A concrete review of abstract phonology:
abstract contrasts and opacity in Bondu-so tongue root harmony

Jade J. Sandstedt
jsandstedt@gmail.com
jsandstedt.hcommons.org

3. December 2019

Contents

Outline

- How abstract is phonology?
- Case study: 'concrete' and 'abstract' analyses of Bondu-so (Dogon)
  - Hantgan & Davis (2012), Heath (2014), Green & Hantgan (2019)
- highlights importance of standard phonological tool-kit

1 Introduction

1.1 How 'abstract' is phonology

How abstract is phonology?

- How closely do phonological representations reflect surface sound patterns?
- How do cognitive representations and surface sound patterns differ?
- Do language learners posit underlying segments which are not realised phonetically?
- How do we know?

> Without generalizing beyond the directly observable, it would be impossible to make even the most mundane observations about any language. The question is therefore not whether phonology is abstract at all, but rather what degree of abstractness is required.
>
> (Odden 2005: 248)

☞ So some degree of abstraction is inevitable in linguistic theory

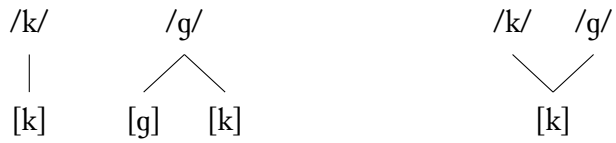
'Abstract' and 'concrete' phonology

'Abstract phonology' means '(more) abstract phonology'

- Fig. 1 illustrates examples of concrete and abstract phonology

Fig. 1a illustrates /k, g/ contrasts with observable [k, g] surface contrasts

- we also observe rule-driven [k, g] alternations
  - e.g. **word-final devoicing**: /g/ surfaces as [k] word-finally, but [k] elsewhere
- such generalisations involve abstraction, but crucially all **phonemic** contrasts have overt, surface correlates



(a) 'Concrete' /k, g/ contrasts **(b)** 'Abstract' /k, g/ contrasts

Figure 1: Abstract and non-abstract representations in phonology

- i.e. are 'concrete' or 'overt'

Fig. 1b illustrates /k, g/ contrasts which are universally neutralised to [k] on the surface

- this means that there are two kinds of *k* with unique phonological properties
  - e.g. k_1 (/g/) may behave as if specified for voicing while k_2 (/k/) does not
- abstract contrasts are motivated by dissimilar phonological behaviour

Concrete vs. abstract:
Traditional concrete phonological representations

- reduce complexity through phonological generalisations (e.g. word-final devoicing)
- never posit more contrasts than observed on the surface

Abstract representations

- posit more complex sound inventories than what actually surfaces

1.2 Case study: Bondu-so vowels and vowel harmony

Bondu-so (North Plateau, Dogon, Niger-Congo)

- spoken in Mali by ca. 24,700 as 1998
- considered endangered by the Endangered Languages Project (http://www.endangeredlanguages.com/lang/8736)

Bondu-so displays **tongue root contrasts** and **tongue root harmony**

- [+ATR] [nɔ̀j-ɛ̀] vs. [−ATR] [dɔ̀g-ɛ]

Advanced and retracted tongue root: commonly abbreviated as ATR or RTR; describes the relative retraction of the tongue root during the pronunciation of vowels

- similar to tense/lax distinctions (i.e. /i, u, e, o/ vs. /ɪ, ʊ, ɛ, ɔ/)
- particularly common among many West African languages
- see Ladefoged & Maddieson (1996: 300–6) for an overview

Very generally defined, **vowel harmony** is a process in which vowels in a word show systematic correspondence for some feature.

- an example of labial or rounding harmony is provided in (1)

(1) **Rounding harmony in Yakut** (Siberian-Turkic; Krueger 1962: 46–53)

a.	kel-el-ler	'come'-3.PRES.-PL.
b.	kør-øl-lør	'see'-3.PRES.-PL.
c.	kele-ɣin	'come'-2.SG.
d.	døjø-ɣyn	'grow quiet'-2.SG.

