# A reanalysis of (non-)exceptional patterns in Bondu-so tongue root harmony

Jade J. Sandstedt

jsandstedt@gmail.com

jsandstedt.hcommons.org

Humboldt University of Berlin

9. May 2019

# Introduction

▶ Problem: unusual vowels and vowel harmony in Bondu-so (Dogon)

(Hantgan & Davis 2012, Heath 2014, Green & Hantgan 2019)

# Introduction

► Problem: unusual vowels and vowel harmony in Bondu-so (Dogon)

  ► How abstract is phonology? Do language learners posit underlying segments which are not realised phonetically?

(Hantgan & Davis 2012, Heath 2014, Green & Hantgan 2019)

# Introduction

▶ Problem: unusual vowels and vowel harmony in Bondu-so (Dogon)
  ▶ How abstract is phonology? Do language learners posit underlying segments which are not realised phonetically?
▶ Solution: crucial data have been misinterpreted

(Hantgan & Davis 2012, Heath 2014, Green & Hantgan 2019)

# Introduction

- ▶ Problem: unusual vowels and vowel harmony in Bondu-so (Dogon)
  - ▶ How abstract is phonology? Do language learners posit underlying segments which are not realised phonetically?
- ▶ Solution: crucial data have been misinterpreted
  - \* Direction of harmony in ambiguous cases: dɔgɛ̀

(Hantgan & Davis 2012, Heath 2014, Green & Hantgan 2019)

# Introduction

▶ Problem: unusual vowels and vowel harmony in Bondu-so (Dogon)

    ▶ How abstract is phonology? Do language learners posit underlying segments which are not realised phonetically?

▶ Solution: crucial data have been misinterpreted

    \* Direction of harmony in ambiguous cases: dɔgɛ

    ▶ Eliminates all typologically and theoretically controversial generalisations

(Hantgan & Davis 2012, Heath 2014, Green & Hantgan 2019)

# Introduction

- ▶ Problem: unusual vowels and vowel harmony in Bondu-so (Dogon)
  - ▶ How abstract is phonology? Do language learners posit underlying segments which are not realised phonetically?
- ▶ Solution: crucial data have been misinterpreted
  - \* Direction of harmony in ambiguous cases: dɔgɛ
  - ▶ Eliminates all typologically and theoretically controversial generalisations
  - ▶ Easily accomodated with the standard phonological toolkit

(Hantgan & Davis 2012, Heath 2014, Green & Hantgan 2019)

# Outline

# Basic generalisations

# Basic generalisations

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

| | UR of root | |
|---|---|---|
| [+ATR] root | /noj-/ | 'sleep' |
| [−ATR] root | /dɔg-/ | 'leave' |

According to the data above,

1. roots are contrastive for [ATR]

# Basic generalisations

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

|  | UR of root |  | Underspecified suffix (perfective) |
|---|---|---|---|
| [+ATR] root | /noj-/ | 'sleep' | [nòj-è] |
| [−ATR] root | /dɔg-/ | 'leave' | [dɔ̀g-ɛ̀] |

According to the data above,

   I. roots are contrastive for [ATR]

      ▶ e.g. [+ATR] [nòj-è] vs. [−ATR] [dɔ̀g-ɛ̀]

# Basic generalisations

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

|  | UR of root |  | Underspecified suffix (perfective) |
|---|---|---|---|
| [+ATR] root | /noj-/ | 'sleep' | [nòj-è] |
| [−ATR] root | /dɔg-/ | 'leave' | [dɔ̀g-ɛ̀] |

According to the data above,

1. roots are contrastive for [ATR]

   ▶ e.g. [+ATR] [nòj-è] vs. [−ATR] [dɔ̀g-ɛ̀]

2. non-harmonising suffixes determine the [±ATR] value on roots

# Basic generalisations

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

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

According to the data above,

1. roots are contrastive for [ATR]

