

Mayak [ATR]-Harmony and Vowel Raising (Andersen 1999:16)

Chain-shifting mutation as compound opacity:
vowel raising in Mayak

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Andersen's (1999) Claim:

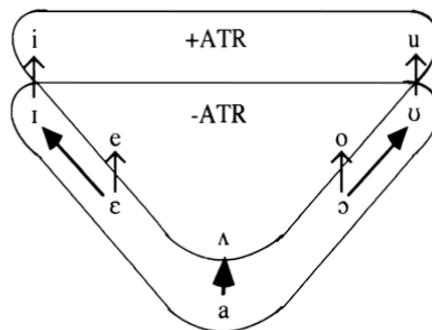
[ATR]-Harmony: is a regular phonological process

Vowel Raising: is an idiosyncratic morphological process triggered by specific affixes

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Mayak: [ATR]-Harmony and Vowel Raising (Andersen 1999:16)

	Past	AP
	[i] ʔiɬ	ʔið-u ʔiɬ-ir
	[ɛ] dɛc	dɛj-u dɛj-ir
[-ATR]	[a] ʔam	ʔam-u ʔam-ir
	[ɔ] kɔc	koj-u koj-ir
	[u] guɬ	guð-u guɬ-ir
[+ATR]	[i] tiŋ	tiŋ-u tiŋ-ir
	[ʌ] nʌk	nʌɣ-u nʌk-ir
	[u] tuc	tuj-u tuc-ir



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Theoretical Problems Raised by Vowel Raising

- It cannot be vowel harmony since ...
 - it affects vowels inconsistently (wrt $[\pm\text{ATR}]$ or $[\pm\text{high}]$)
 - Vowel harmony is vowel harmony

- It cannot be sonority affixation since it ...
 - it affects vowels inconsistently
 - decreases/not raises vowel sonority
 - ...

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Claims of this Talk

- Vowel Raising is Stem-Level vowel harmony and differs from “regular” Word-Level vowel harmony
 - > Opacity by Strata

- Inconsistency of Vowel Raising results from generalized constraints on underlying mid vowels, which are high on the surface
 - > Opacity by Containment

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Roadmap for the Talk

- 1 Background
 - Mayak
 - Theoretical Assumptions

- 2 Vowel Raising as Stem-Level Harmony
 - The General Picture
 - Different Affix Types

- 3 Stem-Level vs. Word-Level Phonology
 - Stem-Level vs. Word-Level Harmony
 - More Differences of Word-Level and Stem-Level

- 4 Summary

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Background

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More on Mayak

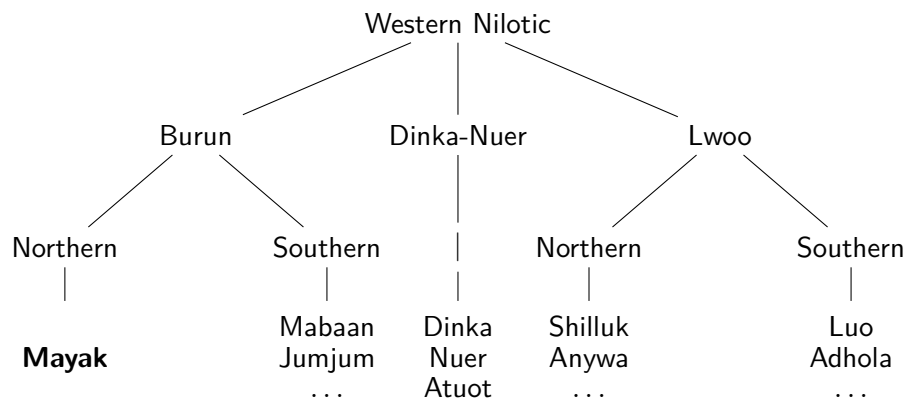
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Mayak

- Western Nilotic language of the Northern Burun sub-branch
- spoken in the Southern part of Blue Nile province in Southern Sudan
- Rich non-concatenative morphology, (tone, vowel quality, segmental features of Cs), but also a rich inventory of monosyllabic affixes
- All data in this talk from the fieldwork of Andersen (1999,2000)

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Western Nilotic Languages



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Mayak Phonology

- Complex tone system (systematically neglected here)
- Complex [-]-dominant vowel harmony
- Canonical shape of lexical roots: (C)VC
Canonical shape of suffixes: -(C)V or subsegmental

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Theoretical Assumptions

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Theoretical Assumptions

- **Stratal OT:** 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)
Underlying material (i.e. nodes and association lines) is never literally deleted, but retained in the output, and marked as phonetically invisible.
- **Doubling:** (cf. Doubling in Correspondence Theory, McCarthy & Prince 1995)
All markedness constraints are assumed to exist in two versions, one referring only to phonetically visible material, and one to all material in a given structure.

