	ɲáɔ́	ɲáw-án	ɲáw-wággā	[ɲáwágā]	'request'
(m)	/kɔy/ H	kɔ́ɛ́	kɔ́y-án	kɔ́y-yɔ́ggɔ̄	[kɔ́yɔ́gɔ̄]	'cook'

Word-Level Conservation

(7) **Third singular agented passive clitic =Ɛ́**
on incompletive forms with various root-final segments

	Root	INCP 3sN	PAS.A INCP 3SN	
(a)	/ab/ L	àɔ̄	àɔ̀. =ɛ̄, àw=ɛ̄	'sit'
(b)	/kaɟ/ H	káɛ́	káɛ́. =ɛ́, káy=ɛ́	'bring'
(c)	/cig/ M	cīī	cīī. =ī̂	'wear'
(d)	/cud̰/ M	cūd̰	cūd̰=ī̂	'climb'
(e)	/lɔf/ L	lɔ̄f	lɔ̀f=ɛ̄	'do magic'
(f)	/las/ M	lās	lās=ɛ́	'roll-up'
(g)	/ɲam/ M	ɲām	ɲām=ɛ́	'break'
(h)	/gɔn/ L	gɔ̀n, gɔ̀ɔ̄	gɔ̀n=ɛ̄, gɔ̀ɔ̀. =ɛ̄	'grab'
(i)	/guɲ/ L	gṵ̀ɲ	gṵ̀ɲ=ī	'agree'
(j)	/mal/ M	māl	māl=ɛ́	'gather'
(k)	/wɛr/ M	wɛ̄r	wɛ̄r=ɛ́	'watch'
(l)	/ɲaw/ H	ɲáɔ́-(n)	ɲáw=ɛ́, ɲáɔ́-n=ɛ́	'request'
(m)	/kɔy/ H	kɔ́ɛ́-(n)	kɔ́y=ɛ́, kɔ́ɛ́-n=ɛ́	'cook'
(n)	/fɛð/ H	fɛ́ð-(n)	fɛ́ð=ɛ́, fɛ́ð-n=ɛ́	'release'
(o)	/pa/ M	pāā, pā-d̰	pāā. =ɛ́, pā-d̰=ɛ́	'guard'

Stratal Organization in Lenition

Root Level		**Stem Level**		**Word Level**
/ab/	→	|ao|	→	[ao]
/ab/+/an/	→	|awan|	→	[awan]
/ab/	→	|ao|+|an|	→	[aoan]

Spreading and Affixation of [ATR]

Advanced Tongue Root ([ATR]) in Gaahmg (Stirtz 2011:33)

Table 2: Vowel Phonemes

	[-round]		[+round]
	[-back]	[+back]	
[+ATR]	i	ə	u
[-ATR]	ɛ	a	ɔ

[+ATR]-Dominant Vowel Harmony

(1) **Rightward [ATR] spreading to plural suffix *-ƐƐgg***

	Vowel	Noun SG	Noun PL	
(a)	ɛ	cèèr	cèèr-ɛ̄ɛ̄gg	'singer'
(b)	a	ɖààr	ɖààr-èègg	'eagle'
(c)	ɔ	cɔ̄ɔ̄l	cɔ̄ɔ̄l-ɛ̄ɛ̄gg	'donkey'
(d)	i	ɟííl	ɟííl-īigg	'cricket'
(e)	ə	gùùr	gùùr-īigg	'grinding stone'
(f)	u	ə̀ə̀r	ə̀ə̀r-ìigg	'sheep'

(2) **Leftward [ATR] spreading from imperative plural suffix *-ɗA⁺***

	Vowel	IMP	IMP PL	
(a)	ɛ	fɛ́ɛ́	fíí-ɖɔ̄	'clean'
(b)	a	ṭál	ṭɔ́l-ɖɔ̄	'put, make'
(c)	ɔ	kɔ́m	kúm-ɖū	'cut, chop'
(d)	i	díú	díú-ɖū	'plant'
(e)	ə	pə̂r	pə̂r-ɖə̀	'attach'
(f)	u	ṭúr	ṭúr-rū	'see'

[+ATR] 2nd Person Affixation (Stirtz 2011:84)

(13) **Paradigm of short subject pronouns on continuous non-past verb *kɔ́m-ān* 'cut, chop'**

á	kɔ́m-ān	1sN	āgg	kɔ́m-ān	1pN
ɔ́ kúm-ɔ̄n, ú = kúm-ɔ̄n		2sN	ɔ̄gg kúm-ɔ̄n, ūg = kúm-ɔ̄n		2pN
ɛ̄	kɔ́m-án	3sN	ɛ̄gg	kɔ́m-ân[20]	3pN

Phonological Analysis of [ATR]-Harmony

Input: = c.	SHARE [ATR]	MAX [+ATR]	MAX [-ATR]
☞ a. **gù:r-ī:g**			*
b. gɔ̀:r-ɛ̄:g		*!	
c. **gù:r**-ɛ̄:g	*!		

Input: = c.	SHARE [ATR]	MAX [+ATR]	MAX [-ATR]
☞ a. **kúm-d̪ū**			*
b. kɔ́m-d̪ɔ̄		*!	
c. kɔ́m**-d̪ū**	*!		

Phonological Analysis of [+ATR]-Affixation

Input: kɔ́m-an**-[+ATR]**	SHARE [ATR]	MAX [+ATR]	MAX [-ATR]
☞ a. **kúm-ən**			*
b. kɔ́m-an		*!	
c. kɔ́m-**ən**	*!		

Tonal Affixation and Register Lowering

Register Lowering

Gaahmg Tonal Contrasts (Stirtz 2011:43,45)

Table 5: Contrastive H, M, and L tones

H	ə́ə́r	'tree bark'
M	ə̄ə̄r	'anger'
L	ə̀ə̀r	'sheep'

(29) Tonal contrasts in infinitive verb forms

	Root tone	INF	
(a)	H	fír-r	'smell, pray'
(b)	M	cɔ̄r-r	'help'
(c)	L	d̰ùr-r	'bury'
(d)	HL	pə̂r-r	'attach'
(e)	HM (rare)	bɛ́l-l	'name, call'
(f)	ML (rare)	dɔ̄ɔ̀s-s	'stand'
(g)	MH	kə̋ð-ð	'strike, ram'

Gaahmg Register Lowering after Low-Tones

High → **Mid**

Mid → **Low**

Register Lowering: **High** → **Mid** (Stirtz 2011:184,196)

(38) **Imperative forms with various root tone melodies**

	Root tone	IMP	IMP.PL	
(a)	H	fír-ɔ́	fír-rə̄	'smell'
(b)	M	cə̄r	cúr-rū	'help'
(c)	L	ḍùr	ḍùr-rù	'bury'
(d)	HL	pə̂r	pə̂r-rə̀	'attach'
(e)	HM	bɛ́l-á	bíl-ḍə̄	'name'
(f)	ML	dɔ̄ɔ̀s-ɔ̄	dūùḍ-ḍù	'stand'
(g)	MH	kə̋ð-ɔ́	kə̋ḍ-ḍə̄	'strike'