   ▶ e.g. [+ATR] [nòj-è] vs. [−ATR] [dɔ̀g-ɛ̀]

2. non-harmonising suffixes determine the [±ATR] value on roots

   ▶ dominant [+ATR] harmony: e.g. INF. /dɔ̀g-ílòŋ/→[dòg-ílòŋ]

# Basic generalisations

(1) **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]

   ▶ e.g. [+ATR] [nòj-è] vs. [−ATR] [dɔ̀g-ɛ̀]

2. non-harmonising suffixes determine the [±ATR] value on roots
   ▶ dominant [+ATR] harmony: e.g. INF. /dɔ̀g-ílòŋ/→[dòg-ílòŋ]
   ▶ dominant [−ATR] harmony: e.g. MED-PASS. /nòj-íjɛ́/→[nɔ̀j-íjɛ́]

# Basic generalisations

(1) **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] |

# Basic generalisations

(1) **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] |

**Summary and implications:**

# Basic generalisations

(1) **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] | [nòj-íjɛ́] |
| [−ATR] root | /dɔg-/ | 'leave' | [dɔ̀g-ɛ̀] | [dòg-ílòŋ] | [dɔ̀g-íjɛ́] |

**Summary and implications:**

1. ternary contrast on mid-vowel suffixes

# Basic generalisations

(1) **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] |

**Summary and implications**:

1. ternary contrast on mid-vowel suffixes
   ▶ [+ATR] /-(i)loŋ/, [−ATR] /-ijɛ/, ∅ (underspecified) /-E/

# Basic generalisations

(1) **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] |

**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/)

# Basic generalisations

(1) **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-íjɛ̀] |
| [−ATR] root | /dɔg-/ | 'leave' | [dɔ̀g-ɛ̀] | [dòg-ílòŋ] | [dɔ̀g-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)

# Basic generalisations

(1) **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-íjɛ̀] |
| [−ATR] root | /dɔg-/ | 'leave' | [dɔ̀g-ɛ̀] | [dòg-ílòŋ] | [dɔ̀g-íjɛ̀] |

**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

# Basic generalisations

(1) **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-íjɛ̀] |
| [−ATR] root | /dɔg-/ | 'leave' | [dɔ̀g-ɛ̀] | [dòg-ílòŋ] | [dɔ̀g-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

# Abstract contrasts?

Bondu-so vowel harmony is not always surface true

- ▶ displays 7V surface contrasts:
    - ▶ paired [e, ɛ, o, ɔ]
    - ▶ unpaired [i, u, a] – lacking *[ɪ, ʊ, ə]

# Abstract contrasts?

Bondu-so vowel harmony is not always surface true

- ▶ 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*)
    - ▶ [dòg-ílòŋ] vs. [dɔ̀g-íjɛ́], not *[dɔ̀g-íjɛ́]

# Abstract contrasts?

Bondu-so vowel harmony is not always surface true

- ▶ 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*)
    - ▶ [dòg-ílòŋ] vs. [dɔ̀g-íjɛ́], not *[dɔ̀g-íjɛ́]

What happens following unpaired /i, u, a/ harmony triggers?

- ▶ /bij-E/ → ?? 's/he laid down'
- ▶ /gij-E/ → ?? 's/he killed'
- ▶ /bar-E/ → ?? 's/he helped'
- ▶ /pag-E/ → ?? 's/he tied'

# Abstract contrasts?

Bondu-so vowel harmony is not always surface true

- ▶ 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*)
    - ▶ [dògɔ-ílòŋ] vs. [dɔ̀gɔ-íjɛ́], not *[dɔ̀gɔ-íjɛ́]

What happens following unpaired /i, u, a/ harmony triggers?