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Representation of Association (Zimmermann & Trommer 2011)

Morphological association relations		Epenthetic association relations
phonetically visible:	phonetically invisible:	phonetically visible:
X	X	X
	⊕	⋮
Y	Y	Y

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Axiom of Phonetic Visibility (Zimmermann & Trommer 2011)

A phonological node is visible to phonetics

if and only if

it is dominated by the designated ancestor node of the structure

through an uninterrupted path of phonetic association lines

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The Cloning Hypothesis

Every markedness constraint exists in 2 incarnations:

The **general clone** refers to all structure in I

The **phonetic clone** refers only to structure in P

(cf. Doubling in Correspondence Theory, McCarthy & Prince 1995)

Vowel Raising as Stem-Level Harmony

Vowel Raising as Stem-Level Harmony

- Vowel Raising is the result of two independent Stem-Level processes: [high]-Harmony and [ATR]-harmony
- The interaction of both processes is opaque due to a generalized (containment-based) ban on mid [+ATR] vowels
- [high]-harmony is restricted to Stem-Level affixation

Stem-Level [ATR]-harmony works differently from Word-Level [ATR]-harmony

The General Picture

[high]-Harmony

	SG	PL	
a.	d̥ɔ:l	d̥ɔ:l-d̥ɪn	'anus'
b.	gɛ:l	gɪl-d̥ɪn	'lion'
b.	ja:ŋ	jʌŋ-uk	'crocodile'
c.	mʌ:l	mʌl-uk	'leg of calf'
d.	d̥ɪr	d̥ɪr-uk	'shield'
e.	bul	bul-uk	'stomach'

Mid (stem) vowels get high before high (suffix) vowels

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[ATR]-Harmony

	SG	PL	
a.	d̥ɪr	d̥ɪr-uk	'shield'
b.	bul	bul-uk	'stomach'
c.	kɪlkʌt̥	kɪlk-u-t̥	'broom'
d.	kuɾ̥ɛr	kuɾ̥-u-r	'pig'
e.	ja:ŋ	jʌŋ-uk	'crocodile'
f.	mʌ:l	mʌl-uk	'leg of calf'

High and low [-] (stem) vowels get [-] before [-] (suffix) vowels

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Markedness-based Implementation of Vowel Harmony

- Harmony is triggered by constraints requiring an unmarked feature specification **F** for specific vowels
- Non-**F** vowels in isolation cannot become **F** due to the high-ranked constraint $DEP\ F$
- Non-**F** vowels associate to the **F** of adjacent **F**-vowels since this obviates **F**-Insertion/violation of $DEP\ F$

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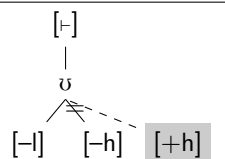
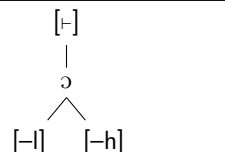
Constraints Governing [high]-Harmony

- a. $\begin{matrix} IE \\ \downarrow \\ [+h] \end{matrix}$ [-low] vowels should be [+high]
- b. $DEP\ [h]$ Don't insert $[\pm high]$
- c. $MAX\ \begin{matrix} \bullet \\ \downarrow \\ [h] \end{matrix}$ Pronounce association lines between segments and $[\pm high]$ features

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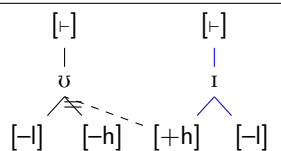
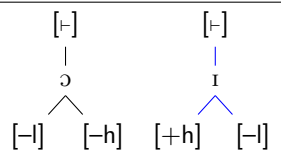
No [high]-Insertion ($j\text{ɔ}m \Rightarrow j\text{ɔ}m$)

Input: = b.

	DEP [h]	IE ↓ [+h]	MAX ↓ [h]
a. 	*!		*
b. 		*	

[high]-Harmony ($j\text{ɔ}m\text{-d}\text{ɪ}n \Rightarrow j\text{ɔ}m\text{-d}\text{ɪ}n$)

Input: = b.

