Exceptional and derived environments in Assamese vowel harmony

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Main claim

Assamese vowel harmony with **exceptional triggers** and **exceptional undergoers** follows in an account without direct reference to morphology in the phonology:

1. exceptional triggers=**floating features**
2. exceptional undergoers=a marked structure is avoided if it is derived but preserved if it is underlying: a **gang effect in HG**
   (Legendre et al., 1990; Smolensky and Legendre, 2006)

Data

Assamese

- all data and generalizations from Mahanta (2008) and Mahanta (2012)

(1) *Vocalic inventory (Mahanta, 2012, 1111)*

	−back	+back	
+high,−low	i	u	+ATR
		ʊ	−ATR
−high,−low	e	o	+ATR
	ɛ	ɔ	−ATR
−high,+low		ɑ	−ATR

(/e/ and /o/ are only derived, never underlying)

Regressive [+ATR]-harmony

(2) *Suffix-triggered harmony (Mahanta, 2012, 1112+1113)*

a.	gʊl	'mix'	–i	guli	'to mix'
	pɛt	'belly'	–u	petu	'pot bellied'
b.	bɔsɔr	'year'	–i	bosori	'yearly'
	gɛrɛlɑ	'fat' (MASC)	–i	gereli	'fat' (FEM)
	bɔx	'settle'	–ɔ–ti	boxoti	'settlement'
	mɔr	'die'	–ɔ–ti	moroti	'cursed to die'

Regressive [+ATR]-harmony

(3) *No [–ATR] harmony (Mahanta, 2012, 1113)*

a.	bʰut	‘ghost’	–ɛ	bʰutɛ	‘ghost’ (Erg)
	kin	‘buy’	–ɛ	kinɛ	‘buy’ (Erg)
	pʰur	‘travel/roam’	–ʊ	pʰurʊ	‘travel/roam’ (1.Prs)
b.	gɔrɔm	‘hot’	–ɔt	gɔrɔmɔt	‘heat’ (Acc)
	pɔxɛk	‘week’	–ɔt	pɔxɛkɔt	‘week’ (Loc)

Opaque /ɑ/

- the **low vowel /ɑ/ is opaque** and blocks any further harmony to its left
- this opaque /ɑ/ can be in the stem (4-a) or the suffix (4-b)

(4) *Opaque low vowel /ɑ/ (Mahanta, 2012, 1119)*

a.	kɔpɑh	'cotton'	–i	kɔpɑhi	'made of cotton'
	zʊkɑr	'shake'	–i	zʊkɑri	'shake' (INF)
	bɛpɑr	'trade'	–i	bɛpɑri	'trader'
b.	lɛkʰ	'write'	–ɑru	lɛkʰɑru	'writer'
	gɔz	'grow'	–ɑli	gɔzɑli	'sprout'
	zʊn	'silver'	–ɑli	zʊnɑli	'silvery'

Exceptional triggers

- an /ɑ/ adjacent to the exceptional suffixes /-ijɑ/ and /-uwɑ/ is **unexpectedly raised** to a mid vowel and undergoes harmony

(5) *Exceptional raising (Mahanta, 2012, 1121)*

sɑl	'roof'	–ijɑ	solijɑ	'roof-ed'
dɑl	'branch'	–ijɑ	dolijɑ	'branch-ed'
mɑr	'beat' (Vb)	–ijɑ	morijɑ	'beat'
misɑ	'lie'	–ijɑ	misolijɑ	'liar'
kʰitɑp	'title'	–ijɑ	kʰitopijɑ	'renowned/titled'
dʰɑr	'debt'	–uwɑ	dʰoruwɑ	'debtor'

Exceptional raising and harmony: Local and not iterative

- the exceptional trigger suffixes only have an effect on an adjacent /ɑ/

(6) *Only adjacent /ɑ/'s as exceptional undergoers (Mahanta, 2012, 1121)*

pɑtɔl	'light'	–ijɑ	pɑtolijɑ	'lightly'
ɑpɔd	'danger'	–ijɑ	ɑpodijɑ	'in danger'
ɑbɔtɔr	'bad time'	–ijɑ	ɑbotorijɑ	'bad-timed'
ɑlɑx	'luxury'	–uwɑ	ɑloxuwɑ	'pampered'
ɑd^{h}ɑ	'half'	–uwɑ	ɑd^{h}oruwɑ	'halved'

