The role of phonological contrastivity in neutral harmony

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Argument

- Asymmetric inventory shape and blocking/skipping in harmony systems are closely linked
- This is predicted by Modified Contrastive Specification (MCS; Dresher, Piggott & Rice 1994; Dresher 2003, 2009)
- *But* the MCS approach fails to produce valid harmony pairs, such as in Yoruba RTR harmony
- Proposal: privative features

Outline

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Introduction: Vowel harmony

Harmony involves correspondence between all segments bearing a harmonizing feature

(1) **Yoruba (Atlantic-Congo)** (Archangeli & Pulleyblank 1989; Ọla Orie 2001, 2003; Dresher 2013, 2015)

ATR	ò.gè.dè̱	*ɔ̀.gɛ̀.dè̱	‘incantations’
RTR	ɔ̀.gɛ̀.dɛ̱̀	*ò.gè.dɛ̱̀	‘banana’

The role of contrast in vowel harmony

- Ekiti Yoruba has symmetric ATR/RTR contrasts (Ọla Orie 2003)
- Ifẹ Yoruba lacks RTR high vowels (Archangeli & Pulleyblank 1989; Ọla Orie 2001, 2003)

(2) **Non-low vowel inventory in Ekiti and Ifẹ Yoruba**

	ATR		RTR	
HIGH	i	u	ɪ	ʊ
MID	e	o	ɛ	ɔ

(a) **Ekiti Yoruba**

	ATR		RTR	
HIGH	i	u		
MID	e	o	ɛ	ɔ

(b) **Ifẹ Yoruba**

Inventory symmetries and vowel harmony

- Ekiti Yoruba paired mid and high vowels display full harmony
  - [RTR] /ɛ, ɔ, a, ɪ, ʊ/
  - [ATR] /e, o, i, u/

(3) **RTR/ATR paired Ekiti Yoruba mid vowels**

ATR	olẹ̀	*ɔlẹ̀	‘thief’
	òɡèdẹ̀	*ɔ̀ɡɛ̀dẹ̀	‘incantations’
RTR	ɔsɛ̣	*osɛ̣	‘soap’
	ɔ̀ɡɛ̀dɛ̣̀	*òɡèdɛ̣̀	‘banana’

(4) **RTR/ATR Ekiti Yoruba high vowels**

	Ekiti	
ATR	èbútẹ	‘harbor’
	eúro	‘bitter-leaf’
RTR	ɔrúkɔ	‘name’
	èlùbɔ́	‘yam flour’

Inventory asymmetries and vowel harmony

- Ifẹ Yoruba unpaired /i, u/ display neutral harmony
  - [RTR] /ɛ, ɔ, a /
  - [ATR] /e, o, i, u/

(5) **RTR/ATR paired Ifẹ Yoruba mid vowels**

ATR	olẹ̀	*ɔlẹ̀	‘thief’
	òg̀ẹ̀dẹ̀	*ɔ̀g̀ɛ̀dẹ̀	‘incantations’
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	ɔ̀g̀ɛ̀dɛ̀	*òg̀ẹ̀dɛ̀	‘banana’

(6) **RTR/ATR unpaired Ifẹ Yoruba high vowels**

ATR	èbútẹ́	*ɛ̀bútẹ́	‘harbor’
	eúro	*ɛ́úro	‘bitter-leaf’
RTR	ɔrúkɔ	*orúkɔ	‘name’
	ɛlùbɔ́	*ɛlùbɔ́	‘yam flour’

Phonological behavior and contrasts are linked

- There are differences in what kinds of vowels are phonologically relevant
  - [ATR] /e, o, i, u/ in Ekiti Yoruba
  - [ATR] /e, o/ in Ifẹ Yoruba

(7) **Phonologically relevant ATR/RTR vowels in Ekiti and Ifẹ Yoruba**

	ATR		RTR	
HIGH	i	u	ɪ	ʊ
MID	e	o	ɛ	ɔ

(a) **Ekiti Yoruba**

	ATR		RTR	
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(b) **Ifẹ Yoruba**

Neutral harmony variation

The link between phonological contrasts and disharmony is not one to one

- RTR/ATR unpaired high vowels display variation across Yoruba varieties

(8) **Yoruba skipping and blocking**

	Ifẹ Yoruba	Standard Yoruba	
a.	èbúé	èbúé	port
b.	ògùrò	ògùrò	stick for stirring
c.	ɔdídɛ	odídɛ	parrot
d.	ɛ̀lùbɔ́	èlùbɔ́	yam flour

- **Ifẹ Yoruba**: harmonic skipping: ɛ̀lùbɔ́
- **Standard Yoruba**: harmonic blocking: èlùbɔ́

Outline

Why are inventory shapes and harmonic behaviors related?

Modified Contrastive Specification (MCS; Dresher, Piggott & Rice 1994; Dresher 2003, 2009)

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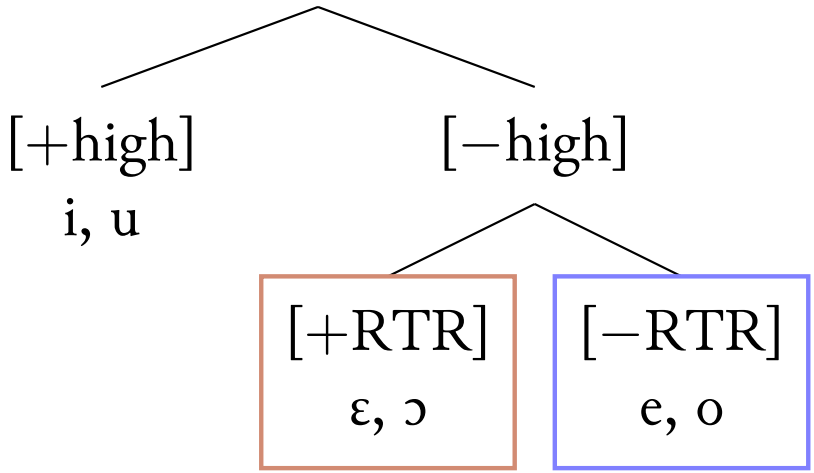
- phonological features specified according to hierarchical divisions of a language's sound inventory