- ▶ /bij-E/ → [bìj-è] 's/he laid down'
- ▶ /gij-E/ → [gìj-ɛ̀] 's/he killed'
- ▶ /bar-E/ → [bàr–è] 's/he helped'
- ▶ /pag-E/ → [pàg-ɛ̀] 's/he tied'

# Abstract contrasts?

Bondu-so vowel harmony is not always surface true

- ▶ 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*)
    - ▶ [dòg-ílòŋ] vs. [dɔ̀g-íjɛ́], not *[dɔ̀g-íjɛ́]

What happens following unpaired /i, u, a/ harmony triggers?

- ▶ /bij-E/ → [bìj-è] 's/he laid down'
- ▶ /gij-E/ → [gìj-ɛ̀] 's/he killed'
- ▶ /bar-E/ → [bàr–è] 's/he helped'
- ▶ /pag-E/ → [pàg-ɛ̀] 's/he tied'

**\*** Unpaired high/low vowels trigger both [±ATR] harmony

# Abstract contrasts?

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

| [+ATR] root | | [−ATR] root | |
|---|---|---|---|
| [bìj-è] | 's/he laid down' | [gìj-ɛ̀] | 's/he killed' |
| [sùg-è] | 's/he went down' | [dʒùg-ɛ̀] | 's/he recognised' |
| [bàr–è] | 's/he helped' | [pàg-ɛ̀] | 's/he tied' |

# Abstract contrasts?

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

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

# Abstract contrasts?

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

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

\* Harmony opacity via neutralisation: /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

# Outline

# Problems

# Problems

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

# Problems

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

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

|  | /bij-E/ | /gɪj-E/ | /pag-E/ | /bər-E/ |
|---|---|---|---|---|
| Harmony |  |  |  |  |
| Neutralisation |  |  |  |  |
|  | 's/he laid down' | 's/he killed' | 's/he tied' | 's/he helped' |

# Problems

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

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

|  | /bij-E/ | /gɪj-E/ | /pag-E/ | /bər-E/ |
|---|---|---|---|---|
| Harmony Neutralisation | bij-e | gɪj-ɛ | pag-ɛ | bər-e |
|  | 's/he laid down' | 's/he killed' | 's/he tied' | 's/he helped' |

# Problems

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

▶ /ɪ, ə/ can trigger harmony but can't surface

(3)  **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 |
|  | 's/he laid down' | 's/he killed' | 's/he tied' | 's/he helped' |

# Problems

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

- ▶ /ɪ, ə/ can trigger harmony but can't surface
- ▶ surface [αATR]-harmony without obvious [αATR]-trigger (3)

(3) **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] | [gìj-ɛ̀] | [pàg-ɛ̀] | [bàr-è] |
|  | 's/he laid down' | 's/he killed' | 's/he tied' | 's/he helped' |

# Acquisition of opaque patterns

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

# Acquisition of opaque patterns

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

▶ the processes simply need to be independently motivated, as in (4)

# Acquisition of opaque patterns

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

▶ the processes simply need to be independently motivated, as in (4)

(4) **Hypothetical counterbleeding opacity**

|  |  | /te/ | /to-u/ | /ti-u/ |
|---|---|---|---|---|
| **Palatalisation** | $t \rightarrow tʃ / \left\{ \begin{array}{l} \_i \\ \_e \end{array} \right.$ |  |  |  |
| **Deletion** | $V \rightarrow \varnothing / \_V$ |  |  |  |

# Acquisition of opaque patterns

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

▶ the processes simply need to be independently motivated, as in (4)

(4) **Hypothetical counterbleeding opacity**

|  |  | /te/ | /to-u/ | /ti-u/ |
|---|---|---|---|---|
| **Palatalisation** | $t \rightarrow tʃ / \begin{cases} \_i \\ \_e \end{cases}$ | tʃe | – |  |
| **Deletion** | $V \rightarrow \varnothing / \_V$ |  |  |  |

# Acquisition of opaque patterns

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

▶ the processes simply need to be independently motivated, as in (4)