Vowel harmony typology

Any segmental feature may serve as the basis for a harmony system

Chewa (Bantu) height harmony (Downing & Mtenje 2017)

[+high]	phík-il	'cook'-APPL.
[−high]	tsék-el	'close'-APPL.

Finnish (Finno-Ugric) backness harmony (Ringen 1975)

[+back]	pouta-na	'fine weather'-ESS.
[−back]	pöytnä-nä	'table'-ESS.

Yoruba (Atlantic-Congo) tongue root harmony (Ọla Orie 2001, 2003)

[+ATR]	ògèdè	'incantations'
[−ATR]	ɔ̀gɛ̀dɛ̀	'banana, plantain'

Bondu-so harmony generalisations

(2) **Bidirectional [+ATR] and [−ATR] harmony in Bondu-so**

	UR of root		Underspecified suffix (perfective)	[+ATR] suffix (infinitive)	[−ATR] suffix (mediopassive)
[+ATR] root	/noj-/	'sleep'	[nòj-è]	[nój-ílòŋ]	[nɔ̀j-íjɛ́]
[−ATR] root	/dɔg-/	'leave'	[dɔ̀g-ɛ̀]	[dòg-ílòŋ]	[dɔ̀g-íjɛ́]

According to the data above,

1. roots are contrastive for [ATR] and trigger harmony on suffixes
    - e.g. [+ATR] [nɔ̀j-ɛ̀] vs. [−ATR] [dɔ̀g-ɛ̀]
2. non-harmonising suffixes determine the [±ATR] value on roots
    - dominant [+ATR] harmony: e.g. INF. /dɔ̀g-ílɔ̀ŋ/→[dɔ̀g-ílɔ̀ŋ]
    - dominant [−ATR] harmony: e.g. MED-PASS. /nɔ̀j-íjɛ́/→[nɔ̀j-íjɛ́]

Test: Bondu-so harmony generalisations

Fill in the gaps in (3) following the above generalisations

(3) **Bondu-so harmony generalisations**

	UR of root		Underspecified suffix (perfective)	[+ATR] suffix (infinitive)	[−ATR] suffix (mediopassive)
stem		"reek"	[gɔ̀m-ɛ̀]		[gɔ́m−íjɛ́]
[+ATR] stem	/ʤoŋ/	"heal"		[ʤóŋ−ílɔ̀ŋ]	
stem		"slaughter"	[sɛ̀m-ɛ̀]		[sɛ́m−íjɛ́]

Summary and implications:

1. ternary contrast on mid-vowel suffixes
    - [+ATR] /-(i)loŋ/, [−ATR] /-ijɛ/, ∅ (underspecified) /-E/
2. incompatible with privative features (e.g. [ATR] /e, o/ vs. ∅ /ɛ, ɔ/)
    - symmetric [+ATR] *and* [−ATR] suffix-controlled harmony
    - neither feature is dominant/recessive (marked/unmarked)
3. directionally asymmetric bidirectional harmony
    - leftwards harmony bleeds rightwards harmony

Abstract contrasts?

Bondu-so vowel harmony is not always **surface true** (i.e. there are exceptions to the rule)

- displays 7V surface contrasts:
    - paired [e, ɛ, o, ɔ]
    - unpaired [i, u, a] – lacking *[ɪ, ʊ, ə]
- therefore do not display harmony alternations (*harmonically neutral*)
    - [dɔ̀g-ílɔ̀ŋ] vs. [dɔ̀g-íjɛ́], not *[dɔ̀g-íjɛ́]

What happens following unpaired /i, u, a/ harmony triggers?
Unpaired high/low vowels trigger both [±ATR] harmony (4)

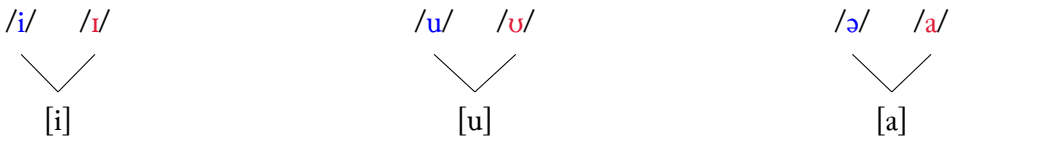
(4) **Distinct high/low vowel [±ATR]-harmony in Bondu-so**