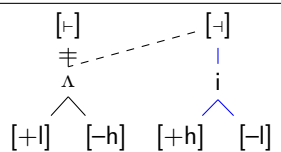
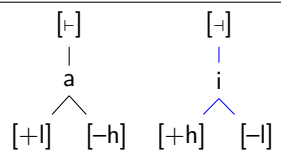
	DEP [h]	IE ↓ [+h]	MAX ↓ [h]
a. 			*
b. 		*!	

Constraints Governing [ATR]-Harmony

- a. \downarrow
V
[-] Vowels should be [-]
- b. DEP [+] Don't insert [-] or [+]
- c. MAX
 \downarrow
[-] Pronounce association lines between segments and [-] features

Regressive [ATR] Harmony ($m\text{a}:\text{c}\text{-it} \Rightarrow m\text{a}\text{c}\text{-it}$)

Input: = b.

	DEP [+]	V ↓ [-]	MAX ↓ [-]
a. 			*
b. 		*!	

Opacity of [ATR]-harmony

[-high]	[-high]	[+high]	[+high]
[-]	[-]	[-]	[-]

cɪ:m ⇒ cim

mɛ:k ⇒ miɣ

mɛ:k *⇒ miɣ

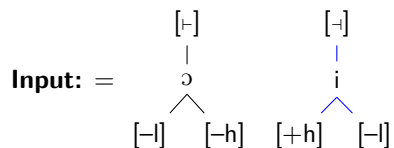
(mɛ:k *⇒ meɣ)

(⇒ a counter-feeding Chain Shift, cf. Bakovic 2011)

Blocking of [-] for (Underlying or Surface) Mid Vowels

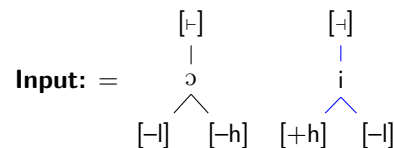
*E_±: Assign * to every V which is associated to [-high], [-low] and [-]

Blocking [ATR]-Harmony for Mid Vowels (ʔot-it *⇒ʔut-it)



	*E _± DEP [-]	V ↓ +	MAX _[-] ↓ +
a.		*	
b.	*!		*

Blocking [ATR]-Harmony for Mid Vowels (ʔot-it *⇒ʔut-it)



	*E _± DEP [-]	V ↓ +	MAX _[-] ↓ +
a.		*	
b.	*!		*

Licit [high]-Harmony for Mid Vowels (ʔət-it ⇒ ʔut-it)

Input: = b.

	*E _ɪ	DEP [h]	IE ↓ [+h]	MAX _[h]
a.				*
b.			*!	

Different Affix Types

A [-]-Vowel Affix: PL -it̩ (Andersen 2000:38)

- | | SG | PL | |
|----|------|---------|---------------|
| a. | ma:c | mΛj-it̩ | 'fire' |
| b. | pΛ:m | pΛm-it̩ | 'mountain' |
| c. | mɪŋ | miŋ-it̩ | 'deaf person' |
| d. | ki:n | kin-it̩ | 'mat' |

- -it̩ triggers both [high] (??) and [-]-harmony
- -it̩ is consistently [-] independently from the vowel of its base
- ⇒ the vowel of -it̩ is underlyingly [-]

A [-]-Vowel Affix: -din/-dɪn (Andersen 2000:38)

- | | SG | PL | |
|----|------|----------|---------|
| a. | dɔ:l | dɔ:l-dɪn | 'anus' |
| b. | gɛ:l | gɪl-dɪn | 'lion' |
| c. | ʔɪr | ʔɪr-dɪn | 'thief' |
| d. | run | run-dɪn | 'year' |

- -dɪn/-dɪn triggers [high]-, but not [-]-harmony
- -dɪn/-dɪn assimilates in [ATR] to the vowel of its base
- ⇒ the vowel of -dɪn/-dɪn is underlyingly [-]

A [-]-Vowel + Floating Affix: PL **-uk/-uk** (Andersen 2000:37)

	SG	PL	
a.	mɛ:k	mɪɣ-uk	'spider'
b.	gɔ:c	gɔj-uk	'bowl'
c.	mΔ:l	mΔl-uk	'leg of calf'
d.	ɖir	ɖir-uk	'shield'
e.	ja:ŋ	jΔŋ-uk	'crocodile'
f.	cɪ:m-a	cim-uk	'knife'