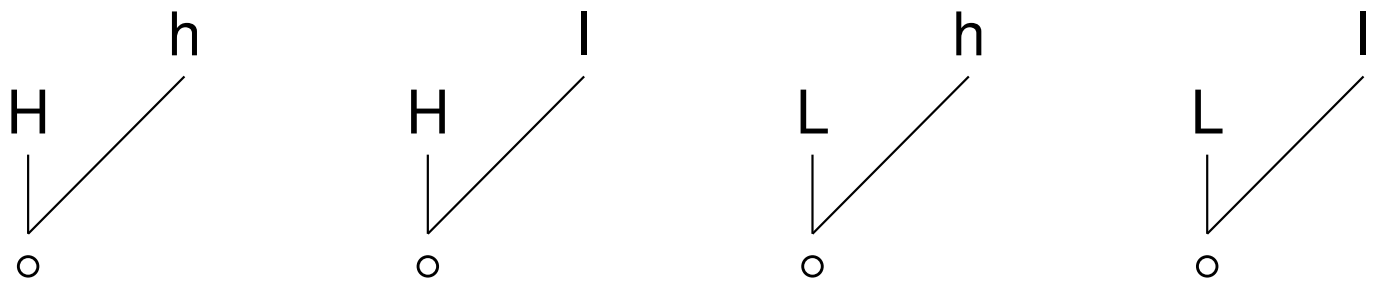
Register Lowering: **Mid** → **Low** (Stirtz 2011:184,196)

(18) **Imperative verb forms with various root-final segments**

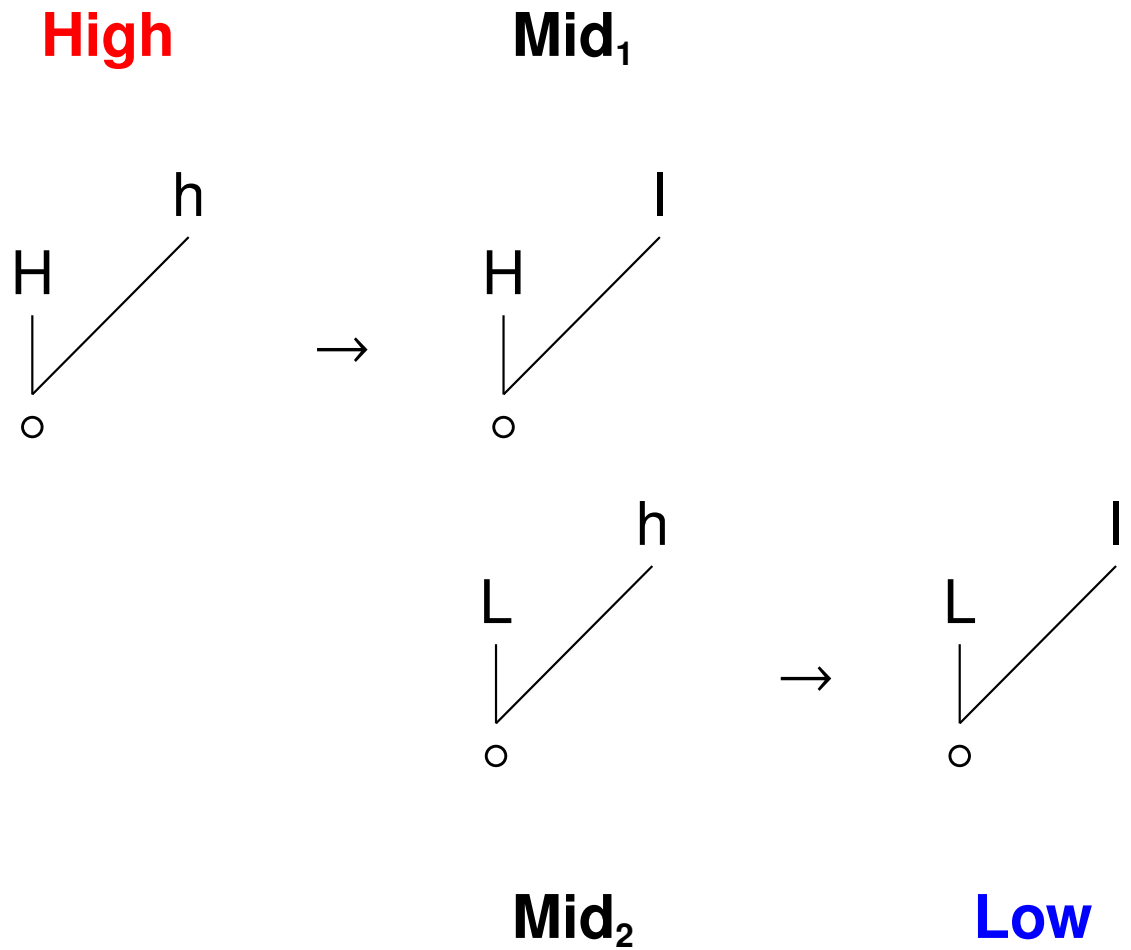
	Root	IMP	IMP PL	
(a)	/cuḍ/ M	cūḍ-ú	cúḍ-ḍū [cúḍū]	‘climb’
(b)	/las/ M	lās	láḍ-ḍə̄ [láḍə̄]	‘roll-up’
(c)	/gɔn/ L	gɔ̀n, gɔ̀ɔ̀	gùḍ-ḍù [gùḍù]	‘grab’
(d)	/fɛð/ H	fɛ́ð	fíḍ-ḍə̄ [fíḍə̄]	‘release’
(d)			fíð-ðə̄ [fíðə̄]	‘release’
(e)	/wɛr/ M	wēr	wír-rə̄ [wír:ə̄], wír-ḍə̄	‘watch’
(f)	/ɲaw/ H	ɲáɔ́, ɲáɔ́-n	ɲə́ú.-ū, ɲə́ú-ḍū	‘request’
(g)	/kɔy/ H	kɔ́ɛ́, kɔ́ɛ́-n	kúí-ū, kúí-ḍū	‘cook’
(h)	/ab/ L	àɔ̀	ə̀ù-ḍù	‘sit’
(i)	/kaɟ/ H	káɛ́	kə́í-ḍə̄	‘bring’
(j)	/cig/ M	cīī	cíg-ḍə̄	‘wear’
(k)	/lɔf/ L	lɔ̀f	lùù-ḍù	‘do magic’
(l)	/ɲam/ M	ɲām	ɲə́m-ḍə̄	‘break’
(m)	/guɲ/ L	gùɲ-ū	gùɲ-ḍù	‘agree’
(n)	/mal/ M	māl	mə́l-ḍə̄	‘gather’
(o)	/pa/ M	pāā	pə́-ḍə̄	‘guard’
(p)	/bɛɛ/ L	bɛ̀ɛ̀-nā	bìì-ḍə̀	‘say’

Tone in Register Tier Theory (RTR) (Snider 1999)