[+ATR] root			[−ATR] root		
/bij-/	[bìj-è]	's/he laid down'	/gɪj-/	[gìj-ɛ̀]	's/he killed'
/sug-/	[sùg-è]	's/he went down'	/ʤʊg-/	[ʤùg-ɛ̀]	's/he recognised'
/bər-/	[bàr–è]	's/he helped'	/pag-/	[pàg-ɛ̀]	's/he tied'

Symmetric [±ATR] harmony following [ATR]-unpaired /i, u, a/ has been interpreted as evidence of abstract [±ATR] /i, ɪ, u, ʊ/ and low /a, ə/ contrasts

- neutralised on the surface
    - * Harmony opacity via neutralisation: /gɪj-E/ → {gɪj-ɛ} → [gìj-ɛ̀]

Abstract representations in Bondu-so



(a) 'Abstract' /i, ɪ/ contrasts **(b)** 'Abstract' /u, ʊ/ contrasts **(c)** 'Abstract' /ə, a/ contrasts

Figure 2: Abstract tongue root contrasts on high and low vowels in Bondu-so

The advantage of abstract analyses

According to (5)

- exceptional data like [gìj-ɛ̀] can be reconciled as phonologically regular
- it only *seems* to violate the harmony rule because of the subsequent neutralisation of /i, ɪ/ → [i]

(5) /gɪj-E/ → {gɪj-ɛ} → [gìj-ɛ̀]

Interim summary – the received story

Bondu-so displays:

- bidirectional harmony
  - * directionally asymmetric
- ternary contrasts on mid-vowel suffixes
  - * not compatible with privative features
- abstract contrasts on high/low vowels
  - * phonologically active but never surface

1.3 Problems with abstract analyses

Bondu-so harmony opacity

Bondu-so involves a case of **opacity** (cf. Kiparsky 1973; Baković 2009, 2011)

- where two independent processes A & B interact such that there are contexts where
  - A seems to have applied, but without obvious motivation on the surface
  - A seems to have failed to apply, even though it should have

In Bondu-so, the neutralisation of tongue root contrasts crucially occurs after tongue root harmony:

- thus /ɪ, ə/ can trigger harmony but can't surface
  - neutralisation always fails to bleed harmony (counterbleeding)
- surface [αATR]-harmony without obvious [αATR]-trigger (6)

(6) **Bondu-so harmony opacity via neutralisation**

	/bij-E/	/gɪj-E/	/pag-E/	/bər-E/
Harmony	bij-e	gɪj-ɛ	pag-ɛ	bər-e
Neutralisation	–	gij-ɛ	–	bar-e
	[bìj-è] 's/he laid down'	[gìj-è] 's/he killed'	[pàg-ɛ] 's/he tied'	[bàr-è] 's/he helped'

Acquisition of opaque patterns

Vaux (2008: 32) argues opaque patterns are fine:

- the processes simply need to be independently motivated, as in (7)

(7) **Hypothetical counterbleeding opacity**

		/te/	/to-u/	/ti-u/
Palatalisation	$t \rightarrow ʧ / \left\{ \begin{matrix} \_i \\ \_e \end{matrix} \right.$	ʧe	–	ʧi-u
Deletion	$V \rightarrow \varnothing / \_V$	–	tu	ʧ-u
		[ʧe]	[tu]	[**ʧu**]

Vaux (2008: 32) argues opaque patterns are fine:

- the processes simply need to be independently motivated, as in (7)

(8) **Hypothetical transparent bleeding**

		/te/	/to-u/	/ti-u/
Deletion	$V \rightarrow \varnothing / \_V$	–	tu	t-u
Palatalisation	$t \rightarrow ʧ / \left\{ \begin{matrix} \_i \\ \_e \end{matrix} \right.$	ʧe	–	–
		[ʧe]	[tu]	[**tu**]

In (7) we have a hypothetical language with palatalisation of /t/→[ʧ] before front vowels and vowel deletions in vowel hiatuses.

- crucially palatalisation and vowel deletions occur transparently in independent contexts: e.g. /te/→[ʧe] and /to-u/→[tu].