(4) **Hypothetical counterbleeding opacity**

|  |  | /te/ | /to-u/ | /ti-u/ |
|---|---|---|---|---|
| **Palatalisation** | $t \rightarrow tʃ \; / \begin{cases} \_i \\ \_e \end{cases}$ | tʃe | – | |
| **Deletion** | $V \rightarrow \varnothing \; / \; \_V$ | – | tu | |

# Acquisition of opaque patterns

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

▶ the processes simply need to be independently motivated, as in (4)

(4) **Hypothetical counterbleeding opacity**

|  |  | /te/ | /to-u/ | /ti-u/ |
|---|---|---|---|---|
| **Palatalisation** | $t \rightarrow tʃ / \begin{cases} \_i \\ \_e \end{cases}$ | tʃe | – |  |
| **Deletion** | $V \rightarrow \varnothing / \_V$ | – | tu |  |
|  |  | [tʃe] | [tu] |  |

# Acquisition of opaque patterns

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

▶ the processes simply need to be independently motivated, as in (4)

(4) **Hypothetical counterbleeding opacity**

|  |  | /te/ | /to-u/ | /ti-u/ |
|---|---|---|---|---|
| **Palatalisation** | $t \rightarrow tʃ / \left\{ \begin{array}{l} \_i \\ \_e \end{array} \right.$ | tʃe | – |  |
| **Deletion** | $V \rightarrow \varnothing / \_V$ | – | tu |  |
|  |  | [tʃe] | [tu] | [**tʃu**] |

# Acquisition of opaque patterns

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

▶ the processes simply need to be independently motivated, as in (4)

(4) **Hypothetical counterbleeding opacity**

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

# The problem with opacity via absolute neutralisation

# The problem with opacity via absolute neutralisation

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

# The problem with opacity via absolute neutralisation

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

* neutralisation is not independently motivated, cf. (5)

# The problem with opacity via absolute neutralisation

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

  * neutralisation is not independently motivated, cf. (5)

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

| /dɔg-E/ |
| :---: |
| Harmony |
| Neutralisation |
| [dɔ̀g-ɛ̀] |
| 's/he left (it)' |

# The problem with opacity via absolute neutralisation

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

* neutralisation is not independently motivated, cf. (5)

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

|  | /dɔg-E/ |
| --- | --- |
| Harmony | dɔg-ɛ |
| Neutralisation | – |
|  | [dɔ̀g-ɛ̀] |
|  | 's/he left (it)' |

# The problem with opacity via absolute neutralisation

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

* neutralisation is not independently motivated, cf. (5)

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

|  | /dɔg-E/ | |
| --- | --- | --- |
| Harmony | dɔg-ɛ | |
| Neutralisation | – | |
| | [dɔ̀g-ɛ̀] | [mín] |
| | 's/he left (it)' | 's/he waited' |

# The problem with opacity via absolute neutralisation

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

* neutralisation is not independently motivated, cf. (5)

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

|                | /dɔg-E/            | /mʔn/          |
| -------------- | ------------------ | -------------- |
| Harmony        | dɔg-ɛ              | –              |
| Neutralisation | –                  | ??             |
|                | [dɔ̀g-ɛ̀]          | [mín]          |
|                | 's/he left (it)'   | 's/he waited'  |

# The problem with opacity via absolute neutralisation

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

* neutralisation is not independently motivated, cf. (5)

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

|  | /dɔg-E/ | /mʔn/ | /gɪj-E/ |
|---|---|---|---|
| Harmony | dɔg-ɛ | – | gɪj-ɛ |
| Neutralisation | – | ?? | gij-ɛ |
|  | [dɔ̀g-ɛ̀] | [mín] | [gìj-ɛ̀] |
|  | 's/he left (it)' | 's/he waited' | 's/he killed' |