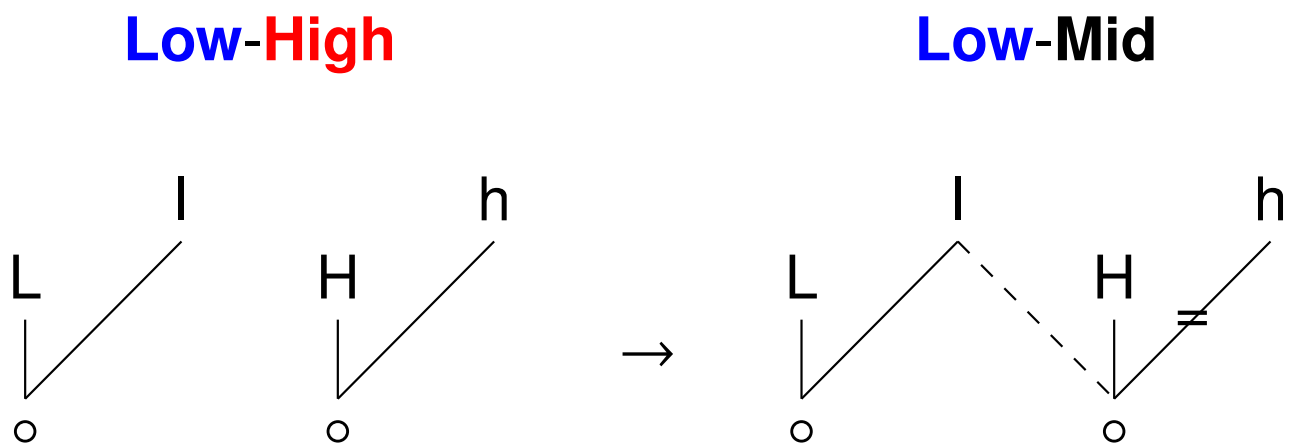
High **Mid$_1$** **Mid$_2$** **Low**



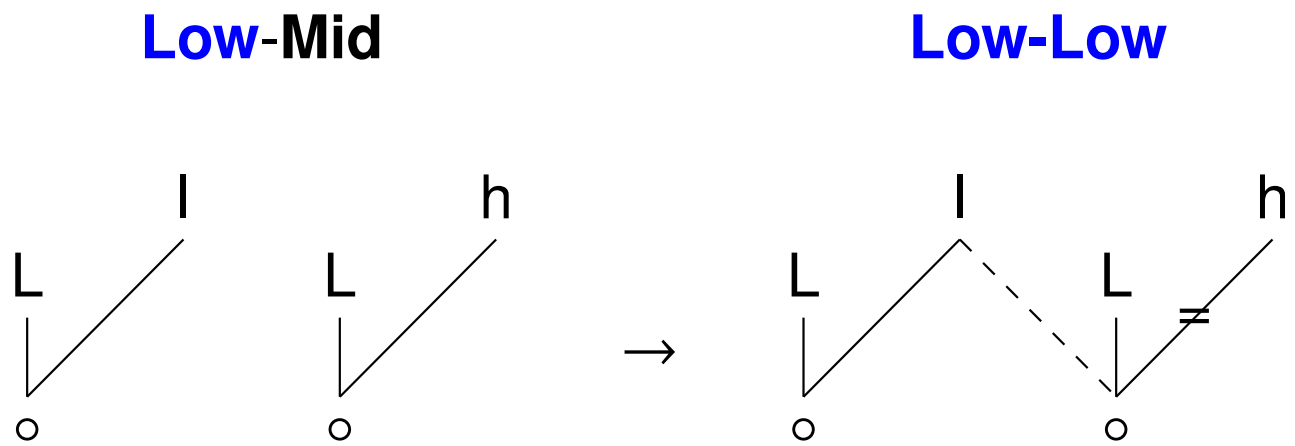
Gaahmg Register Lowering in RTR



Lowering of High to Mid



Lowering of Mid to Low



Aggressive Lowering in the Continuous Non-past

(43) **Continuous non-past forms -*Án* (H) with various root tone melodies**

	Root tone	CONT.N 1sN	CONT.N 3sN	CONT.N 3pN	
(a)	H	fír-ə̄n	fír-ə́n	fír-ə̂n	'smell'
(b)	M	cɔ̄r-án	cɔ̄r-án	cɔ̄r-ân	'help'
(c)	L	ḍ̰ùr-ən	ḍ̰ùr-ə̀n	ḍ̰ūr-ən	'bury'
(d)	HL	pər-ən	pər-ə̀n	pər-ən	'attach'
(e)	HM	bɛ́l-ān	bɛ́l-ān	bɛ́l-àn	'name'
(f)	ML	dɔ̄ɔ̀s-ān	dɔ̄ɔ̀s-ān	dɔ̄ɔ̀s-àn	'stand'
(g)	MH	kə̌ð-ə̄n	kə̌ð-ə́n	kə̌ð-ə̂n	'strike'

Stratal Organization (after Low)

Stem Level

High → **Low**

Mid → **Low**

Word Level

High → **Mid**

Mid → **Low**

Tonal Affixation

Tonal Affixation (Future)

Future and non-future pronouns (see 9.8.4)

Subject non-future	Subject future	
á	ā́	1s
ɔ́	ɔ̄́	2s
āggá	āggā́	1p
ɔ̄ggɔ́	ɔ̄ggɔ̄́	2p

Tonal Affixation (Subject Agreement)

Table 40: Subject person inflectional tone

	1sN	2sN	3sN	1pN	2pN	3pN
Root tone	+M	+M	+H	+M	+M	+L

Subject Agreement + Register Lowering (Completive)

(35) **Completive forms with various root tone melodies**

	Root tone	COMP 1sN	COMP 3sN	COMP 3pN	
(a)	H	fír-sə̄	fír-sə́	fír-sə̀	'smell'
(b)	M	cə̄r-sə̄	cə̄r-sə́	cə̄r-sə̀	'help'
(c)	L	ḍùr-sù	ḍùr-sū	ḍūr-sù	'bury'
(d)	HL	pə̂r-sə̀	pə̂r-sə̄	pə̂r-sə̀	'attach'
(e)	HM	bɛ́l-ḍā	bɛ́l-ḍá	bɛ̂l-ḍà	'name'
(f)	ML	dɔ̄̀s-sə̀	dɔ̄̀s-sɔ̄	dɔ̄̀s-sə̀	'stand'
(g)	MH	kə̋s-sə̄	kə̋s-sə́	kə̋s-sə̀	'strike'

Subject Agreement + Register Lowering (Incompletive)

(37) **Incompletive forms with various root tone melodies**

	Root tone	INCP 1sN	INCP 3sN	INCP 3pN	
(a)	H	f ̂ir	fír	f îr	'smell'
(b)	M	cɔ̄r	cɔ̄r	cɔ̀r	'help'
(c)	L	ḍùr	ḍùr	ḍùr	'bury'
(d)	HL	pə̂r	pə́ r	pə̂r	'attach'
(e)	HM	bɛ́l	bɛ́ l	bɛ̂l	'name'
(f)	ML	dɔ̄ɔ̀s	dɔ̄ɔ̀ s	dɔ̄ɔ̀s	'stand'
(g)	MH	kə́ ̄ð	kə́ð	kə́ ̀ð	'strike'

Tonal Affixation & Contours – Constraints

$\tau \downarrow \sigma$ — Assign $*$ to every tone which is not dominated by a syllable

$*\sigma_{3\tau}$ — Assign $*$ to every syllable which is associated to more than two tonal root nodes

MAX τ — Assign $*$ to every morphological tone τ which is not phonetically realized

Affixation and Contours at Different Strata

Word Level

Input: = c.	$\tau \downarrow \sigma$	MAX τ	$*\sigma_{3\tau}$
☞ a. bɛl$_{\text{HM}}$**H**			*
b. bɛl$_{\text{HM}}$		*!	
c. bɛl$_{\text{HM}}$+**H**	*!		

Morpheme/Stem Level

Input: = c.	$*\sigma_{3\tau}$	$\tau \downarrow \sigma$	MAX τ
☞ a. bɛl$_{\text{HM}}$			*
b. bɛl$_{\text{HMH}}$	*!		