In opaque patterns like [ʧu], palatalisation appears to have applied but without motivation (just like vowel harmony in Bondu-so [gìj-ɛ̀]).

- à la Vaux (2008) (and others) language learners should be able to recover the simple counterbleeding interaction because the two processes are independently motivated
  - they have independent evidence for both processes and therefore should be able to generalise underlying representations like /ti-u/ which satisfy the conditions for both palatalisation (/**ti**-u/) and vowel deletions (/**ti-u**/).

The problem with opacity via absolute neutralisation

Requirement of independent motivation is a 'handicap for abstract analyses' (Baković 2009: 11)

* neutralisation is not independently motivated, cf. (9)

(9) **Counterbleeding opacity in Bondu-so**

	/dɔg-E/	/m?n/	/gɪj-E/
Harmony	dɔg-ɛ	–	gɪj-ɛ
Neutralisation	–	??	gij-ɛ
	[dɔ̀g-ɛ̀] 's/he left (it)'	[mín] 'wait'	[gɪ̀j-ɛ̀] 's/he killed'

Consequences of absolute neutralisation

* **Non-falsifiable**: no independent way to confirm/disprove abstract /i, ɪ, u, ʊ, a, ə/ contrasts
  - Can't be observed; don't turn up in acoustic analysis
  - Don't figure in any other linguistic pattern
* **Circular**: abstract contrasts only evidenced by distinct patterns in (4), which they're supposed to explain

(4) **Distinct high/low vowel [±ATR]-harmony in Bondu-so**

[+ATR] root			[−ATR] root		
/bij-/	[bɪ̀j-ɛ̀]	's/he laid down'	/gɪj-/	[gɪ̀j-ɛ̀]	's/he killed'
/sug-/	[sùg-ɛ̀]	's/he went down'	/ʤʊg-/	[ʤùg-ɛ̀]	's/he recognised'
/bər-/	[bàr–ɛ̀]	's/he helped'	/pag-/	[pàg-ɛ̀]	's/he tied'

* **Theoretically/typologically irregular implications**:
  - bidirectional harmony
    * directionally asymmetric
  - ternary contrasts on mid-vowel suffixes
    * not compatible with privative features
  - abstract contrasts on high/low vowels
    * phonologically active but never surface

Where have we gone wrong?

(2) **Bidirectional [+ATR] and [−ATR] harmony in Bondu-so**

	UR of root		Underspecified suffix (perfective)	[+ATR] suffix (infinitive)	[−ATR] suffix (mediopassive)
[+ATR] root	/noj-/	'sleep'	[nòj-è]	[nój-ílòŋ]	[nɔ̀j-íjɛ́]
[−ATR] root	/dɔg-/	'leave'	[dɔ̀g-ɛ̀]	[dòg-ílòŋ]	[dɔ̀g-íjɛ́]

The only variable we can play with is the representation of root vowels (and therewith the direction of harmony in perfective contexts):

- 'correlation doesn't imply causation'
  - [nòj-è] and [dɔ̀g-ɛ̀] are correlated for the harmony feature
  - but what's the trigger and what's the target?
- Is it /dɔ̰g-E/ → [dɔ̰g-ɛ̀]?
- or /dOg-ɛ̰/ → [dɔ̀g-ɛ̰]?

No root-controlled harmony?

The question comes down to where the underlying contrast is – root or suffix?

- the near minimal pairs [bìj-è] and [gìj-ɛ̀] suggest the suffix is contrastive

1. ~~/dɔ̰g-E/ → [dɔ̰g-ɛ̀]~~
2. /dog-ɛ̰/ → [dɔ̀g-ɛ̰]

Preview: reanalysis implications

(10) **Harmony variation across Bondu-so verbal classes**

	UR of root		perfective	infinitive	mediopassive	imperative
Class A	/noj-/	'sleep'	[nòj-ɛ̰]	[nój-ílò̰ŋ]	[nɔ̀j-íjɛ́]	[nój-ó]
Class B	/dog-/	'leave'	[dɔ̀g-ɛ̰]	[dòg-ílò̰ŋ]	[dɔ̀g-íjɛ́]	[dóg-á]