Exceptional triggers: Regular triggers for [+ATR]-harmony

- in the absence of an adjacent /ɑ/, the two suffixes trigger regular [+ATR] harmony

(7) *Exceptional suffixes as regular triggers (Mahanta, 2012, 1120)*

dʰʊl	'drum'	–ijɑ	dʰulijɑ	'drummer'
sɔr	'slap'	–ijɑ	sorijɑ	'to slap'
bɔjɔx	'age'	–ijɑ	bojoxijɑ	'aged'
gʊbɔr	'dung'	–uwɑ	guboruwɑ	'kind of beetle found in dung'
mɛr	'wind'	–uwɑ	meruwɑ	'wind' (Caus)

Exceptional undergoers and fronting

- the vowels subject to exceptional raising **agree in frontness** with a preceding mid vowel

(8) *Exceptional progressive frontness harmony (Mahanta, 2012, 1132)*

a.	kɔpɑl	'destiny'	–ijɑ	kopolijɑ	'destined'
	bɔzɑr	'marketplace'	–uwɑ	bozoruwɑ	'cheap'
	pɔlɑx	'fertiliser'	–uwɑ	poloxuwɑ	'fertile'
b.	d^hɛmɑli	'play'	–ijɑ	d^hemelijɑ	'playful'
	ɛlɑh	'laziness'	–uwɑ	elehuwɑ	'lazy'
	kɛsɑ	'raw'	–uwɑ	keseluwɑ	'rawness'
	dɛkɑ	'youth (male)'	–uwɑ	dekeruwɑ	'youthfulness'

Exceptional undergoers and fronting

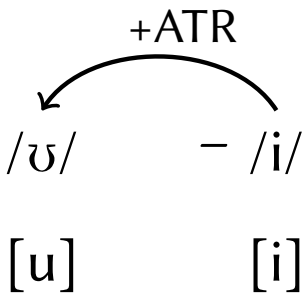
- **fronting only for phonologically derived mid** vowels, never for underlyingly mid ones

(9) *No fronting for underlying mid vowels (Mahanta, 2012, 1112+1134)*

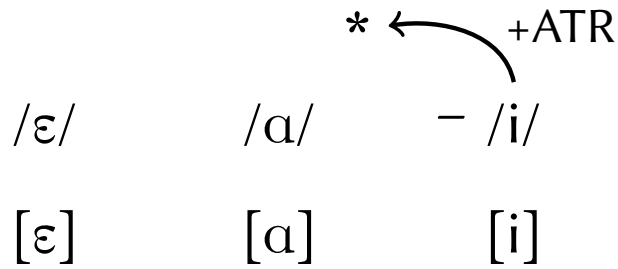
a.	bʰut	'ghost'	bʰutɛ	'ghost' ERG	*(highV+midV)*
	kʰʊz	'steps'	ekʰuzijɑ	'going slowly'	
b.	xɛh	'last'	xehotijɑ	'recent'	*(midV+midV)*
	kɔt	'inclining'	ekotijɑ	'inclining to one side'	
	pɔxɛk	'week'	pɔxɛkɔt	'week' Loc	
	bɛtɔn	'salary'			