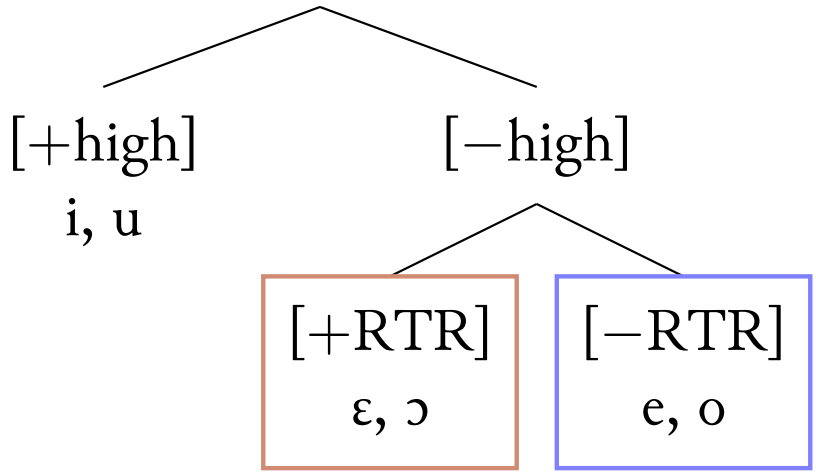


Example feature hierarchy

Why are inventory shapes and harmonic behaviors related?

Modified Contrastive Specification (MCS; Dresher, Piggott & Rice 1994; Dresher 2003, 2009)

- phonological features specified according to hierarchical divisions of a language's sound inventory
- variation in neutral harmony are representationally derived



Example feature hierarchy

MCS architectural assumptions

Three principle components

1. Contrastivist Hypothesis (Hall 2007, Dresher 2009): only those features which serve to distinguish segments in the underlying sound inventory may be phonologically active
2. Successive Division Algorithm (SDA; Dresher 2009): sound inventories are divided into binary feature classes
3. Feature ordering: the relative hierarchical ranking of features is cross-linguistically variable

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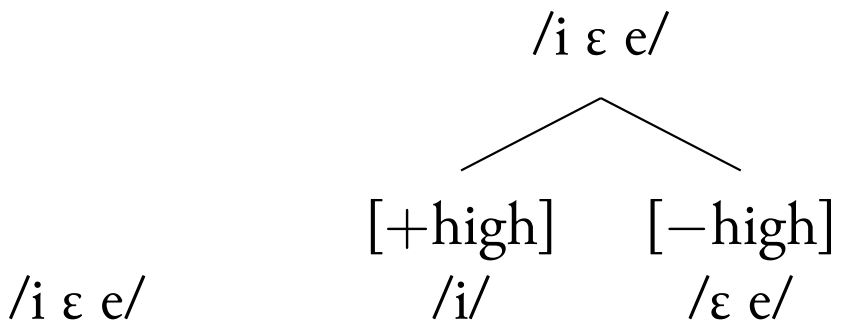

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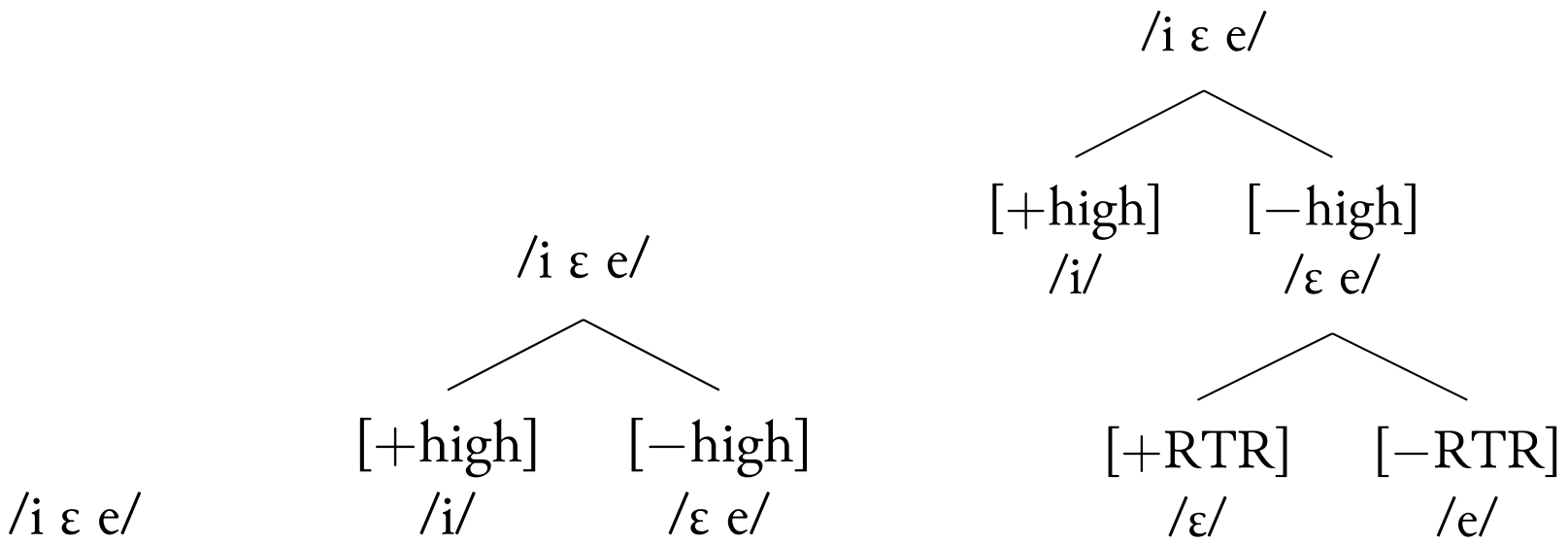