Important differences:

1. ~~directionally asymmetric bidirectional harmony~~
   - only uni-directional suffix-controlled harmony
2. ~~ternary contrast on mid-vowel suffixes~~
   - ~~[+ATR] /-(i)loŋ/, [−ATR] /-ijɛ/, ∅ (underspecified) /-E/~~

- only [RTR] /ɛ, ɔ/ ~ (non-RTR) /e, o/
- fully compatible with privative or monovalent features

3. ~~Abstract contrasts on high/low vowels~~
   - ~~/bij-E/ and /gɪj-E/~~
   - only concrete or non-abstract /i, u, a/ in (11)
4. ~~Harmony counterbleeding opacity via neutralisation~~
   - ~~/gɪj-E/ → {gɪj-ɛ} → [gìj-ɛ̀]~~
   - only transparent harmony neutrality: /gij-ɛ̲/ → [gìj-ɛ̀]

(11) **No abstract contrasts: non-contrastive high/low vowels are harmonically neutral non-targets of tongue root harmony**

ATR class /-e/			RTR class /-ɛ/		
/bij-e̲/	[bìj-è]	's/he laid down'	/gij-ɛ̲/	[gìj-ɛ̀]	's/he killed'
/sug-e̲/	[sùg-è]	's/he went down'	/ʤug-ɛ̲/	[ʤùg-ɛ̀]	's/he recognised'
/bar-e̲/	[bàr–è]	's/he helped'	/pag-ɛ̲/	[pàg-ɛ̀]	's/he tied'

☞ all controversial generalisations hinge upon misinterpretation of the direction of harmony

In sum:

- reinterpreting the direction of harmony in ambiguous cases (dɔ̀gɛ̀)
  - eliminates all typologically and theoretically controversial generalisations
  - avoids analytical pitfalls of abstract approaches

2 A 'concrete' reanalysis of Bondu-so

2.1 High/low vowel harmony neutrality

If high/low vowels don't trigger harmony (e.g. /gɪj-E/ → {gɪj-ɛ} → [gìj-ɛ̀])

- then what is their actual behaviour?

Harmonically unpaired /i, u, a/ vowels are harmonically neutral

(12) **Bondu-so high and low vowel transparency**

a.	/kedʒ-ilɔŋ/	[kédʒ-ìlɔ̀ŋ]	'cut'-INF.
b.	/kedʒ-ijɛ/	[kédʒ-íjɛ́]	'cut'-MED-PASS.
c.	/sem-andʒ-e/	[sém-ándʒ-è]	'slaughter'-IMPERF.-2.PL.
d.	/sem-andʒ-ɛɛ/	[sém-ándʒ-ɛ́ɛ̀]	'slaughter'-IMPERF.-3.PL.

High and low vowels are in other words phonologically *inactive* and *invisible*

- non-targets and non-triggers (transparent segments)

Bondu-so harmony is active [RTR]-spreading

Transparent segments (e.g. /i, u, a/) co-occur with non-RTR /e, o/ vowels

- e.g. /bèl-áà/ → [bèl-áà], *[bɛ̀l-áà] (13)

(13) **Low/high vowel non-triggers**

[bèl-áà]	*[bɛ̀l-áà]	'edible leaves (cooked)'-SG.
[ɔ̀b-áà]	*[ɔ̀b-áà]	'flexible liana branch'-SG.
[dʒóŋ-óndʒ-ójì]		'heal'-IMPERF.-1.PL.
[sém-ándʒ-ójì]	*[sɛ́m-ándʒ-ójì]	'slaughter'-IMPERF.-1.PL.