Summary: The empirical picture

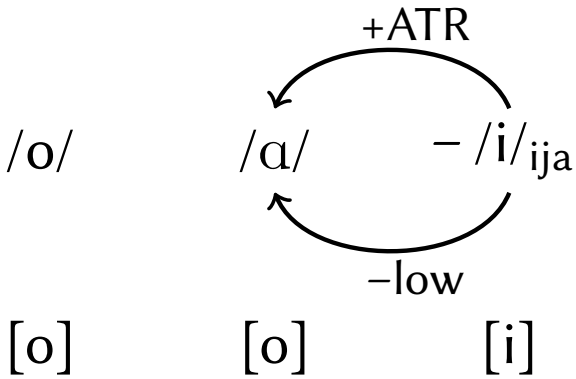
(10) *Regular ATR-Harmony*



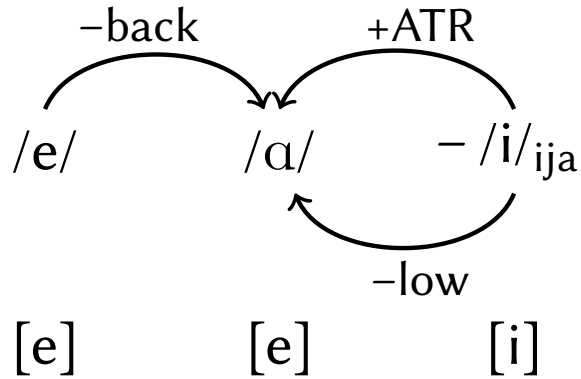
(11) *Opaque low vowel*



(12) *Exceptional trigger*



(13) *Exceptional undergoer*



Analysis

Background assumptions

- **Harmonic Grammar**

⇒ Weighted constraints (Smolensky and Legendre, 2006; Legendre et al., 1990)

- **Stratal OT**

⇒ Pre-optimization at the stem level ensures that all stems are (featurally) fully specified (cf. Trommer (2011))

- Autosegmental feature representations: MAX(F) **and** DEP(F) preserve feature specifications in correspondence theory (McCarthy and Prince, 1995)

(14) a. MAX(±F)
Assign a violation mark for every [±F] input feature without an output correspondent.

b. DEP(±F)
Assign a violation mark for every [±F] output feature without an input correspondent.

Regular harmony

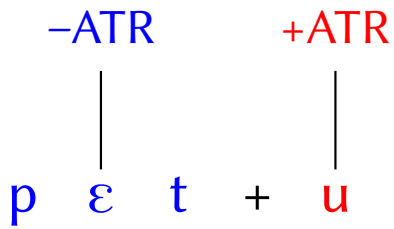
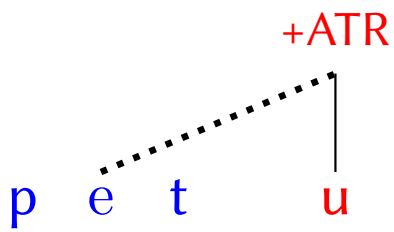
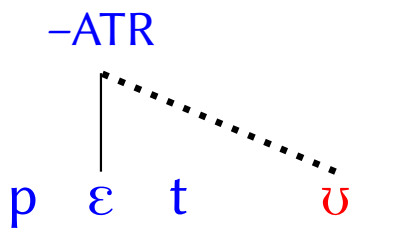
- Harmony is the result of **feature spreading**.
- Triggered by an **alignment constraint**, that aligns [+ATR]-features with the left edge of a prosodic word.
  (Kirchner, 1993; Akinlabi, 1994; Archangeli and Pulleyblank, 2002)
- It can only become active, when it **reduces markedness** by keeping the [-ATR]-features from being realized.

Constraints for regular harmony

(15) a. ALIGN([+ATR],ω,L)
Assign a violation mark for every [+ATR] feature that is not associated with the leftmost vowel in a prosodic word.

b. *[-ATR]
Assign a violation mark for every [-ATR] feature in the output.

(16) *Regressive harmony*

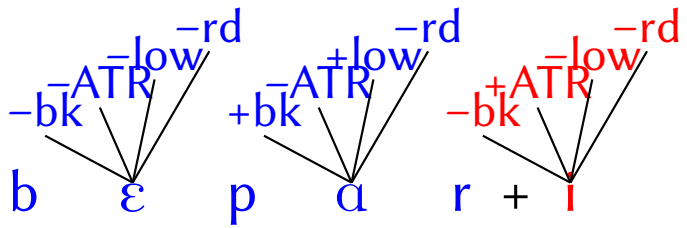
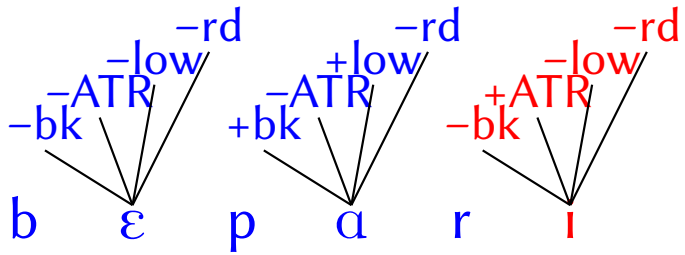
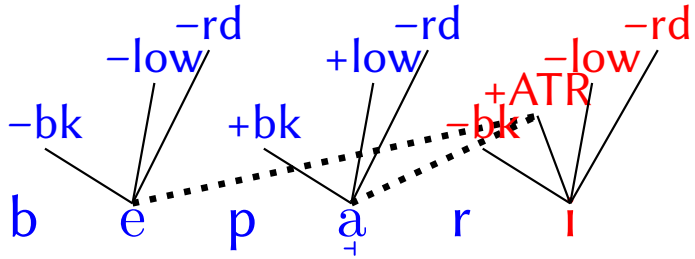
Input = a. W=	Max(±ATR) 5	*[-ATR] 4	Align 2	H=
a. 		-1	-1	-6
☞ b. 	-1			-5
c. 	-1	-1		-9