# Consequences of absolute neutralisation

# Consequences of absolute neutralisation

* **Non-falsifiable**: no independent way to confirm/disprove abstract contrasts

# Consequences of absolute neutralisation

* **Non-falsifiable**: no independent way to confirm/disprove abstract contrasts
    ▶ Can't be observed; don't turn up in acoustic analysis
    ▶ Don't figure in any other linguistic pattern

# Consequences of absolute neutralisation

* **Non-falsifiable**: no independent way to confirm/disprove abstract 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 (2), which they're supposed to explain

(2) **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' | /dʒʊg-/ | [dʒùg-ɛ̀] | 's/he recognised' |
| /bər-/ | [bàr–è] | 's/he helped' | /pag-/ | [pàg-ɛ̀] | 's/he tied' |

# Consequences of absolute neutralisation

\* **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?

(1) **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] |

# Where have we gone wrong?

(1) **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] |

**Root vowel representations**

# Where have we gone wrong?

(1) **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] |

**Root vowel representations**

▶ 'correlation doesn't imply causation'

# Where have we gone wrong?

(1) **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]                  |

**Root vowel representations**

▶ 'correlation doesn't imply causation'
  ▶ [nòj-è] and [dɔ̀g-ɛ̀] are correlated for the harmony feature

# Where have we gone wrong?

(1) **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] |

**Root vowel representations**

- ▶ '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?

# Where have we gone wrong?

(1) **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] |

**Root vowel representations**

▶ '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 /d_ɔg-E/ → [d_ɔg-ɛ̀]?

# Where have we gone wrong?

(1) **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] |

**Root vowel representations**

- ► '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 /dɔ̲g-E/ → [dɔ̲g-ɛ̀]?
- ► or   /dOg-ɛ̲/ → [dɔ̀g-ɛ̲]?

# Where have we gone wrong?

(1) **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] |

**Root vowel representations**

# Where have we gone wrong?

(1) **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] | [nòj-íjɛ] |
| [−ATR] root | /dɔg-/ | 'leave' | [dɔ̀g-ɛ̀] | [dòg-ílòŋ] | [dɔ̀g-íjɛ́] |

**Root vowel representations**

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

# Where have we gone wrong?

(1) **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] |

**Root vowel representations**

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

# Where have we gone wrong?

(1) **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 | /dog-/ | 'leave' | [dɔ̀g-ɛ̀] | [dòg-ílòŋ] | [dɔ̀g-íjɛ́] |

**Root vowel representations**

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

# Where have we gone wrong?

(1) **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 | /dog-/ | 'leave' | [dɔ̀g-ɛ̀] | [dòg-ílòŋ] | [dɔ̀g-íjɛ́] |

**Root vowel representations**

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. /d̲ɔ̲g-E/ → [d̲ɔ̲g-ɛ̀]

2. /dog-ɛ̲̀/ → [dɔ̀g-ɛ̲̀]

# Preview: reanalysis implications

# Preview: reanalysis implications

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

|         | UR of root |          | perfective   | infinitive     | mediopassive   |
|---------|------------|----------|--------------|----------------|----------------|
| Class A | /noj-/     | 'sleep'  | [nòj-è]      | [nój-ílòŋ]     | [nɔ̀j-íjɛ́]     |
| Class B | /dog-/     | 'leave'  | [dɔ̀g-ɛ̀]    | [dòg-ílòŋ]     | [dɔ̀g-íjɛ́]     |

# Preview: reanalysis implications

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

|         | UR of root |         | perfective | infinitive | mediopassive | imperative |
|---------|------------|---------|------------|------------|--------------|------------|
| Class A | /noj-/     | 'sleep' | [nòj-è]    | [nój-ílòŋ] | [nòj-íjɛ́]    | [nój-ó]    |
| Class B | /dog-/     | 'leave' | [dɔ̀g-ɛ̀]   | [dòg-ílòŋ] | [dɔ̀g-íjɛ́]   | [dóg-á]    |