☞ The marked value is [RTR] in Bondu-so

  – i.e. [RTR] /ɛ, ɔ/ vs. (non-RTR) /e, o/

Bondu-so high/low vowels:

- **harmonically transparent**: phonologically inactive and invisible to tongue root harmony
  - [sém-ándʒ-è] vs. [sɛ́m-ándʒ-ɛ́ɛ̀] 'slaughter'-IMPERF.-2./3.PL.
- **reveal markedness aymmetries**: [RTR] /ɛ, ɔ/ vs. (non-RTR) /e, o/
  - /bèl-áà/ → [bèl-áà], *[bɛ̀l-áà]

☞ theoretically and typologically fully consistent with other harmony languages

  – cf. typological surveys in Nevins (2010); Rose & Walker (2011); Sandstedt (2018)

2.2 Inflectional classes

Distinct inflectional classes are not controversial

Hantgan & Davis (2012) and Green & Hantgan (2019) have demonstrated distinct nominal inflections and harmony patterns in (14)

- Class A [kɔ́b-ɔ̀ɔ̀] and Class B [kób-áá]

(14) **Distinct noun classes in Bondu-so**

	Sing.	Plur.	
Class A	kɔ́b-ɔ̀ɔ̀	kɔ́b-ɛ̀ɛ̀	'sheath'
	nɛ̀nd-ɔ̀ɔ̀	nɛ̀nd-ɛ̀ɛ̀	'tongue'
Class B	kób-áá	kɔ́b-ɛ́ɛ́	'brick mold'
	cénd-àà	cɛ́nd-ɛ̀ɛ̀	'heart/liver'

Suffixes are contrastive

Hantgan & Davis (2012) and Green & Hantgan (2019) have demonstrated minimal ATR/RTR distinctions on suffixes

- which define important morphological distinctions (15)

(15) **Person and number inflections in Bondu-so: 'heal'-IMPERF.**

	Sing.	Plur.
1.	ʤóŋ-óndʒ-ɔ̀m	ʤóŋ-óndʒ-ójì
2.	ʤóŋ-óndʒ-ɔ̀ɔ̀	ʤóŋ-óndʒ-è
3.	ʤóŋ-óndʒ-ɔ̀	ʤɔ́ŋ-ɔ́ndʒ-ɛ́ɛ̀

2.3 Reorganisation of the data

In their conclusion:

> We leave it as a challenge as to whether the full range of vowel harmony data considered in this article can be accounted for just as insightfully without positing abstract vowels or the ternary use of [ATR].
>
> (Hantgan & Davis 2012: 24)

To show that this is indeed possible, I have recorded the full range of data provided by Hantgan & Davis (2012) in a .csv file

- Available online at http://dx.doi.org/10.17613/p0sp-yj29

Reorganised assuming suffixes are underlyingly contrastive for [±ATR]

(16) **Example data**

	Form	Morph.	Gloss	Ex.No	Class
a.	kédʒ-ìlòŋ	infinitive	'cut'	6	1
b.	kédʒ-á	imperative	'cut!'	9	1
c.	kɛ́dʒ-íjɛ́	mediopassive	'be cut'	7	1
d.	kɛ̀dʒ-è	perfective	's/he cut'	1	1
e.	gí-ílòŋ	infinitive	'kill'	6	1
f.	gíj-á	imperative	'kill!'	9	1
g.	gìj-è	perfective	's/he killed'	1	1
	...				

Bondu-so revised inflectional classes

In this dataset, four verbal and three nominal inflectional classes emerge.

	Class 1	Class 2	Class 3
SING.	/-oo/	/-ɔɔ/	/-aa/
PLUR.	/-ee/	/-ɛɛ/	/-ɛɛ/

Table 1: Nominal inflections in Bondu-so

	Class 1	Class 2	Class 3	Class 4	Personal endings	
PERF.	/-e/	/-ɛ/	/-e/	/-e/	1.SG	/-om/
INF.	/-(i)loŋ/	/-(i)loŋ/	/-(i)loŋ/	/-(i)loŋ/	2.SG	/-oo/
IMP.	/-o/	/-a/	/-a/	/-o/	3.SG	/-o/
MED-PASS.	/-ije/	/-ijɛ/		/-ijɛ/	1.PL	/-oji/
IMPERF.	/-ondʒ-/	/-andʒ-/			2.PL	/-e/
					3.PL	/-ɛɛ/

Table 2: Verbal classes in Bondu-so

2.3.1 Morphological approach captures missed generalisations

Previously assumed that the MED-PASS. suffix is non-alternating /-ijɛ/ (2)

- this leaves unexplained ATR mediopassive suffixes in (19)