Opaque ɑ

- The opacity of /ɑ/ follows from a high ranked markedness constraint **against [+ATR,+low] vowels**.

(17) *[+ATR,+low]
Assign a violation mark for every vowel that is associated to [+ATR] and [+low].

(18) *Opaque* /ɑ/

	*[+ATR,+low]	Max(±ATR)	*[-ATR]	Align	
 W=	5	5	4	2	H=
☞ a. 			-2	-2	-12
b. 	-1	-2			-15

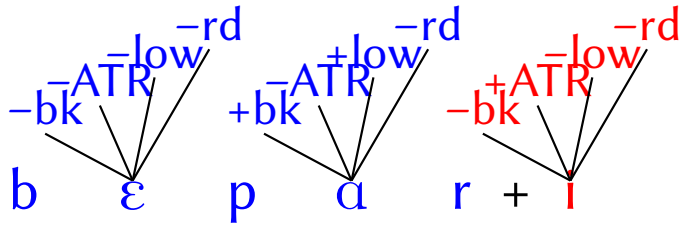
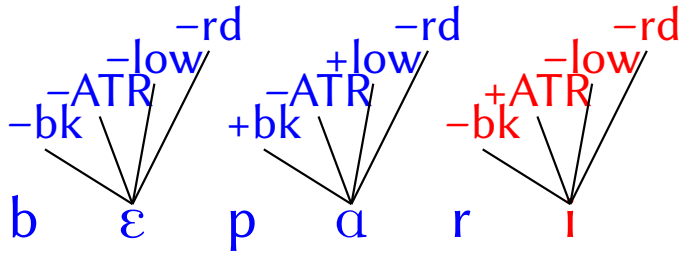
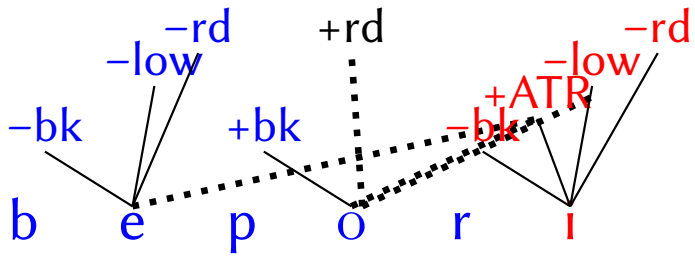
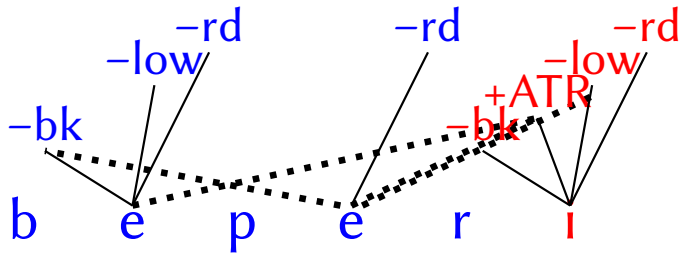
Constraints for opaque α

- Changing the [±low] feature would entail more violation, because either the [±back] or the [±round] value would have to be changed as well.