Combined Affixation and Lowering

Non-Iterativity of Register Lowering: Object Suffixes

(37) **Third singular incompletive verbs with first singular *a*, third singular *=Ɛ́*, first plural *áāggá*, and third plural *=ÉÈggÀ* object pronouns**

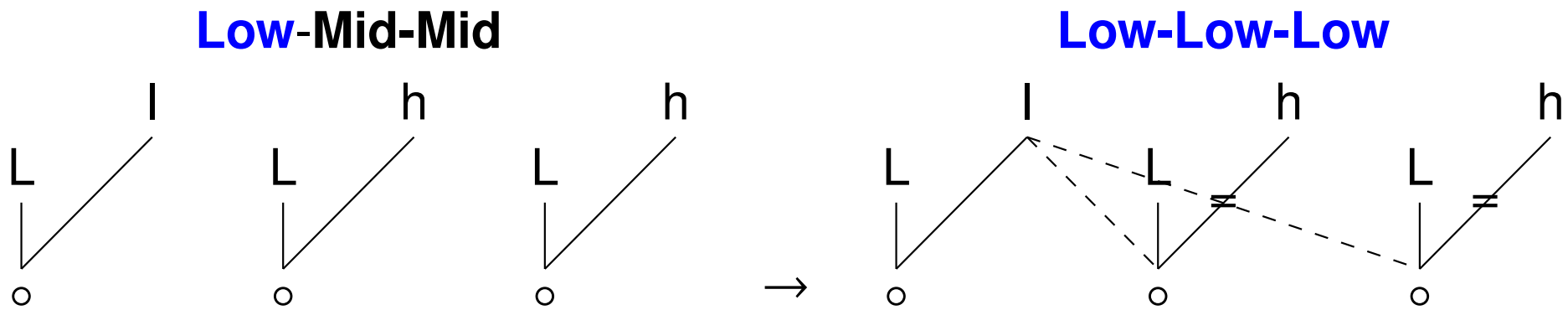
	Root tone	INCP 3sN	INCP 3sN/ 1sA	INCP 3sN/ 3sA	INCP 3sN/ 1pA	INCP 3sN/ 3pA	
(a)	H	fír	fír á	fír=î	fír áāggá	fír=îggə	'smell'
(b)	M	cōr	cōr á	cōr=ɛ̋	cōr áāggá	cōr=ɛ́ɛ̀ggà	'help'
(c)	L	ḍùr	ḍùr ā	ḍùr=ī	ḍùr āāggá	ḍùr=îìggə	'bury'
(d)	HL	pɔ́r	pɔ̂r ā	pɔ̂r=ī	pɔ̂r āāggá	pɔ̂r=îìggə	'attach'
(e)	HM	bɛ́l	bɛ̋l á	bɛ̋l=ɛ̋	bɛ̋l áāggá	bɛ̋l=ɛ́ɛ̀ggà	'name'
(f)	ML	bùn-ḍū	bŭŋ-ḍ ā	bŭŋ-ḍ=ī	bŭŋ-ḍ āāggá	bŭŋ-ḍ=îìggə	'make. big'
(g)	MH	kɔ̃ð	kɔ̃ð á	kɔ̃ð=î	kɔ̃ð áāggá	kɔ̃ð=îìggə	'strike'

Iterativity of Register Lowering: Object Suffixes

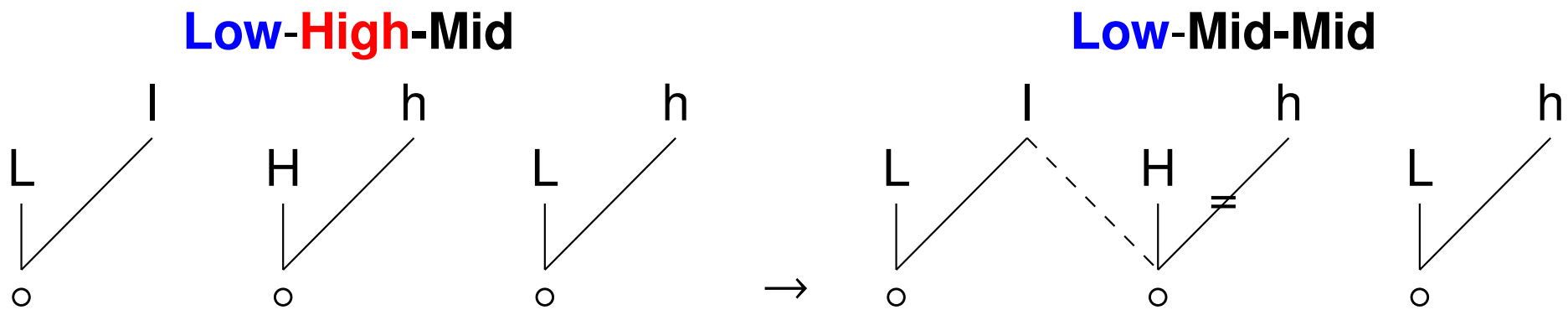
(36) **First singular incompletive verbs with second singular *=O*, third singular *=E*, second plural *=OOggÓ*, and third plural *=EEggÀ* object pronouns**

	Root tone	INCP 1sN	INCP 1sN/ 2sA	INCP 1sN/ 3sA	INCP 1sN/ 2pA	INCP 1sN/ 3pA	
(a)	H	fˆir	fír=ū	fír=ī	fír=ūūggú	fír=īīggà	'smell'
(b)	M	cār	cār=ā	cār=ē	cār=ɔ̄ɔ̄ggɔ́	cār=ɛ̄ɛ̄ggà	'help'
(c)	L	ɖùr	ɖùr=ù	ɖùr=ì	ɖùr=ùùggū	ɖùr=ììggà	'bury'
(d)	HL	pə̂r	pə̂r=ù	pə̂r=ì	pə̂r=ùùggū	pə̂r=ììggà	'attach'
(e)	HM	bɛ́l	bɛ́l=ā	bɛ́l=ē	bɛ́l=ɔ̄ɔ̄ggɔ́	bɛ́l=ɛ̄ɛ̄ggà	'name'
(f)	ML	bŭɲ-ɖù	bŭɲ-ɖ=ù	bŭɲɖ=ì	bŭɲ-ɖ=ùùggū	bŭɲ-ɖ=ììggà	'make-big'
(g)	MH	kɔ̄ð	kɔ̄ð=ū	kɔ̄ð=ī	kɔ̄ð=ūūggú	kɔ̄ð=īīggà	'strike'

Iterativity of Register Lowering: Object Suffixes



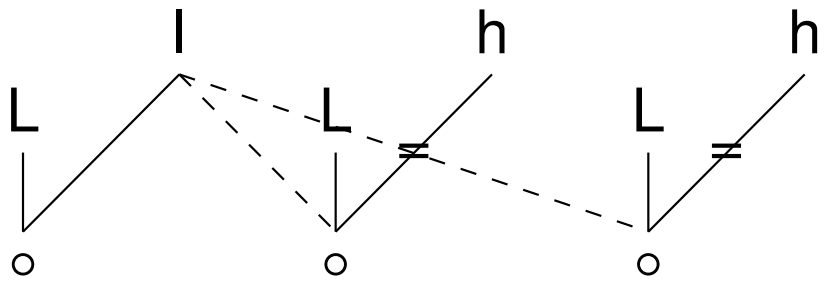
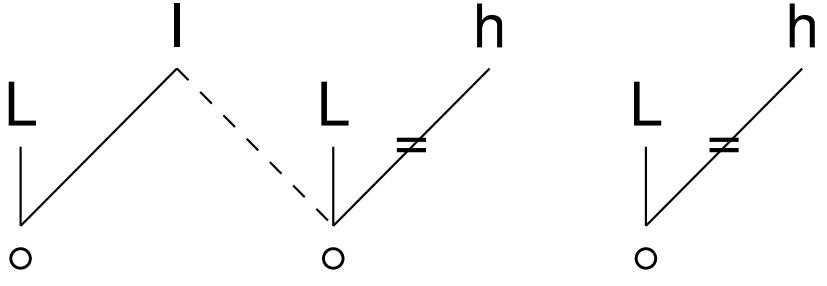
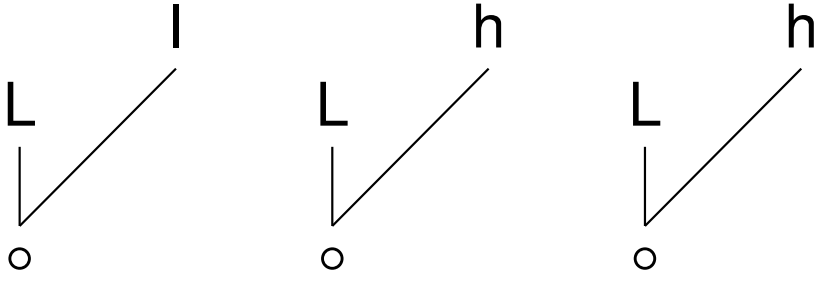
Non-Iterativity of Register Lowering: Object Suffixes