- Hantgan & Davis (2012: 9, fn. 8): nasals contribute to [+ATR] realisations
  - but this too admits exceptions: e.g. [jàmb-íjɛ́] ‘cover’

(19) **Exceptional ATR MED-PASS. [-íjé]**

RTR [-íjɛ́]		ATR [-íjé]	
[kɛ́ʤ-íjɛ́]	‘cut’	[nèmbìl-íjé]	‘beg’
[dɔ̀g-íjɛ́]	‘leave’	[sòŋg-íjé]	‘curse’
[jàmb-íjɛ́]	‘cover’	[dàŋ-íjé]	‘be stuck’

Coherent patterns across inflectional classes

These ‘exceptions’ are evidence of subregularities between inflectional classes (20)

- e.g. Class 1 ATR [-è, -íjé] and labial [-ó, -óndʒ-]
- e.g. Class 2 RTR [-ɛ̀, -íjɛ́] and non-labial [-á, -ándʒ-]

(20) **Class 1–2 regular correspondences**

	Class 1	Class 2
PERF.	-è	-ɛ̀
MED-PASS.	-íjé	-íjɛ́
IMP.	-ó	-á
IMPERF.	-óndʒ-	-ándʒ-

Inflectional class summary

We have clear evidence for:

1. Distinct inflectional classes
   - Class 2 [kɔ́b-ɔ̀ɔ̀] ‘sheath’-SG. vs. Class 3 [kób-áá] ‘brick mold’-SG.
2. Suffixes are contrastive for the tongue root feature
   - e.g. ATR [ʤóŋ-óndʒ-è] vs. RTR [ʤɔ́ŋ-ɔ́ndʒ-ɛ́ɛ̀] ‘heal’-IMPERF.-2.PL./3.PL.
3. Regularities across inflectional patterns explain exceptions
   - e.g. Class 1 ATR [-è, -íjé] and labial [-ó, -óndʒ-]
   - e.g. Class 2 RTR [-ɛ̀, -íjɛ́] and non-labial [-á, -ándʒ-]

3 Summary and conclusions

Bondu-so has been previously analysed as displaying:

* a complex, directionally-asymmetric tongue root harmony system
* ternary [ATR] feature specifications on mid vowels
* abstract or covert [ATR] contrasts on high/low vowels
* harmony counterbleeding opacity via neutralisation

In addition to these theoretical/typological irregular implications

* lack of independent motivation for neutralisation
  - results in circular and non-falsifiable conclusions

☞ suggesting the locus of explanation lies elsewhere

Crux of the problem:

- misinterpretation the direction of harmony in ambiguous cases (dɔ̀gɛ̀)
  - ignored neutral harmony insights (e.g. [bìj-è] and [gìj-ɛ̀])

Reanalysis:

- Unidirectional suffix-controlled [RTR] harmony with harmonically transparent non-contrastive vowels
  - eliminates all the problems identified in this talk
  - compatible with any existing harmony framework

Bondu-so vowel and vowel harmony generalisations

Bondu-so vowels and vowel harmony summarised:

- 7 concrete /i, e, ɛ, a, ɔ, o, u/
- leftwards [RTR]-spreading
- harmonically transparent non-contrastive high/low vowels

(21) **Bondu-so [RTR]-harmony and high/low vowel transparency**

a.	/kedʒ-ilo̲ŋ/	[kédʒ-ìlò̲ŋ]	'cut'-INF.	i	u
b.	/kedʒ-ije̲/	[kɛ́dʒ-íjɛ́]	'cut'-MED-PASS.	e	o
c.	/sem-andʒ-e̲/	[sém-ándʒ-è]	'slaughter'-IMPERF.-2.PL.	ɛ	ɔ
d.	/sem-andʒ-ɛɛ̲/	[sɛ́m-ándʒ-ɛ́ɛ̀]	'slaughter'-IMPERF.-3.PL.	a	

The 'Abstractness Controversy'

This reanalysis of Bondu-so has important implications for abstract phonology
Do other languages display abstract segments?