(19) a. *[+rd]
Assign a violation for every [+round]-feature in the output.

b. (Faith(±rd) = Dep(±rd) + Max(±rd))

(20) *Opaque* /ɑ/

	Max(bk)	Max(low)	Align	Faith(rd)	*[+rd]	
 W=	5	2	2	1	1	H=
☞ a. 			-2			-4
b. 		-1		-2	-1	-5
c. 	-1	-1				-7

Exceptional triggers: Floating features

- -/ija/ and -/uwa/ bear a **floating [-low]-feature** that strives to associate to a stem-final vowel.
- That **only an adjacent /ɑ/** can be raised follows mainly from the inviolable **ban on the crossing association lines**.
- The raised vowel can now undergo regular ATR-harmony.

(21) a. MaxFl
Assign a violation mark for every floating input feature without an output correspondent.

b. *Float
Assign a violation for every floating feature in the output.

(cf. Wolf (2007))

(22) *Exceptional raising*

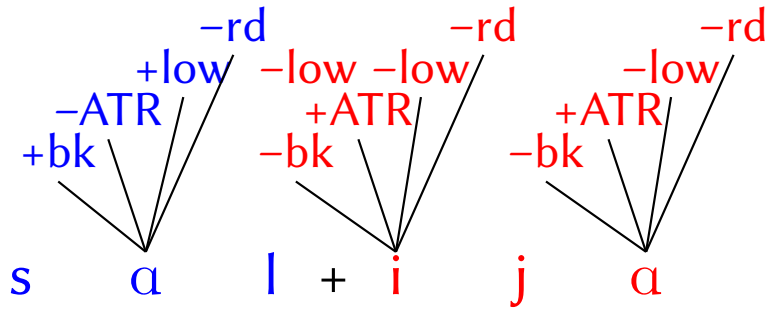
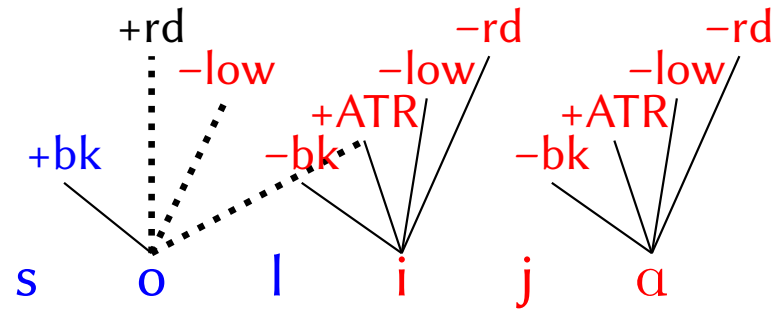
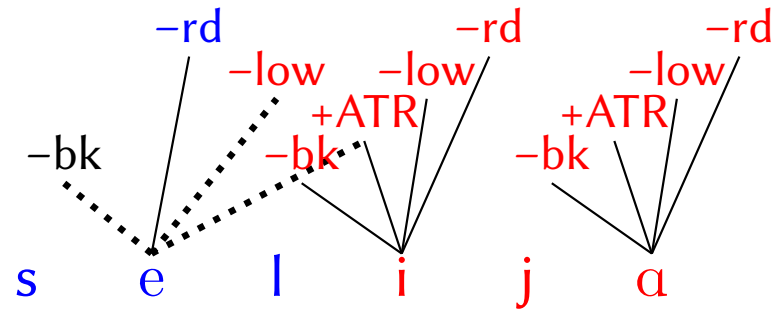
	MaxFL	*Float	Max(low)	
+low −low−low +low s ɑ l + i j ɑ W=	5	5	2	H=
a. +low −low +low s ɑ l i j ɑ	-1		-1	-7
b. +low −low−low +low s ɑ l i j ɑ		-1		-5
☞ c. −low−low +low s ɑ l i j ɑ			-1	-2

Exceptional triggers: Default realization

- Although [+bk] is marked, the /ɑ/ becomes /o/ in the default case since changing the [±back]-feature is too costly.

(23) *[+bk]
Assign a violation for every [+back]-feature in the output.

(24) *Exceptional raising: Back round vowel as default*

		Max(bk)	Faith(rd)	*[+rd]	*[+bk]	
	 W=	5	1	1	1	H=
☞ a.			-2	-1	-2	-5
b.		-1			-1	-6

Exceptional undergoers

- Exceptional harmony in derived environments is triggered by a SHARE **constraint that requires mid vowels to agree in backness**.