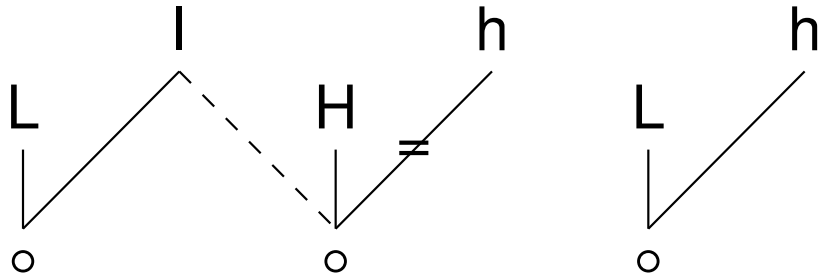
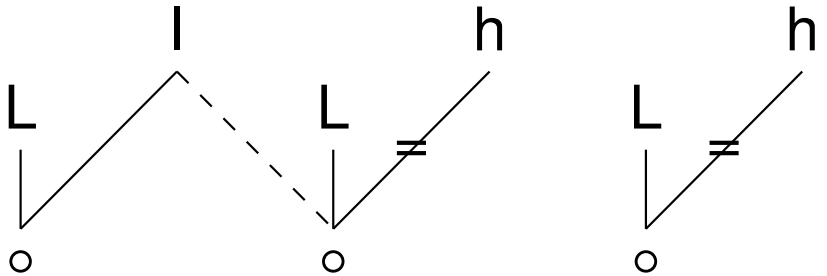
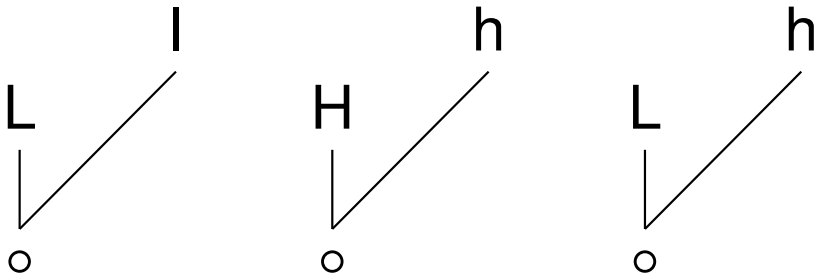
Constraints on Register Lowering

SHR [I]	Assign $*$ to every tonal root node which doesn't share the [I]-register of a preceding root node
UNIFORMITY	Assign $*$ to every spreading [I] span with different target types
$*[\text{I}]_4$	Assign $*$ to every [I]-span which covers more than 3 tonal root nodes

Iterativity of Register Lowering: Object Suffixes

Input: = c.	UNIF	*[l]$_4$	SHR [l]
☞ a. 			
b. 			*!
c. 			*!*

Non-Iterativity of Register Lowering: Object Suffixes

Input: = c.	UNIF	*[l]$_4$	SHR [l]
a. 	*!		
☞ b. 			*
c. 			**!

Overwriting

Tonal Overwriting in Inalienable Plural Possession

(51) **Possessive paradigm for inalienable body part *bɔ̄ɔ̄rà / bɔ̄ɔ̄rà-gg* 'shoulder'**

	Singular person pronouns			Plural person pronouns		
Noun SG	ā	bɔ̄ɔ̄ràà	1sPs	---		1pPs
	ɔ̄	bɔ̄ɔ̄ràà	2sPs	---		2pPs
	ɛ̄	bɔ̄ɔ̄ràà	3sPs	---		3pPs
Noun PL	ā	bɔ̄ɔ̄ràà-gg	1sPp	āgg	bɔ̀ɔ̀rāā-gg	1pPp
	ɔ̄	bɔ̄ɔ̄ràà-gg	2sPp	ūgg	bɔ̀ɔ̀rāā-gg	2pPp
	ɛ̄	bɔ̄ɔ̄ràà-gg	3sPp	ɛ̄gg	bɔ̀ɔ̀rāā-gg	3pPp

The tone assignment of the plural person possessive morpheme is described in (52).

(52) Plural person possessive L(M) tone assignment

Plural possessed body part nouns have LM pattern in that Mid tone surfaces on the final syllable and Low tone surfaces on the others. However, monosyllabic body part nouns have Low tone.

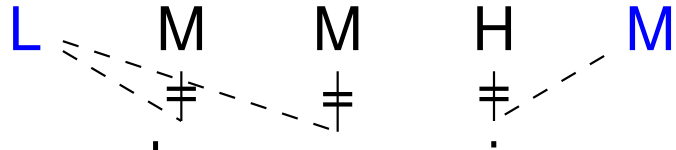
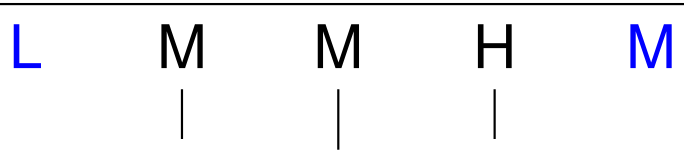
Tonal Overwriting – Constraints (Trommer 2011)

$\begin{matrix}\tau \\ \downarrow \\ \sigma\end{matrix}$ Assign $*$ to every tone which is not dominated by a syllable

$\underline{\text{CONTIGUITY}_{\tau}}$ Assign $*$ to every tone which intervenes between two tautomorphemic tones

MAX | Assign $*$ to every morphological association line which is not phonetically realized