- uk/-uk triggers [high]-harmony
- uk/-uk assimilates in [ATR] to [-] base vowels but triggers [-] in non-mid base vowels
- ⇒ the vowel of **-uk/-uk** is underlyingly [-] and bears an additional floating -

Stem-Level Affix Types in Mayak

	Representation	undergoes [-]-harmony	triggers [high]-harmony	triggers [-]-harmony
a. -ɖin/-ɖin	<pre> [-] I / \ [+h] [-] </pre>	+	+	-
b. -it	<pre> [-] i / \ [+h] [-] </pre>	-	+	+
c. -uk/-uk -u-/-u-	<pre> [-] [-] u / \ [+h] [-] </pre>	+	+	+

Progressive [ATR] Harmony (run-ɖin ⇒ run-ɖin)

Input: = b.

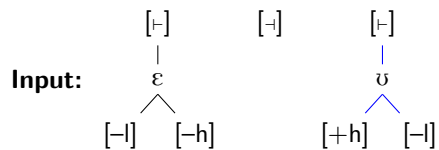
	DEP -	V ↓ -	MAX ↓ -	
a.	<pre> [-] [-] u i / \ / \ [-] [+h] [+h] [-] </pre>			*
b.	<pre> [-] [-] u I / \ / \ [-] [+h] [+h] [-] </pre>		*!	

Association of Floating Affix (cɪ:m-uk ⇒ cim-uk)

Input: = b.

	*E -	DEP -	V ↓ -	MAX ↓ -
a.	<pre> [-] [-] [-] i u u / \ / \ / \ [-] [+h] [+h] [-] [+h] [-] </pre>			**
b.	<pre> [-] [-] [-] I u u / \ / \ / \ [-] [+h] [+h] [-] [+h] [-] </pre>		*!*	

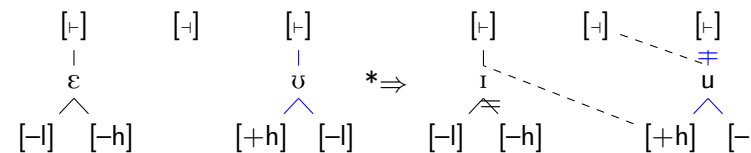
Non-Association of Floating \uparrow ($m\epsilon k\text{-}\uparrow\text{-}\upsilon k \Rightarrow m\text{IY}\text{-}\upsilon k$)



	*E \uparrow	DEP $\uparrow\text{-}\uparrow$	V \downarrow \uparrow	MAX \downarrow $\uparrow\text{-}\uparrow$
a.			**	
b.	*!			**

Remaining Problem:

Why does floating \uparrow not always associate to the affix?

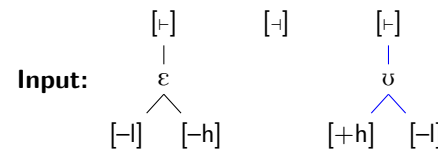


Solution: Constraint on Tautomorphic Association

Assign * to every $\uparrow\text{-}\uparrow$ node which is associated by an epenthetic line to a tautomorphic V but not to a heteromorphic V

\Rightarrow General constraint (type) which ensures that floating affix material associates to bases, not to the affix itself (Trommer 2011, Zimmermann 2012)

Non-Association of Floating \uparrow ($m\epsilon k\text{-}\uparrow\text{-}\upsilon k \Rightarrow m\text{IY}\text{-}\upsilon k$)



	DEP \uparrow \uparrow	*E \uparrow	DEP $\uparrow\text{-}\uparrow$	V \downarrow \uparrow	MAX \downarrow $\uparrow\text{-}\uparrow$
a.				**	
b.	*!			*	*

Stem-Level vs. Word-Level Phonology

Stem-Level vs. Word-Level Harmony

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Word-Level **Regressive** [-] Harmony (Andersen 1999:6)

	Underlying Root Vowel	Present Tense	Past Tense	
	[ɪ]	ʔɪɸ	ʔið-u	'shape'
	[ɛ]	dɛc	dɛj-u	'grind'
[-]	[ɔ]	kɔc	koj-u	'take'
	[ʊ]	ɡʊɸ	ɡuð-u	'untie'
	[a]	ʔam	ʔam-u	'eat'
	[i]	tiŋ	tiŋ-u	'hear'
[-]	[ʌ]	nʌk	nʌɣ-u	'beat'
	[u]	tuc	tuj-u	'send'

Non-low vowels get [-] before high [-] vowels

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Word-Level **Progressive** [-] Harmony (Andersen 1999:10)