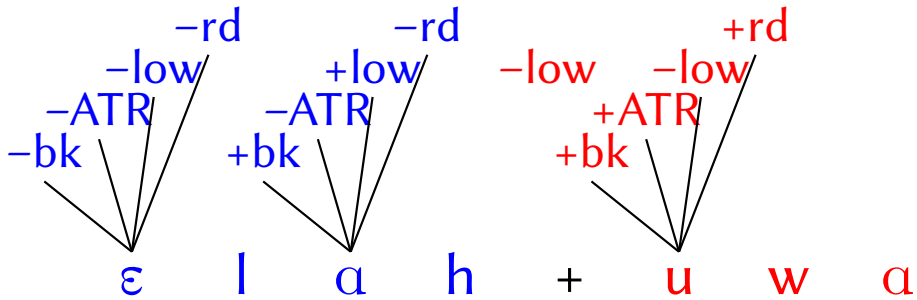
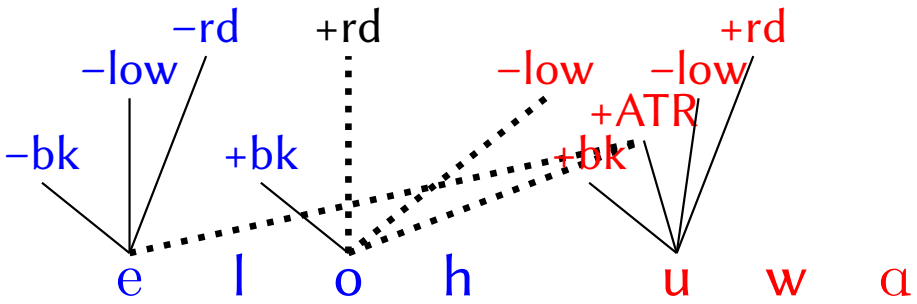
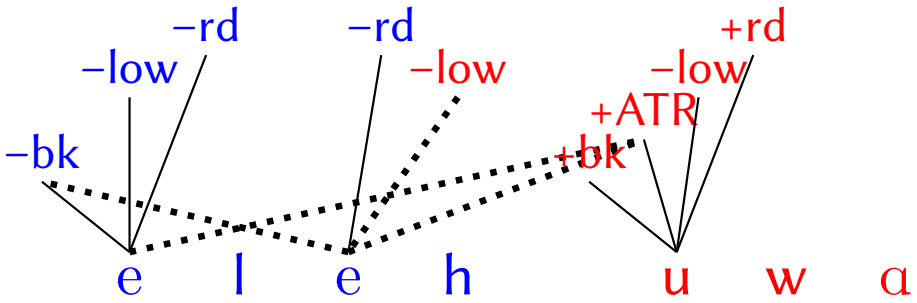
  (=Parasitic vowel harmony; cf. Jurgec, 2011, 2013)

(25) $\text{SHARE}^{[bk]}_{[\text{-hi,-lo}]}$

Assign a violation mark for every pair of [-high,-low] vowels in adjacent syllables that have a different [±back] value.

- In combination with the FAITH(rd), *[+rd] and *[+bk] it **gangs up against** MAX(bk).