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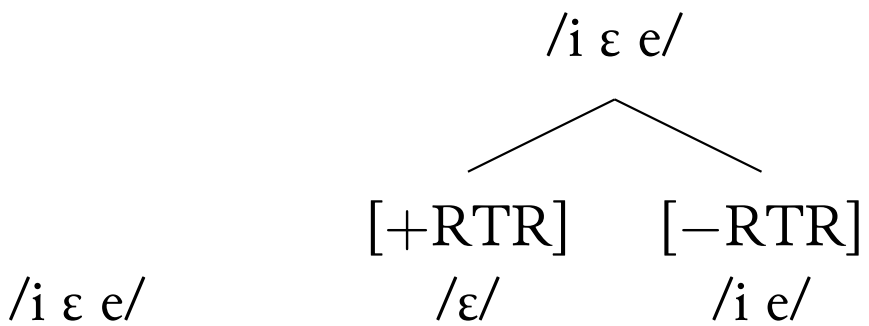

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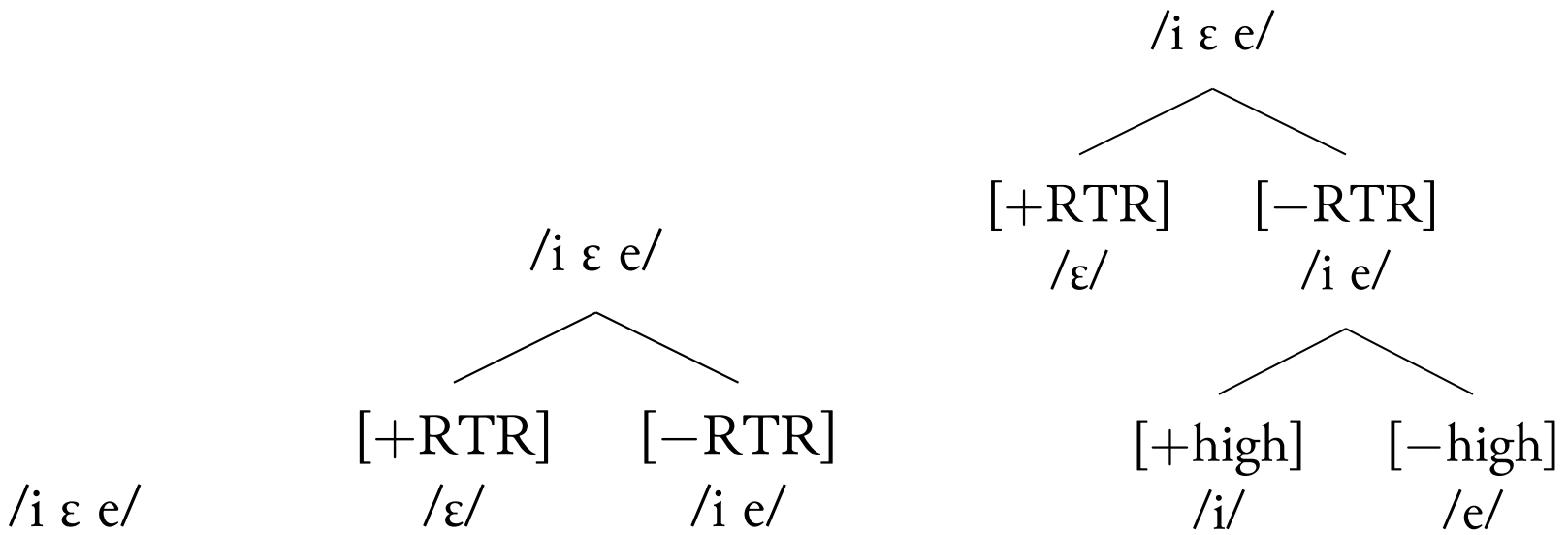

Representational motivations: phonological activity

- Phonological behavior is influenced by feature scope and vice versa

(9) **[RTR] contrasts in Yoruba**

[RTR]	ɔkɔ̲	husband
[ATR]	okọ̲	farm

ATR	e	o
RTR	ɛ	ɔ

[RTR]

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high		i	u
non-high	ATR	e	o
	RTR	ɛ	ɔ

[high] > [RTR]

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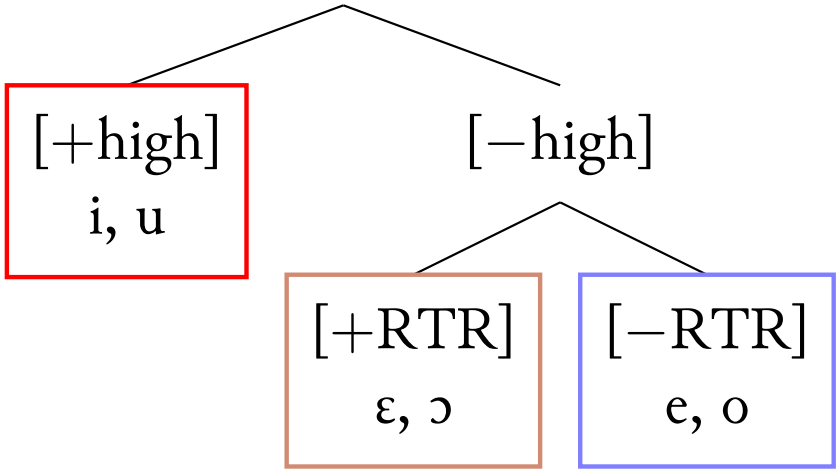
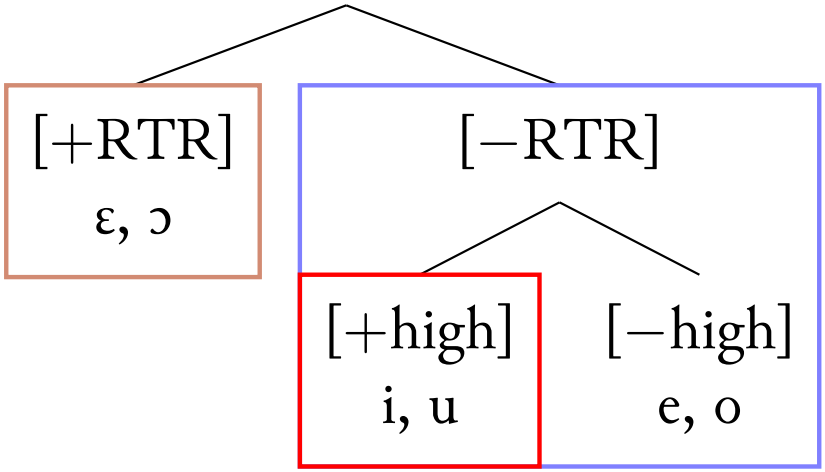
[RTR] > [high]