Tonal Overwriting in Inalienable Plural Possession

Input: = c.	τ ↓ σ	CONT$_{\tau}$	MAX |
☞ a. 			***
b. 		*!	**
c. 	*!*		

Tonal Overwriting in Verbal Noun Formation

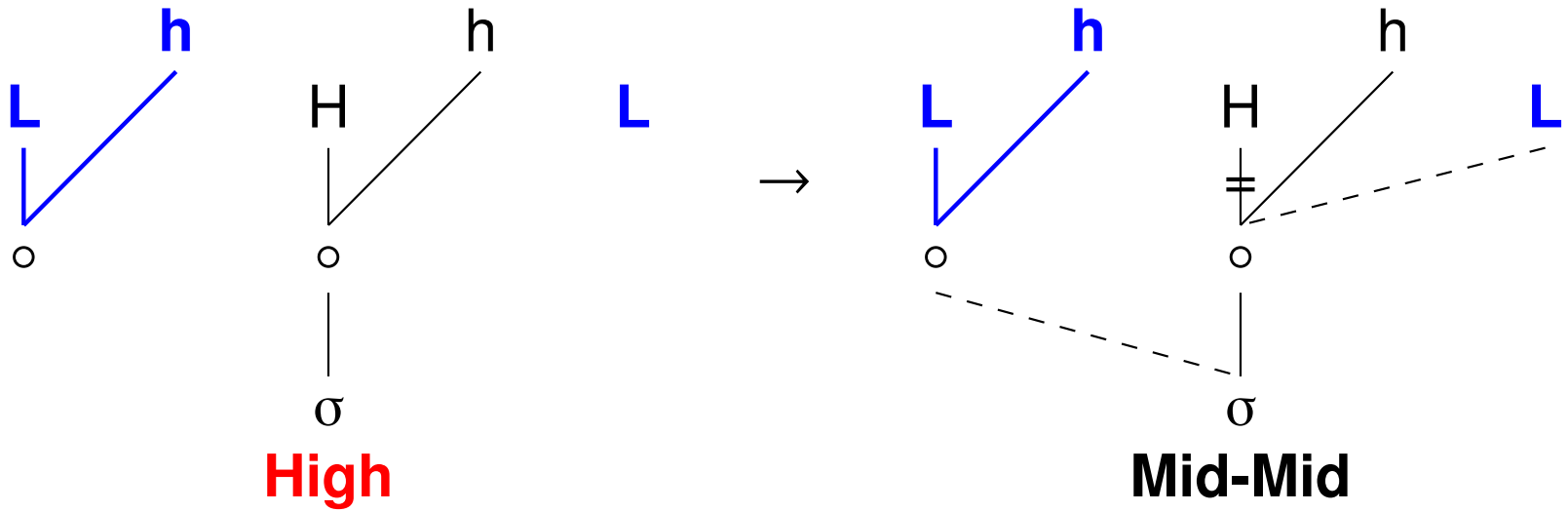
Table 54: Verbal noun tone changes

Root tone melody	Verbal noun tone melody
L, HL, ML	ML
all other melodies	M

(92) **Verbal noun plural clitics *=Agg, =gg***

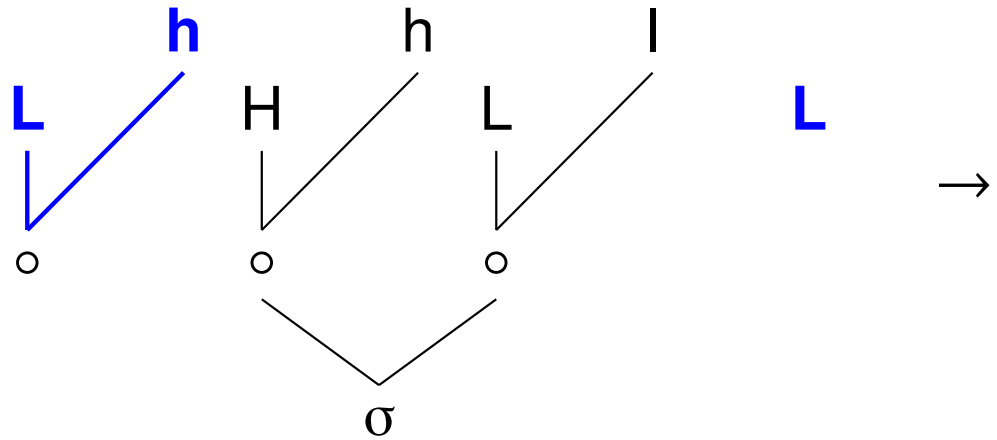
	Root tone	INF	VN tone	VN SG	VN PL	
(a)	H	pál-l	M	pāl	pāl = āgg, pāl = g	'cut'
(b)	M	bɛ̄l-l	M	bɛ̄l	bɛ̄l = āgg, bɛ̄l = g	'possess'
(c)	L	f ɛ̀l-l	ML	f ɛ̃l	fɛ̃l = āgg, f ɛ̃l = g	'tell'
(d)	HL	pîr-r	ML	pr̃	pr̃ = ə̀gg, pr̃ = g	'deceive'
(e)	HM	bɛ́l-l	M	bɛ̄l	bɛ̄l = āgg	'name'
(f)	ML	dɔ̄ɔ̀s-s	ML	---	dɔ̄gs = ɔ̀gg	'stand'
(g)	MH	kə̌ð-ð	M	kən	kəð = əgg	'strike'

Tonal Overwriting in Verbal Noun Formation (H-Verb)

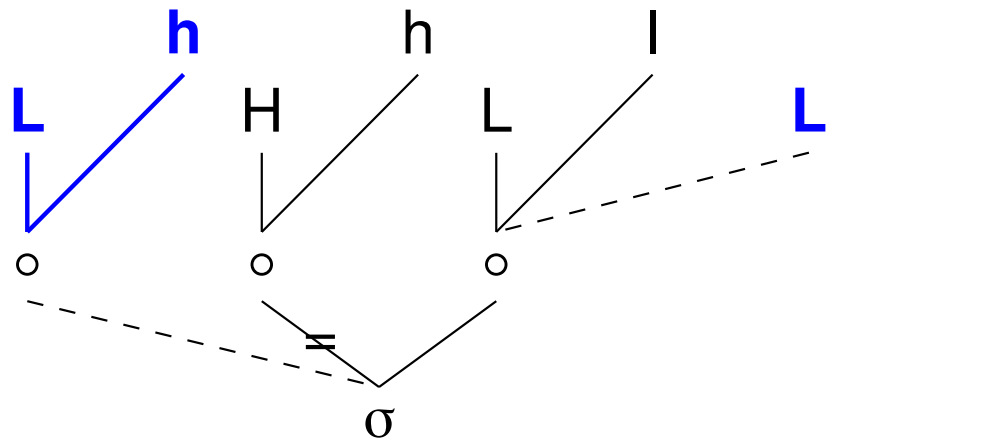


Tonal Overwriting in Verbal Noun Formation (HL-Verb)

High-Low



Mid-Low



Tonal Overwriting in Causative Formation

Table 45: Causative tone changes

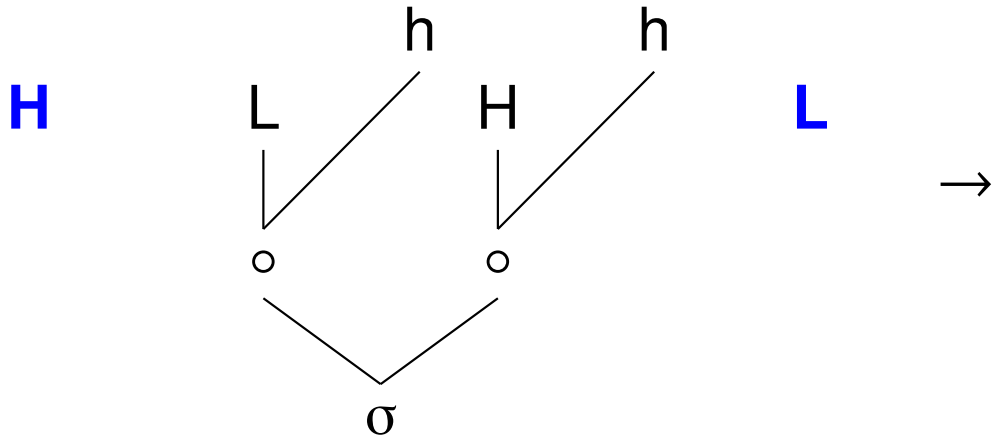
Root tone melody	Causative root tone melody
H	HM
M	HM
L	ML
HL, HM, ML	no change
MH	HM

(68) **Third singular causative completive verbs**

	Root tone	COMP 3SN	CAUS tone	CAUS COMP 3sN	
(a)	H	fír-sə́	HM	f ̂ir-sə́	'smell'
(b)	M	cōr-sɔ́	HM	cúr-sú	'help'
(c)	L	ḍùr-sū	ML	ḍûr-sū	'bury'
(d)	HL	pər̂-sə̄	HL	pər̂-sə̄	'attach'
(e)	HM	bɛ́l-ḍá	HM	bi ̂l-ḍə́	'name'
(f)	ML	dɔ̄ɔ̀s-sɔ̄	ML	dūùs-sū	'stand'
(g)	MH	kə̌s-sə́	HM	kə̂s-sə́	'strike'