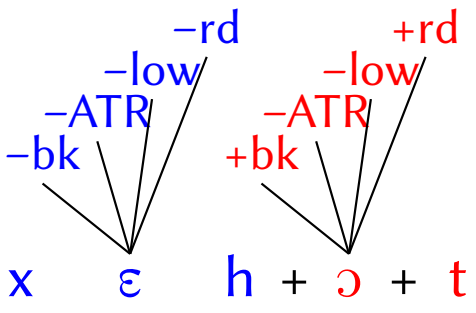
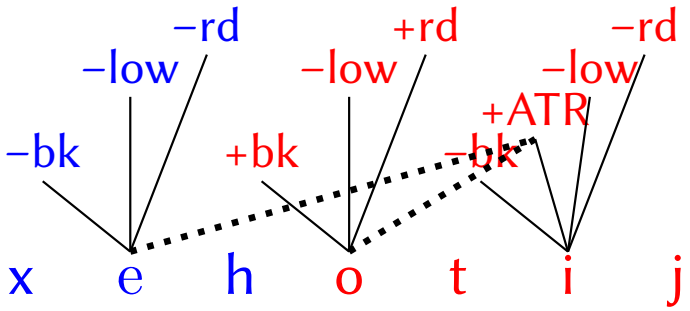
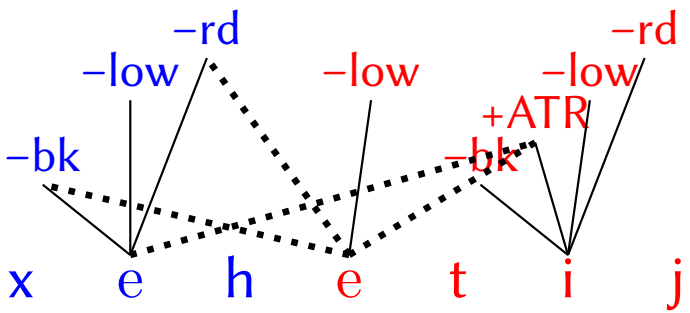
(26) *Exceptional harmony*

	Max(bk)	Share	Faith(rd)	*[+rd]	*[+bk]	
 W=	5	2	1	1	1	H=
a. 		-1	-2	-2	-3	-9
☞ b. 	-1			-1	-2	-8

Underlying /eCo/

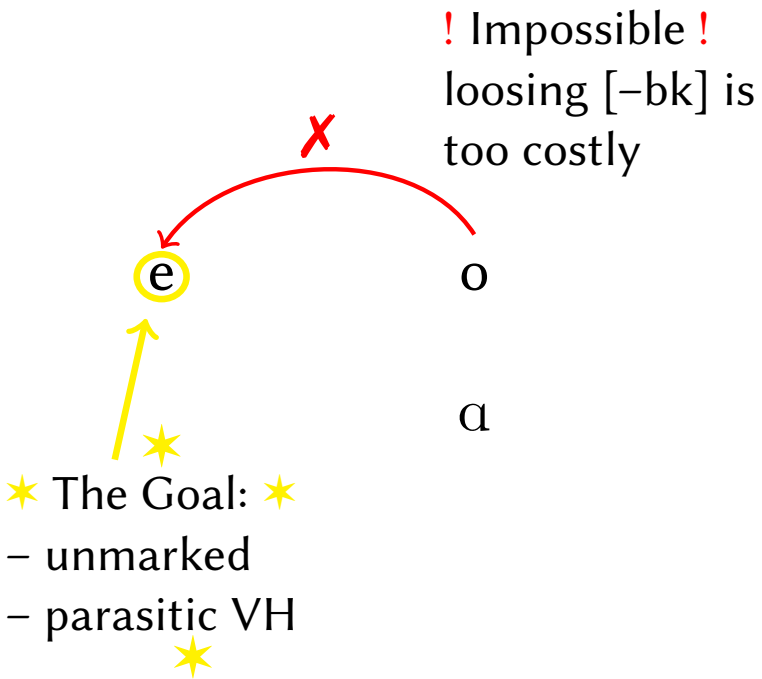
- Underlying mid back vowels do not front after /e/, because changing [±back] is too costly:
- It does not help to avoid a violation of Faith(±rd) – The faithful candidate has no Faith(±rd) violation.