Yoruba contrastive feature hierarchies





[+high]		i	u
[−high]	[+RTR]	e	o
	[−RTR]	ɛ	ɔ

[high] > [RTR] (Ifẹ Yoruba)

−RTR	[+high]	i	u
	[−high]	e	o
[+RTR]		ɛ	ɔ

[RTR] > [high] (Standard Yoruba)

Strictly representational account of neutral harmony variation

- The MCS approach treats cross-dialectal variation in Yoruba simply as differences in feature categorization
  - Yoruba harmony principle: spread [RTR] leftwards

Ifẹ Yoruba transparency

/è lù bɔ́/
[−high] [+high] [−high]
[+RTR] ← ← ← [+RTR]
[ɛ lù bɔ́]

	i	ɛ	e
[high]	+	−	−
[RTR]		+	−

(a) **Ifẹ Y.: [high] > [RTR]**

Standard Yoruba blocking

/è lù bɔ́/
[−RTR] ← [−**RTR**] ↚ [+RTR]
[−high] [+high]
[è lù bɔ́]

	ɛ	i	e
[RTR]	+	−	−
[high]		+	−

(b) **Standard Y.: [RTR] > [high]**

MCS advantages

The MCS approach has a number of qualities that are worth pursuing:

- provides a natural motivation for neutral harmony
- makes a narrow set of testable predictions and provides a good typological fit
- allows for a very economical grammatical model of basic harmony patterns

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Preview: challenges and solutions to the MCS approach

There are a number of basic problems in MCS

- MCS cannot produce valid harmony alternates within asymmetric inventory shapes
  - leads to featurally incongruent harmony pairs:
    e.g. [−RTR, −**high**] /e/ — [+RTR, −**low**] /ɛ/ in Standard Yoruba

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The problem with asymmetric inventories

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- Yoruba high vowels /i, u/–*/ɪ, ʊ/
  - skipping (transparent) in Ifẹ Yoruba
  - blocking (opaque) in Standard Yoruba

(8) **Skipping and blocking high vowels in Yoruba**

	Ifẹ	Standard	
ATR	èbútḛ́	èbútḛ́	‘port’
	ògùrṍ	ògùrṍ	‘stick for stirring’
RTR	ɔdídɛ̱	odídɛ̱	‘parrot’
	ɛ̀lùbɔ̱́	èlùbɔ̱́	‘yam flour’

The problem with asymmetric inventories

- Yoruba low /a/–*/ə/

(10) **Non-alternating low /a/ (*/ə/)**

ATR	arè̲	*ərè̲	crown
	ahoro̲	*əhoro̲	ruins
RTR	àgbɛ̀dɛ̲		blacksmith
	abɔ̲		female

The problem with asymmetric inventories

- Yoruba low /a/–*/ə/
  - harmonic (visible) across all Yoruba dialects

(10) **Non-alternating low /a/ (*/ə/)**

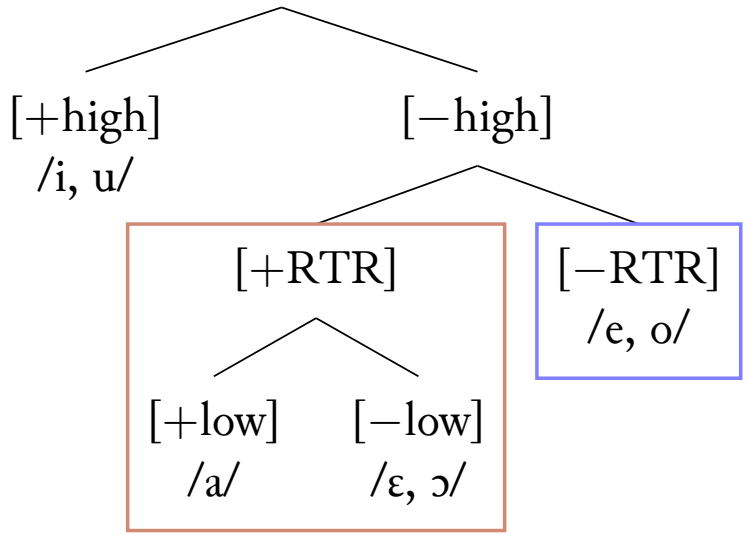
ATR	arè	*ərè	crown
	ahoro	*əhoro	ruins
RTR	àgbɛ̀dɛ		blacksmith
	abɔ		female

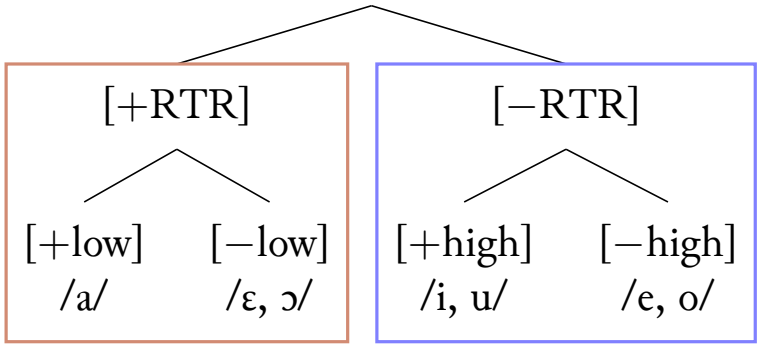
(11) **Non-alternating low /a/ is harmonic trigger**