# Preview: reanalysis implications

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

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

**Important differences:**

# Preview: reanalysis implications

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

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

**Important differences:**

  1. ~~directionally asymmetric bidirectional harmony~~

# Preview: reanalysis implications

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

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

**Important differences:**

1. ~~directionally asymmetric bidirectional harmony~~
   ▶ only uni-directional suffix-controlled harmony

# Preview: reanalysis implications

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

|  | UR of root |  | perfective | infinitive | mediopassive | imperative |
|---|---|---|---|---|---|---|
| Class A | /noj-/ | 'sleep' | [nòj-è] | [nój-ílòŋ] | [nɔ̀j-íjɛ́] | [nój-ó] |
| Class B | /dog-/ | 'leave' | [dɔ̀g-ɛ̀] | [dòg-ílòŋ] | [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/~~

# Preview: reanalysis implications

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

|  | UR of root |  | perfective | infinitive | mediopassive | imperative |
|---|---|---|---|---|---|---|
| Class A | /noj-/ | 'sleep' | [nòj-è] | [nój-ílòŋ] | [nɔ̀j-íjɛ́] | [nój-ó] |
| Class B | /dog-/ | 'leave' | [dɔ̀g-ɛ̀] | [dòg-ílòŋ] | [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/

# Preview: reanalysis implications

# Preview: reanalysis implications

3. ~~Abstract contrasts on high/low vowels~~
   - ~~/bij-E/ and /gɨj-E/~~

# Preview: reanalysis implications

3. ~~Abstract contrasts on high/low vowels~~
   ▶ ~~/bij-E/ and /gɨj-E/~~
   ▶ only concrete or non-abstract /i, u, a/

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

| ATR class /-e/ | | RTR class /-ɛ/ | |
|---|---|---|---|
| [bìj-è] | 's/he laid down' | [gɨj-ɛ̀] | 's/he killed' |
| [sùg-è] | 's/he went down' | [ʤùg-ɛ̀] | 's/he recognised' |
| [bàr–è] | 's/he helped' | [pàg-ɛ̀] | 's/he tied' |

# Preview: reanalysis implications

3. ~~Abstract contrasts on high/low vowels~~
   - ▶ ~~/bij-E/ and /gij-E/~~
   - ▶ only concrete or non-abstract /i, u, a/

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

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

# Preview: reanalysis implications

3. ~~Abstract contrasts on high/low vowels~~
   - ▶ ~~/bij-E/ and /gɨj-E/~~
   - ▶ only concrete or non-abstract /i, u, a/
4. ~~Harmony counterbleeding opacity via neutralisation~~
   - ▶ ~~/gɨj-E/ → /gɨj-ɛ/ → [gɪ̀j-ɛ̀]~~

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

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

# Preview: reanalysis implications

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

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

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

# Preview: reanalysis implications

# Preview: reanalysis implications

In sum:

▶ reinterpreting the direction of harmony in ambiguous cases (dɔgɛ)
  ▶ eliminates all typologically and theoretically controversial generalisations

# Outline

# Outline

# High/low vowel harmony neutrality

# 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?

# High/low vowel harmony neutrality

# High/low vowel harmony neutrality

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

# High/low vowel harmony neutrality

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

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

| | | | |
|---|---|---|---|
| a. | /kedʒ-il<u>oŋ</u>/ | [kédʒ-il<u>òŋ</u>] | 'cut'-INF. |
| b. | /kedʒ-ij<u>ɛ</u>/ | [kédʒ-íj<u>ɛ́</u>] | 'cut'-MED-PASS. |
| c. | /sem-andʒ-<u>e</u>/ | [sém-ándʒ-<u>è</u>] | 'slaughter'-IMPERF.-2.PL. |
| d. | /sem-andʒ-<u>ɛɛ</u>/ | [sém-ándʒ-<u>ɛ́ɛ̀</u>] | 'slaughter'-IMPERF.-3.PL. |