(27) *Preservation of the backness specification for underlying mid vowels*

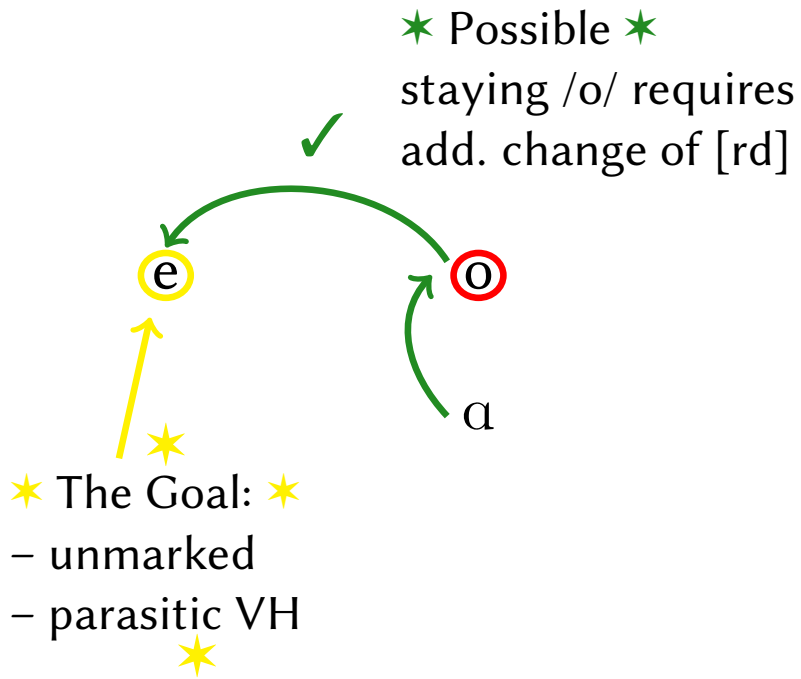
	Max(bk)	Share	Faith(rd)	*[+rd]	*[+bk]	
 W=	5	2	1	1	1	H=
☞ a. 		-1		-1	-2	-5
b. 	-1		-1		-1	-7

The gang effect

(28) *Underlying mid vowel*



(29) *Derived mid vowel*



All constraints with their weights

(30)

Markedness constraints	W=
*[+ATR,+low]	5
*Float	5
*[-ATR]	4
Align([+ATR],ω,L)	2
$\text{Share}^{[bk]}_{[-hi,-lo]}$	2
*[+bk]	1
*[+rd]	1

Faithfulness constraints	W=
Max(±bk)	5
Max(±ATR)	5
MaxFloat	5
Max(±low)	2
Dep(±rd)	1
Max(±rd)	1

(Constraint weights were calculated using OTHelp (Staubs et al., 2010))

Alternative: morpheme-specific constraints

The account in Mahanta (2012)

- directional 'agree' constraint *[–ATR][+ATR]
- exceptional triggers: lexically indexed constraints *[–ATR][+ATR]$_L$ ≫ Id[Lo] ≫ *[–ATR][+ATR]
- exceptional fronting: markedness avoidance effect (=License[–high,–low,+back])

Potentially problematic:

- ➙ **undergeneration**: the exceptional undergoers are not correctly predicted
- ➙ **economy**: specific morphological information is accessible in the phonology

Conclusion

Exceptional undergoer ∼ Phonologically Derived Enviroment Effect

- the gang effect responsible for the exceptional fronting is in fact the implementation of a **Phonologically Derived Enviroment Effect** (Kiparsky, 1973; Lubowicz, 2002; Burzio, 2011)

Possible extension to other instances of PDEE

- only a derived long vowel in Slovak undergoes diphtongization, an underlyingly long vowel is realized faithfully (31)

➙ **HG:** a marked long vowel *and* addition of a μ-association to a vowel is too much: diphtongization applies for mid vowels

(31) *PDEE in Slovak (Lubowicz, 2002)*

	/piv+μ/ 'beer' GEN.PL	/čel+μ/ 'forehead'	/dceːr+a/ 'daughter'
1. Affix-triggered V-lengthening:	piːv	čeːl	–
2. Diphtongization for mid V:	–	čiel	–
	[piːv]	[čiel]	[dceːra]

Slovak PDEE as a gang effect in HG

(32) *V: *and* DEPAL *gang up against* *DIPH

	MAX-μ	*DIPH	*V:	DEPAL(μ–V)	
W=	8	4	3	2	H=
/dce:r+a/					
☞ a. dce:ra			-1		-3
b. dciera		-1			-4
/čel+μ/					
a. čel	-1				-8
b. če:l			-1	-1	-5
☞ c. čiel		-1			-4

Summary

The complex pattern of vowel harmony in Assamese involving two levels of exceptionality follows in an account relying on **independently motivated mechanisms**:

- strengthening and extending the claim for **floating features** made for especially non-concatenative morphology (Zoll, 1996; Wolf, 2007)
- a **gang effect** in HG: deriving a marked structure is avoided whereas the same marked structure is preserved if underlying (=PDEE)

References

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