- e.g. Standard Yoruba (Ọla Orie 2001, 2003)
  - * **harmony exceptions**:
    [e-bi̱] 'hunger' vs. [ɛ̀-bi̱] 'guilt'
  - – **abstract harmony**:
    /e-bɪ̱/ → {ɛ-bɪ̱} → [ɛ-bi̱]
- e.g. Esimbi (Hyman 1988)
  - * **7-affixal contrasts > 3-root contrasts**:
    [u-mu] 'drink' vs. [o-mu] 'go up' vs. [ɔ́-mu] 'sit'
  - – **abstract height transfer**:
    /u-mɔ̱/ → {ɔ-mɔ̱} → [ɔ́-mu̱]
- * the same counterbleeding opacity via absolute neutralisation

If not here then where?

- What would satisfactory evidence of abstract contrasts look like?
- How can abstract segments be independently motivated?
- What do language learners need to acquire them?
- How might they arise diachronically?
- Are they diachronically stable, or is non-abstract reanalysis inevitable?

☞ regardless of the authenticity of abstract contrasts, these questions are worth exploring

References

Baković, Eric. 2009. Abstractness and motivation in phonological theory. *Studies in Hispanic and Lusophone Linguistics* 2(1). DOI: https://doi.org/10.1515/shll-2009-1041, 183–98.

Baković, Eric. 2011. Opacity and ordering. In John Goldsmith, Jason Riggle & Alan C. Yu (eds.), *Handbook of phonological theory*, 2nd edn., 40–67. Oxford: Blackwell.

Downing, Laura J. & Al Mtenje. 2017. *The phonology of Chichewa*. Oxford: Oxford University Press.

Green, Christopher & Abbie Hantgan. 2019. A feature geometric approach to Bondu-so vowel harmony. *Glossa: A Journal of General Linguistics* 4(1). Online: http://doi.org/10.5334/gjgl.793, 35.

Hantgan, Abbie & Stuart Davis. 2012. Bondu-so vowel harmony: A descriptive analysis with theoretical implications. *Studies in African Linguistics* 41(1). Online: https://www.academia.edu/7358391/Bondu-so_vowel_harmony_a_descriptive_analysis_with_theoretical_implications, 1–26.

Heath, Jeff. 2014. Dogon ATR harmony. Last updated December 2014. Online: https://dogonlanguages.org/sources/dogonatrharmony.

Hyman, Larry M. 1988. Underspecification and vowel height transfer in Esimbi. *Phonology* 5(2). 255–73.

Kiparsky, Paul. 1973. Phonological representations. In Osamu Fujimura (ed.), *Three dimensions of linguistic theory*, 1–135. Tokyo: TEC.

Krueger, John Richard. 1962. *Yakut manual*. Bloomington, Indiana: Indiana University Press.

Ladefoged, Peter & Ian Maddieson. 1996. *The sounds of the world's languages*. Oxford: Blackwell.

Nevins, Andrew. 2010. *Locality in vowel harmony*. Cambridge, MA: MIT Press.

Odden, David. 2005. *Introducing phonlogy*. Cambridge: Cambridge University Press.

Ọla Orie, Ọlanikẹ. 2001. An alignment-based account of vowel harmony in Ifẹ Yoruba. *Journal of African Languages and Linguistics* 22(2). 117–43.

Ọla Orie, Ọlanikẹ. 2003. Two harmony theories and high vowel patterns in Ebira and Yoruba. *The Linguistic Review* 20. 1–35.

Ringen, Catherine O. 1975. *Vowel harmony: Theoretical implications*. Indiana University dissertation.

Rose, Sharon & Rachel Walker. 2011. Harmony systems. In John Goldsmith, Jason Riggle & Alan C. Yu (eds.), *Handbook of phonological theory*, 2nd edn., 240–290. Oxford: Blackwell.

Sandstedt, Jade J. 2018. *Feature specifications and contrast in vowel harmony: The orthography and phonology of Old Norwegian height harmony*. Online: https://hcommons.org/app/uploads/sites/1000836/2019/03/thesis_final.pdf. University of Edinburgh dissertation.

Vaux, Bert. 2008. Why the phonological component must be serial and rule-based. In Bert Vaux & Andrew Nevins (eds.), *Rules, constraints, and phonological phenomena*, 20–60. Oxford: Oxford University Press.