ɔba	*oba	king
ɛ̀pà	*èpà	peanut
ɔ̀yàyà	*òyàyà	cheerfulness
ɛrɛ́ta	*eréta	place of ogun
		worship in Ifẹ

Ifẹ and Standard Yoruba contrastive feature hierarchies

(12)





+high			i	u
−high	−RTR		e	o
	+RTR	−low	ɛ	ɔ
		+low	a	

(a) **Ifẹ Yoruba: [high] > [RTR]**

−RTR	+high	i	u
	−high	e	o
+RTR	−low	ɛ	ɔ
	+low	a	

(b) **Standard Yoruba: [RTR] > [high]**

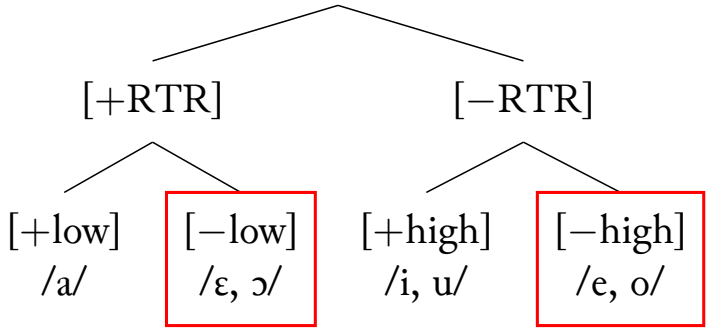
Incompatible harmony pairs

Contrastive feature hierarchies produce featurally incompatible harmonic pairs in asymmetric inventories

- E.g. Standard Yoruba mid vowels

(13) **Incongruent binary harmony pairs**

/i, u/	/e, o/	/ɛ, ɔ/	/a/
[−RTR]	[−RTR]	[+RTR]	[+RTR]
[+high]	[−**high**]	[−**low**]	[+low]



Incompatible harmony pairs

[+RTR] /ɛ/ lacks any [±high] specification

- unclear under MCS what the [−RTR] harmony output should be
  - [−RTR, −high] [e]?
  - [−RTR, +high] [i]?

(14) **[±RTR] /ɛ, e/ harmonic pairs**

ATR	ebɛ̱	*ibɛ̱	heap of yams
	epo̱	*ipo̱	oil
RTR	ɛ̀dɔ̀	*àdɔ̀	liver
	ɛ̀pà	*àpà	peanut

Incompatible harmony pairs

[−RTR] /e/ lacks any [±low] specification

- unclear under MCS what the [+RTR] harmony output should be
  - [+RTR, −low] [ɛ]?
  - [+RTR, +low] [a]?

(14) **[±RTR] /ɛ, e/ harmonic pairs**

ATR	ebɛ̱	*ibɛ̱	heap of yams
	epo̱	*ipo̱	oil
RTR	ɛ̀dɔ̀	*àdɔ̀	liver
	ɛ̀pa̱	*àpa̱	peanut

Incompatible harmony pairs

(15) **Contrastive hierarchies fail to produce /e/→[ɛ] harmony mapping**

	/è		dɔ̀/		/è		pà/
[RTR]	[+RTR]	←	[+RTR]		[+RTR]	←	[+RTR]
[high]	[−high]				[−high]		
[low]			[−low]				[+low]
	[ɛ̀/*à		dɔ̀]		[ɛ̀/*à		pà]

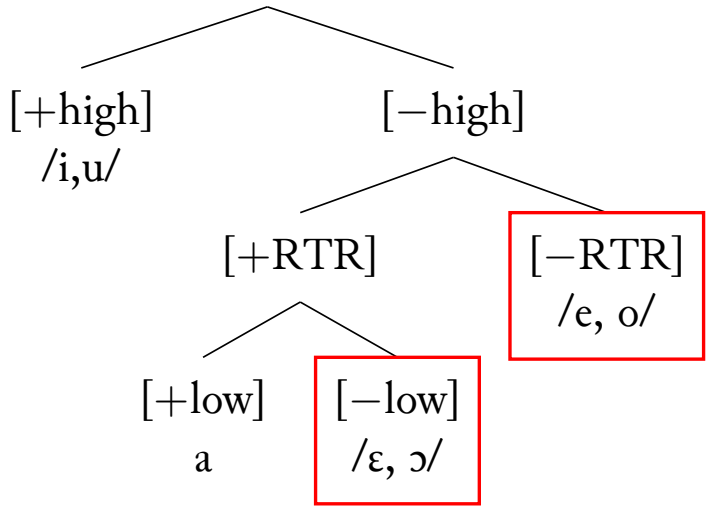
Incompatible harmony pairs

Ifẹ Yoruba features a similar problem

- [−RTR] [e, o] and [+RTR, −**low**] [ɛ, ɔ]

(16) **Incongruent feature specifications in harmonic pairs**

i, u	e, o	ɛ, ɔ	a
[+high]	[−high]	[−high]	[−high]
	[−RTR]	[+RTR]	[+RTR]
		[−low]	[+low]



Incompatible harmony pairs

(17) **Contrastive hierarchies fail to produce /e/→[ɛ] harmony mapping**

	/è		dɔ̀/		/è		pà/
[high]	[−high]		[−high]		[−high]		[−high]
[RTR]	[+RTR]	←	[+RTR]		[+RTR]	←	[+RTR]
[low]			[−low]				[+low]
	[ɛ̀/*à		dɔ̀]		[ɛ̀/*à		pà]

Incompatible harmony pairs

Harmonic pairing is inherently faulty

- see also Dresher's (2013) depiction of Anywa (Nilotic) dental harmony
- see also Hall & Hall's (2016) analysis of Pulaar (Atlantic-Congo) ATR harmony