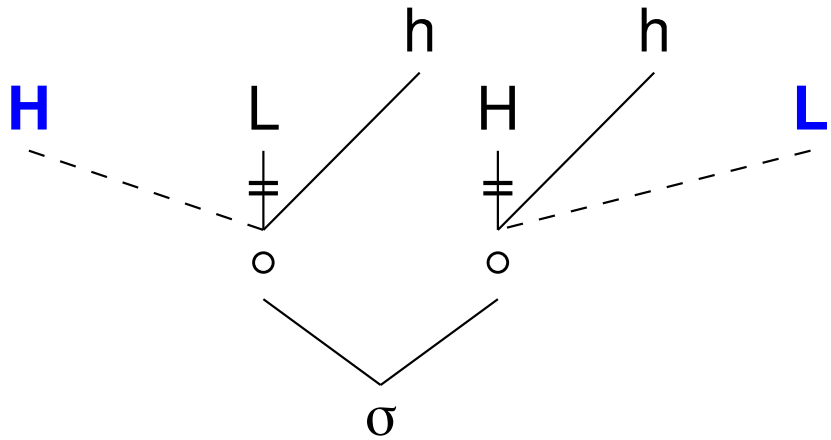
Tonal Overwriting in Causative Formation (MH-Verb)

Mid-High



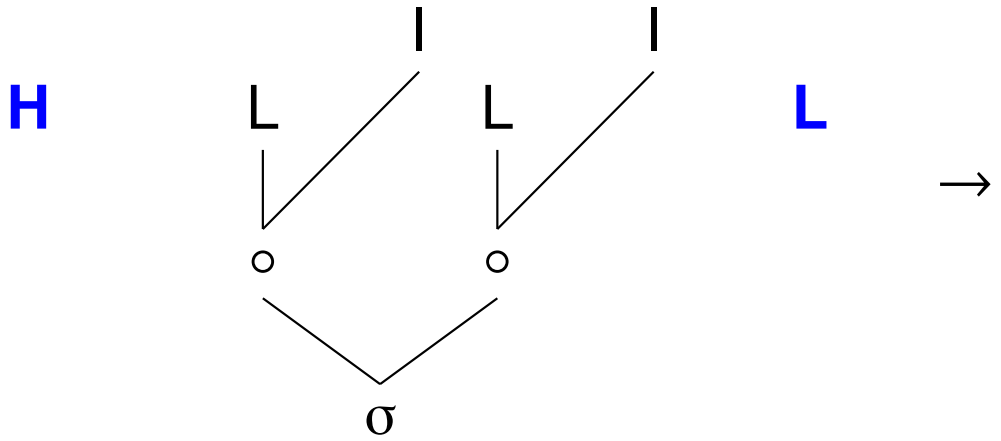
→

High-Mid

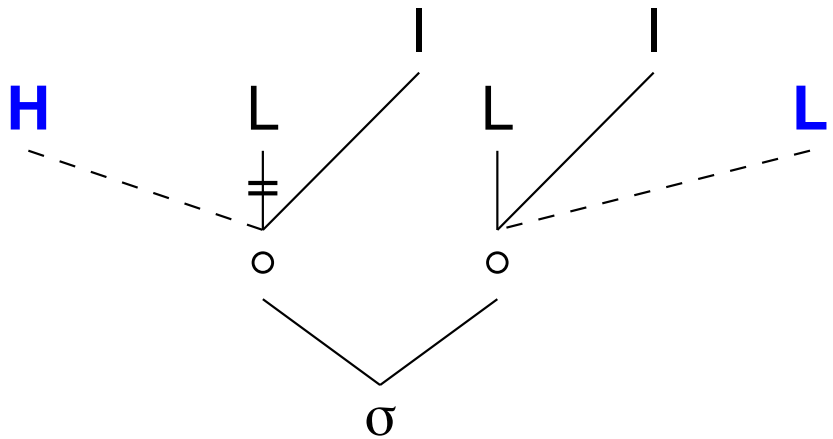


Tonal Overwriting in Causative Formation (L-Verb)

Low-Low



Mid-Low



Tone Shifting and Simplification

Tone Shifting+Simplification in Plurals (Word Level)

(41) **Rightward tone spreading to unassigned suffix vowel**

	Root tone	Suffix	N SG	N PL	
(a)	H	-Agg	kɔ́s	kɔ́s-ɔ́gg	'sorghum type'
(b)		-gg/-EEgg	ún-g	ún-íígg	'tear'
(c)	M	-Agg	māāḍ	māāḍ-āgg	'snake type'
(d)		-EEgg	kōr	kōr-ēēgg	'word, speech'
(e)		-ḍ/-EEgg	bāār-ḍ	bāār-ēēgg	'abdomen, waist'
(f)		-aaḍ/-gg	cāl-āāḍ	càl-g	'testicle'
(g)		-ɔgg	tēēnḍ	tīīnḍ-ōgg	'riddle'
(h)		-ḍ/-OOgg	kōr-ḍ	kōr-ōōgg	'bird type'
(i)	L	-Agg	ɟɛ̀ɛ̀rs	ɟɛ̀ɛ̀rs-àgg	'hippopotamus'
(j)		-EEgg	bààm	bààm-ɛ̀ɛ̀gg	'bird type'

(42) **Second of two root-final tones reassigned to suffix vowel with no underlying tone**

Root tone	Suffix	N SG	N PL	
HL	-Agg	ílɟ	ílɟ-ɔ̀gg	'beeswax'
	-EEgg	fáàm	fáám-ɛ̀ɛ̀gg	'opinion'
	-AAgg	téɛ̀l	téɛ́l-ààgg	'anchor'
	-AAḍ	máàm	máám-ààḍ	'paternal aunt'
HM	-Agg	síīɟɟ	sííɟɟ-ōgg	'tree type'
	-AAgg	cɛ́ɛ́ɔ̄	cɛ́ɛ́w-āāgg	'lame person'
ML	-Agg	kāɲāàḍ	kāɲāāḍ-àgg	'bowel for hot foot'
	-EEgg	gəmūùr	gəmūūr-ììgg	'dove'

Same Pattern in Verbal Noun Plurals (Word Level)

Table 54: Verbal noun tone changes

Root tone melody	Verbal noun tone melody
L, HL, ML	ML
all other melodies	M

(92) **Verbal noun plural clitics *=Agg, =gg***

	Root tone	INF	VN tone	VN SG	VN PL	
(a)	H	pál-l	M	pāl	pāl=āgg, pāl=g	'cut'
(b)	M	bēl-l	M	bēl	bēl=āgg, bēl=g	'possess'
(c)	L	f ɛ̀l-l	ML	f ɛ̄l	fɛ̄l=āgg, f ɛ̄l=g	'tell'
(d)	HL	pîr-r	ML	pr̄	pīr=ə̀gg, pr̄=g	'deceive'
(e)	HM	bɛ́l-l	M	bēl	bēl=āgg	'name'
(f)	ML	dɔ̄ɔ̀s-s	ML	---	dɔ̄gs=ɔ̀gg	'stand'
(g)	MH	kə̋ð-ð	M	kān	kāð=əgg	'strike'

Aggressive Simplification in the Continuous (Stem Level)