	Underlying Root Vowel	Non poss.	1SG	2SG	3SG	
	[ɪ]	ɲɪn	ɲɪn-ɪ-k	ɲɪn-u-k	ɲɪn-ɛ-k	'eyes'
	[ɛ]	lɛk	lɛk-ɪ-k	lɛk-u-k	lɛk-ɛ-k	'teeth'
[-]	[a]	pal	pal-ɪ	pal-u	pal-ɛ	'navel'
	[ɔ]	wɔŋ	wɔŋ-ɪ	wɔŋ-u	wɔŋ-ɛ	'eye'
	[ʊ]	tɔk	tɔɣ-ɪ	tɔɣ-u	tɔɣ-ɛ	'outer mouth'
	[i]	ʔic	ʔid-ɪ	ʔid-u	ʔid-ɛ	'ear'
[-]	[u]	ʔuŋ	ʔuŋ-ɪ	ʔuŋ-u	ʔuŋ-ɛ	'knee'
	[ʌ]	ʔʌm	ʔʌm-ɪ	ʔʌm-u	ʔʌm-ɛ	'thigh'

High vowels get [-] after high [-] vowels

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Stem-Level vs. Word-Level Harmony

	Stem-Level	Word-Level
Regressive [high]-Harmony	+	-
Regressive $\uparrow\uparrow$ -harmony targets mid Vs	-	+
Regressive $\uparrow\uparrow$ -harmony targets low Vs	+	-
Low Vs trigger progressive $\uparrow\uparrow$ -harmony	+	-

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More Differences of Word-Level and Stem-Level Phonology in Mayak

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More Differences of Word-Level and Stem-Level

- Stem-Level affixes trigger shortening of stem vowels, Word-Level affixes don't
- Word-Level affixes may attach to nouns of any length, the combination of a Stem-Level number affix and its base is maximally bisyllabic
- Vowel Raising has exceptions (fails to apply to some base stems), Word-Level Harmony hasn't
- Mayak Antipassive (vowel Raising in verbs), also exhibits Stem-Level properties in its effects on stem consonants (Trommer 2011)

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Stem-Level V-Shortening & Bisyllabicity:

PL -uk/-ʊk (Andersen 2000:37)

	SG	PL	
a.	mɛ:k	mɪʏ-ʊk	'spider'
b.	gɔ:c	gʊj-ʊk	'bowl'
c.	mɔ:l	mɔl-uk	'leg of calf'
d.	ɖɪr	ɖɪr-uk	'shield'
e.	ja:ŋ	jɔŋ-uk	'crocodile'
f.	cɪ:ma	cɪm-uk	'knife'
c.	nɔ:c	nɔj-uk	'calf'
g.	bul	bul-uk	'stomach'
h.	pu:l	pul-uk	'well, pool'
j.	baɾɔ	boɾɔ-uk	'slave, servant'
k.	pura	pur-uk	'cloth'

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Stem-Level V-Shortening & Bisyllabicity:

PL -u-/-ü- (Andersen 2000:39)

	SG	PL	
a.	kɪlkaɫ	kɪlkuɫ	'broom'
b.	mɛɫɣaɫ	mɪɫɣuɫ	'shelf'
c.	rɛ:kɑɫ	rɪkuɫ	'pot type'
d.	kamal	komul	'girl'
e.	nana:ɳ	nʌnʌn	'snake'
f.	kawɪl	kowul	'sheep'
g.	ɖʌɫɖʌ:k	ɖʌɫɖuk	'fox'
h.	mɔrcɔŋ	mɔrcʊŋ	'horse'
i.	ɖɔŋɔɫ	ɖʊŋʊɫ	'cock'
j.	gʊɖɔŋ	gʊɖʊŋ	'bull'
k.	kuɫɛr	kuɫur	'pig'

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Summary

- Opaque (counter-feeding) chain-shifting Vowel Raising is derived by a generalized (containment-based) markedness constraint
- Idiosyncratic properties of Vowel Raising follow from the Stem-Level/Word-Level Architecture

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No Word-Level V-Shortening & Bisyllabicity:

PL -ni (Andersen 2000:39)

	SG	PL	
a.	gɪrɪŋɪ	gɪrɪŋɪ-ni	'hippopotamus'
b.	alma:laga	alma:laga-ni	'spoon'
c.	rʊɪɖ-a	rʊɪɖ-a-ni	'my grandfather'
d.	ba:b-a	ba:b-a-ni	'my father'

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Overview

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