The celebrated advantage of capturing asymmetric harmony systems necessarily leads to incomplete/incompatible harmony outputs

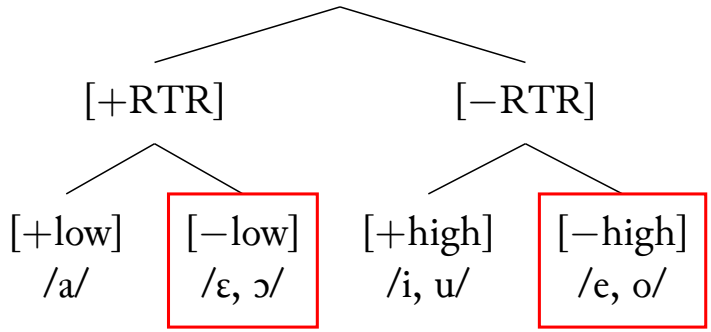
Outline

The problem

- [−RTR] /e, o/ have no specification for [low]
- [+RTR] /ɛ, ɔ/ should not as well

(18) **Incongruent binary harmony pairs**

/i, u/	/e, o/	/ɛ, ɔ/	/a/
[−RTR]	[−RTR]	[+RTR]	[+RTR]
[+high]	[−**high**]	[−**low**]	[+low]



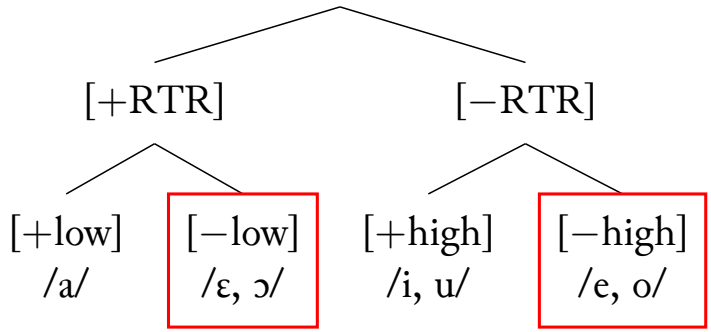
The problem

- [−RTR] /e, o/ have no specification for [low]
- [+RTR] /ɛ, ɔ/ should not as well

Binary contrastive feature hierarchies inevitably lead to a kind of feature overspecification

(18) **Incongruent binary harmony pairs**

/i, u/	/e, o/	/ɛ, ɔ/	/a/
[−RTR]	[−RTR]	[+RTR]	[+RTR]
[+high]	[−**high**]	[−**low**]	[+low]



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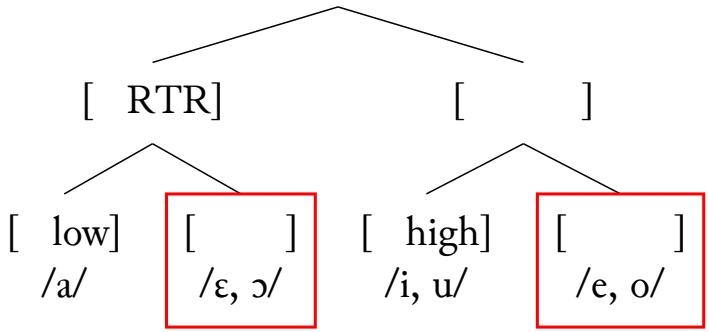
- [−RTR] /e, o/ have no specification for [low]
- [+RTR] /ɛ, ɔ/ should not as well

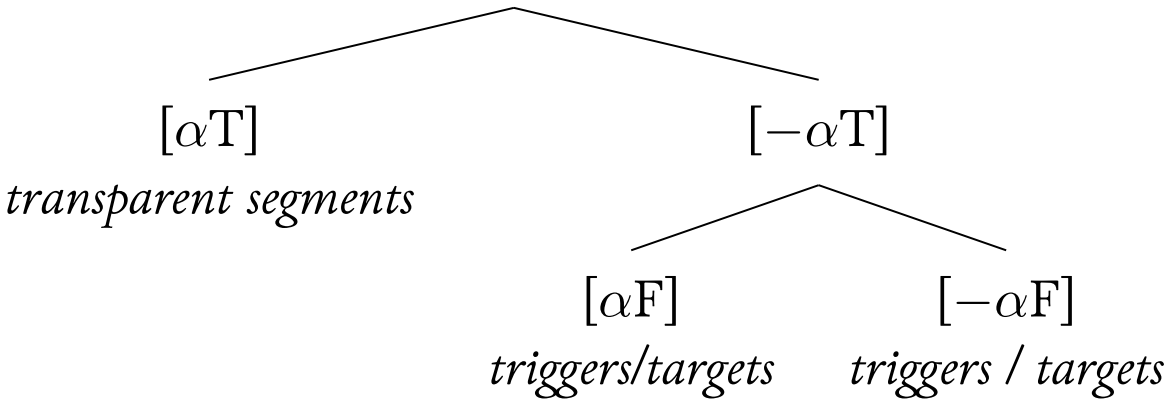
Binary contrastive feature hierarchies inevitably lead to a kind of feature overspecification

(19) **Congruent privative harmony pairs**

/i, u/	/e, o/	/ɛ, ɔ/	/a/
[ ]	[ ]	[RTR]	[RTR]
[high]	[ ]	[ ]	[low]



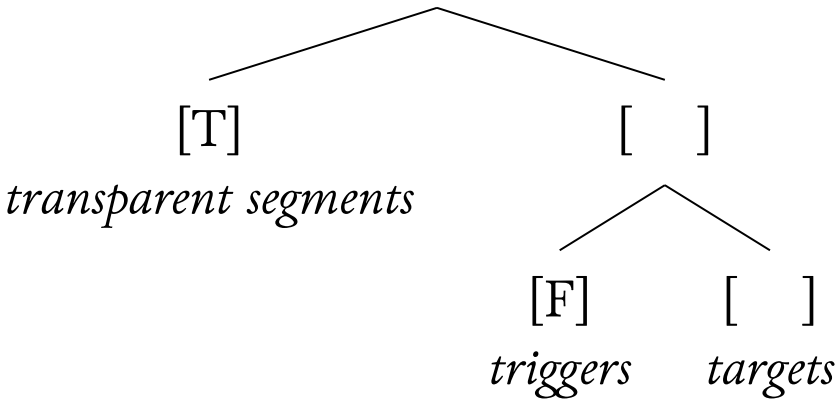
Binary feature hierarchy harmony typology