(43) **Continuous non-past forms -*Án* (H) with various root tone melodies**

	Root tone	CONT.N 1sN	CONT.N 3sN	CONT.N 3pN	
(a)	H	fír-ə̄n	fír-ə́n	fír-ə̂n	'smell'
(b)	M	cɔ̄r-á̄n	cɔ̄r-án	cɔ̄r-ân	'help'
(c)	L	ḍ̰ùr-ən	ḍ̰ùr-ə̀n	ḍ̰ūr-ən	'bury'
(d)	HL	pə́r-ən	pə́r-ə̀n	pə́r-ən	'attach'
(e)	HM	bɛ́l-ān	bɛ́l-ān	bɛ́l-àn	'name'
(f)	ML	dɔ̄ɔ̀s-ān	dɔ̄ɔ̀s-ān	dɔ̄ɔ̀s-àn	'stand'
(g)	MH	kə̆ð-ə̄n	kə̆ð-ə́n	kə̆ð-ân	'strike'

Word-Level: No Aggressive Tone Simplification

(80) **Perfect *-CA̲r* on third singular incompletive verbs**

	Root tone	INCP 3sN	PF INCP 3SN	
(a)	H	fír	fír-rər	'smell'
(b)	M	cōr	cōr-rár	'help'
(c)	L	ḍùr	ḍùr-rər	'bury'
(d)	HL	pə́r	pər-rər	'attach'
(e)	HM	bɛ́l	bɛl-lár	'name'
(f)	ML	dɔ̄̀s	dɔ̄ɔs-sər	'stand'
(g)	MH	kə̄ð	kə̄ð-ðər	'strike'

(38) **Locative/Dative clitic *=Án***
on consonant-final singular nouns with various tone melodies

Tone	N SG	N PL	LCM/DAT N SG	LCM/DAT N PL	
H	wáár	wáār-g	wáár=ān	wáār-g=ān	'insect type'
M	ḍəm	ḍəm-g	ḍəm=ən	ḍəm-g=ən	'Arab'
L	kààm	kààm-g	kààm=ān	kààm-g=ān	'cow type'
HL	séèn	séèn-g	séèn=ān	séèn-g=ān	'ruler'
HM	ɟórgāāl	ɟórgāāl-g	ɟórgāāl=ān	ɟórgāāl-g=ān	'bird type'
ML	kōðèl	kōðèl-g	kōðèl=ān	kōðèl-g=ān	'baboon'
LH	àggáár	àggáār-g	àggáár=ān	àggáār-g=ān	'hunter, rider'
LM	gɔ̀ēn	gɔ̀ēn-g	gɔ̀ēn=ān	gɔ̀ēn-g=ān	'metal worker'
MH	bāár	bāár-g	bāár=ān	bāár-g=ān	'tribe member'

Stem Level: No Simplification to Light Syllables

(35) **Completive forms with various root tone melodies**

	Root tone	COMP 1SN	COMP 3SN	COMP 3PN	
(a)	H	fír-sə̄	fír-sə́	fír-sə̀	'smell'
(b)	M	cɔ̄r-sɔ̄	cɔ̄r-sɔ́	cɔ̄r-sɔ̀	'help'
(c)	L	ḍùr-sù	ḍùr-sū	ḍūr-sù	'bury'
(d)	HL	pə̂r-sə̀	pə̂r-sə̄	pə̂r-sə̀	'attach'
(e)	HM	bɛ́l-ḍā	bɛ́l-ḍá	bɛ̂l-ḍà	'name'
(f)	ML	dɔ̄ɔ̀s-sɔ̀	dɔ̄ɔ̀s-sɔ̄	dɔ̄ɔ̀s-sɔ̀	'stand'
(g)	MH	kə̋s-sə̄	kə̋s-sə́	kə̋s-sə̀	'strike'

Stratal Organization

Stem Level

- **Aggressive:** Simplification of some contours affects syllables prespecified for tone
- **Weight-sensitive:** Simplification only shifts tone to heavy syllables

Word Level

- **Opportunistic:** Simplification of contours only affects toneless syllables
- **Weight-insensitive:** Simplification affects all syllables

Shifting+Simplification in Antipassives (Stem Level)

Table 43: Antipassive tone changes

Root tone melody	Antipassive root tone melody
H	HM
M	MH
L	LH
HL, HM, ML, MH	no change

(59) **Antipassive suffix *–An* on third singular completive verbs**

	Root tone	3sN COMP	ANTIP tone	3SN ANTIP COMP	
(a)	H	fír-sə́	HM	fír-ən-sə́	'smell'
(b)	M	cɔ̄r-sɔ́	MH	cɔ̄r-ɔ́n-sɔ́	'help'
©	L	ḍùr-sū	LH	ḍùr-ūn-sú	'bury'
(d)	HL	pə̂r-sə̄	HL	pə́r-ən-sə̄	'attach'
(e)	HM	bɛ̋l-ḍá	HM	bɛ́l-ān-sá	'name'
(f)	ML	bŭŋ-sū	ML	būŋ-ḍ-ùn-sū	'make-big'
(g)	MH	kə̌s-sə́	MH	kə̄ð-ə́n-sə́	'strike'

Constraints on Tone Simplification

*$\underline{\text{CONTOUR}}_{\text{HL}}$	Assign $*$ to every phonetic melody tone contour HL associated to a single syllable
*$\underline{\text{CONTOUR}}$	Assign $*$ to every phonetic tone contour associated to a single syllable
*$\text{CONTOUR}_{\text{light}}$	Assign $*$ to every tone contour associated to a single light syllable
τ-LIN	Assign $*$ to every melody tone which is syllable-initial in the input, but not in the output

Stem-Level Tone Simplification: HL

Completive:

Input: = b.	*CONT$_{light}$	*CONT$_{HL}$	*CONT
a. fir$_{H}$ sə$_{L}$	*!		
☞ b. fir$_{HL}$ sə		*	*

Antipassive:

Input: = b.	*CONT$_{light}$	*CONT$_{HL}$	*CONT
☞ a. fir$_{H}$ ən$_{L(h)}$			
b. fir$_{HL}$ ən$_{h}$		*	*

Continuous:

Input: = b.	*CONT$_{light}$	*CONT$_{HL}$	*CONT
☞ a. fir$_{H}$ ən$_{L(H)}$			*
b. fir$_{HL}$ ən$_{H}$		*	*

Stem-Level Tone Simplification: ML

Completive:

Input: = b.	*CONT$_{light}$	*CONT$_{HL}$	*CONT	τ-LIN |
a. fir$_{M}$ sə$_{L}$	*!			
☞ b. fir$_{ML}$ sə			*	

Antipassive:

Input: = b.	*CONT$_{light}$	*CONT$_{HL}$	*CONT	τ-LIN
☞ a. fir$_{M}$ ən$_{L(h)}$				
b. fir$_{ML}$ ən$_{h}$			*!	

Continuous:

Input: = b.	*CONT$_{light}$	*CONT$_{HL}$	*CONT	τ-LIN
a. fir$_{M}$ ən$_{L(H)}$			*	*!*
☞ b. fir$_{ML}$ ən$_{H}$			*	

Word-Level Tone Simplification:

Perfect:

Input: = b.	τ-LIN	*CONT	*$\text{CONT}_{\text{light}}$	*CONT_{HL}
a. pər_{H} rər_{LH}	*!	*		
☞ b. pər_{HL} rər_{H}		*		*

Plural:

Input: = b.	τ-LIN	*CONT	*$\text{CONT}_{\text{light}}$	*CONT_{HL}
☞ a. pir_{H} əg_{L}				
b. pir_{HL} əg		*!		*

Summary

Featural Affixation uses:

- same **mechanisms** as spreading
- same **featural representations**
- same morphophonological **strata**

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Overview