(20) **Harmony visibility and activity**

	visible	**invisible**
active	*harmonic trigger/target* (specified)	
inactive		*transparent segments* (underspecified)

Privative feature hierarchy harmony typology



(21) **Harmony visibility and activity**

	visible	**invisible**
active	*trigger* (specified)	
inactive	*target* (non-specified)	*transparent segment* (underspecified)

Locality domains using privative feature hierarchies

What are viable (visible) harmony targets?

- Binary feature hierarchies: harmony targets [±F]-specified segments
- Privative feature hierarchies: ?

Locality domains using privative feature hierarchies

What are viable (visible) harmony targets?

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- Privative feature hierarchies: ?

(22) **Harmony visibility**

/è [ ] ← dɔ/	/è [ ] ← pà/
[**RTR**]	[RTR]
[**low**]	[low]
[ɛ dɔ]	[ɛ pà]

Feature nodes

Privative feature hierarchies require some mechanism to distinguish non-specified (visible) from underspecified (invisible) segments

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- Parallel Structures Model of feature geometry (Morén 2003, Iosad 2017)
  - V-manner/place nodes serve as potential landing sites for assimilatory processes

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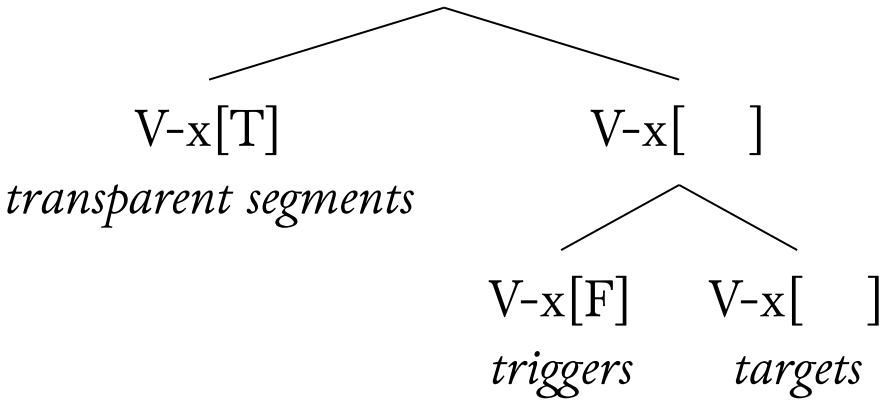

(23) **Harmony segments**

	trigger	*target*	*transparent segment*
[F]	V-x[F]	V-x[ ]	

MCS revisions summary

Binary feature hierarchies

- harmonic (visible) and transparent (invisible) segments
- featurally incongruent harmony pairs in asymmetric inventories

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- harmonic (visible) and transparent (invisible) segments
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Privative feature hierarchies

- harmonic (visible) and transparent (invisible) segments
- correct harmony pairing
- locality domains defined by PSM feature nodes

Yoruba revisited

Harmony principles (based on Dresher 2013, 2015)

- **Yoruba vowel harmony**: Spread [RTR] leftwards
- **Distributional assumptions**: Non-final (non-low) vowels are underlyingly [RTR]-non-specified

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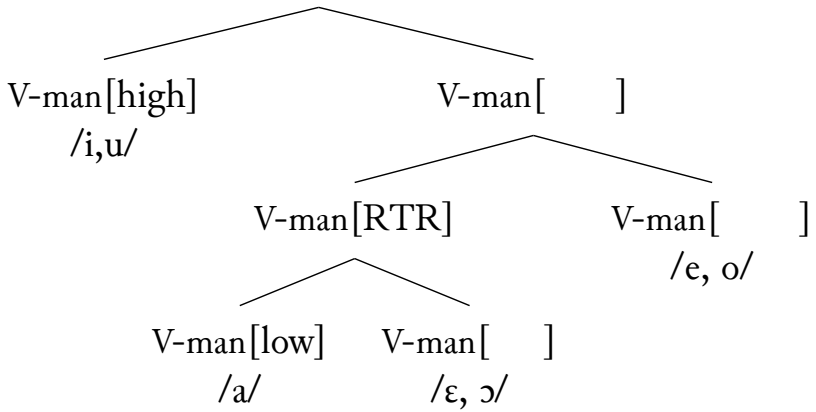
Harmony principles (based on Dresher 2013, 2015)

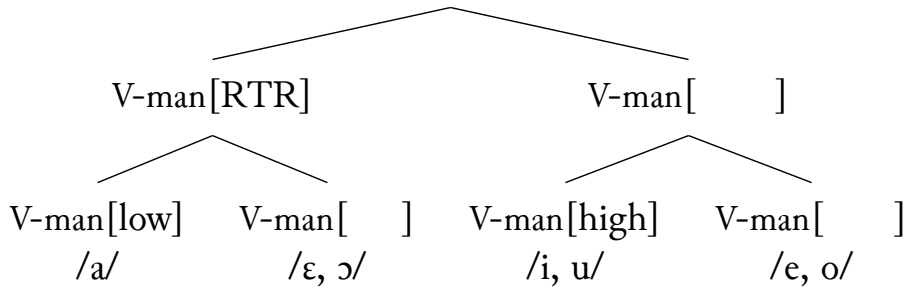
- **Yoruba vowel harmony**: Spread [RTR] leftwards
- **Distributional assumptions**: Non-final (non-low) vowels are underlyingly [RTR]-non-specified

Representations

- **Ifẹ Yoruba**: [high] > [RTR]
- **Standard Yoruba**: [RTR] > [high]



[high] > [RTR] (Ifẹ Yoruba)



[RTR] > [high] (Standard Yoruba)

Yoruba mid vowel harmony

In both Ifẹ and Standard Yoruba

- mid vowels display both surface RTR and ATR harmony

(5) **RTR/ATR pairedYoruba mid vowels**

ATR	olɛ̀	*ɔlɛ̀	‘thief’
	òɡèdɛ̀	*ɔ̀ɡɛ̀dɛ̀	‘incantations’
RTR	ɔsɛ	*osɛ	‘soap’
	ɔ̀ɡɛ̀dɛ̀	*òɡèdɛ̀	‘banana’

Dominant/recessive harmony

All harmony systems are asymmetric; ATR harmony comes for free

- /ògèdè/→[ògèdè] “incantations”
- /ògèdɛ̀/→[ɔ̀gɛ̀dɛ̀] “banana”

(24) **RTR harmony among mid vowels**

	/ò		gè		dɛ̀/
[RTR]	[RTR]	←	[RTR]	←	[RTR]
[high]	[ ]		[ ]		[ ]
	[ɔ̀		gɛ̀		dɛ̀]

(25) **ATR harmony involves no feature spreading**

	/ò		gè		dè/
[RTR]	[ ]		[ ]		[ ]
[high]	[ ]		[ ]		[ ]
	[ò		gè		dè]

Non-alternating harmony triggers

- Yoruba low /a/–*/ə/
  - harmonic across all Yoruba dialects

(10) **Non-alternating low /a/ (*/ə/)**

ATR	arè̲	*ərè̲	crown
	ahoro̲	*əhoro̲	ruins
RTR	àgbɛ̀dɛ̲		blacksmith
	abɔ̲		female

(11) **Non-alternating low /a/ is harmonic trigger**

ɔba̲	*oba̲	king
ɛ̀pà̲	*èpà̲	peanut
ɔ̀yàyà̲	*òyàyà̲	cheerfulness
ɛrɛ́ta̲	*eréta̲	place of ogun
		worship in Ifẹ

“Harmonic blocking”

Under a privative MCS account, there is no such thing as harmonic blocking

- non-RTR vowels have no ATR feature to spread (26)

(26) **Non-alternating /a/ in ATR harmony**

/a	ho	ro/
[RTR] [RTR]	[ ]	[ ]
[low] [low]		
[high]	[ ]	[ ]
[a	ho	ro]

“Harmonic blocking”

Yoruba [RTR] /a/ is a regular harmonic trigger

- /eréta/→[ɛréta] “place of ogun worship in Ifẹ”

(27) **/a/ as RTR harmony trigger**

	/er		ét		a/
[RTR]	[RTR]	←	[RTR]	←	[RTR]
[low]					[low]
[high]	[ ]		[ ]		
	[ɛr		ét		a]

Transpareny (skipping) and blocking

Ifẹ and Standard Yoruba differ in the behavior of high vowel visibility

(8) **Skipping and blocking high vowels in Yoruba**

	Ifẹ	Standard	
ATR	èbútḛ́	èbútḛ́	‘port’
	òɡùrṍ	òɡùrṍ	‘stick for stirring’
RTR	ɔdídɛ̱	odídɛ̱	‘parrot’
	ɛ̀lùbɔ̱́	èlùbɔ̱́	‘yam flour’

Transpareny (skipping) in Ifẹ Yoruba

Transparency is a straightforward effect of underspecification

- [high] > [RTR]

(28) **Word-medial high vowel ATR harmony**

	/è		bú		te/
[high]	[	]	[high]	[	]
[RTR]	[	]		[	]
	[è		bú		te]

(29) **Word-medial high vowel RTR transparency**

	/è		lù		bɔ́/
[high]	[	]	[high]	[	]
[RTR]	[RTR]	←	←	←	[RTR]
	[ɛ̀		lù		bɔ́]

Neutral blocking in Standard Yoruba

Standard Yoruba categorizes [high] within the scope of [RTR]

- [RTR] > [high]: high vowels are visible harmony targets

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Standard Yoruba lacks retracted high vowel counterparts

- *[RTR, high] /ɪ, ʊ/—invalid [RTR] harmony output
- results in neutral blocking

Neutral blocking in Standard Yoruba

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- *[RTR, high] /ɪ, ʊ/—invalid [RTR] harmony output
- results in neutral blocking

(30) **Word-medial high vowel ATR harmony**

	/è	bú	te/
[RTR]	[ ]	[×]	[ ]
[high]	[ ]	[high]	[ ]
	[è	bú	te]

(31) **(*[RTR, high]) neutral blocking in Standard Yoruba**

	/è	lù		bɔ́/
[RTR]	[ ]	[×]	↚	[RTR]
[high]	[ ]	[high]		
	[è	lù		bɔ́]

Harmony analysis summary

Harmony principle:

- Spread [RTR] leftwards

Representations:

- **Ifẹ Yoruba:** [high] > [RTR]
- **Standard Yoruba:** [RTR] > [high]

Harmony patterns

- [RTR] harmony: ɔ̀gɛ̀dɛ̀ “banana”, ògèdè “incantations”
- Harmonic blocking: ahoro “ruins”, ɔ̀yàyà “cheerfulness”
- Neutral blocking (Standard Yoruba): èlùbɔ́ “yam flour”
- Transparency (Ifẹ Yoruba): èlùbɔ́ “yam flour”

Conclusions

Binary Modified Contrastive Specification

- provides a natural motivation for neutral harmony
- provides an overall good typological fit
- allows for a very economical grammatical model of basic harmony patterns
- * featurally incompatible harmony pairing
  - predictable by-product of the use of binary features

Privative Modified Contrastive Specification

- featurally congruent harmony pairing
- require feature nodes to define locality domains
- natural motivation for dominant/recessive style asymmetries in harmony systems
- captures neutral as well as harmonic blocking

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