# High/low vowel harmony neutrality

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

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

| | | | |
|---|---|---|---|
| a. | /keʤ-iloŋ/ | [kéʤ-ìlòŋ] | 'cut'-INF. |
| b. | /keʤ-ijɛ/ | [kéʤ-íjɛ́] | 'cut'-MED-PASS. |
| c. | /sem-anʤ-e/ | [sém-ánʤ-è] | 'slaughter'-IMPERF.-2.PL. |
| d. | /sem-anʤ-ɛɛ/ | [sém-ánʤ-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

# Bondu-so harmony is active [RTR]-spreading

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

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

| | | |
|---|---|---|
| [bɛ̀l-áà] | *[bɛ̀l-àà] | 'edible leaves (cooked)'-sg. |
| [ɔ̀b-áà] | *[ɔ̀b-àà] | 'flexible liana branch'-sg. |
| [ʤóŋ-ónʤ-óji̱] | | 'heal'-imperf.-i.pl. |
| [sém-ánʤ-óji̱] | *[sɛ́m-ánʤ-óji̱] | 'slaughter'-imperf.-i.pl. |

# 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] (9)

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

| | | |
|---|---|---|
| [bèl-áà] | *[bɛ̀l-áà] | 'edible leaves (cooked)'-sɢ. |
| [òb-áà] | *[ɔ̀b-áà] | 'flexible liana branch'-sɢ. |
| [ʤóŋ-óndʒ-óji̱] | | 'heal'-ɪᴍᴘᴇʀꜰ.-ɪ.ᴘʟ. |
| [sém-ándʒ-óji̱] | *[sɛ́m-ándʒ-óji̱] | 'slaughter'-ɪᴍᴘᴇʀꜰ.-ɪ.ᴘʟ. |

# 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] (9)

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

| | | |
|---|---|---|
| [bèl-áà] | *[bɛ̀l-áà] | 'edible leaves (cooked)'-SG. |
| [òb-áà] | *[ɔb-áà] | 'flexible liana branch'-SG. |
| [ʤóŋ-óndʒ-óji̠] | | 'heal'-IMPERF.-I.PL. |
| [sém-ándʒ-óji̠] | *[sɛ́m-ándʒ-óji̠] | 'slaughter'-IMPERF.-I.PL. |

☞ The marked value is [RTR] in Bondu-so
- i.e. [RTR] /ɛ, ɔ/ vs. (non-RTR) /e, o/

# High/low vowel harmony neutrality summary

# High/low vowel harmony neutrality summary

Bondu-so high/low vowels:

# High/low vowel harmony neutrality summary

Bondu-so high/low vowels:

- **harmonically transparent**: phonologically inactive and invisible to tongue root harmony
  - [sɛ́m-ándʒ-è] vs. [sɛ́m-ándʒ-ɛ́ɛ̀] 'slaughter'-IMPERF.-3.PL.

# High/low vowel harmony neutrality summary

Bondu-so high/low vowels:

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

# High/low vowel harmony neutrality summary

Bondu-so high/low vowels:

- **harmonically transparent**: phonologically inactive and invisible to tongue root harmony
    - [sém-ándʒ-è] vs. [sɛ́m-ándʒ-ɛ́ɛ̀] 'slaughter'-IMPERF.-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)

# Outline

# Distinct inflectional classes are not controversial

Hantgan & Davis (2012) and Green & Hantgan (2019) have demonstrated distinct nominal inflections and harmony patterns in (10)

# Distinct inflectional classes are not controversial

Hantgan & Davis (2012) and Green & Hantgan (2019) have demonstrated distinct nominal inflections and harmony patterns in (10)

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

# Distinct inflectional classes are not controversial

Hantgan & Davis (2012) and Green & Hantgan (2019) have demonstrated distinct nominal inflections and harmony patterns in (10)

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

(10) **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'   |
|         | cɛ́nd-àà  | cɛ́nd-ɛ̀ɛ̀ | 'heart/liver'  |

# Suffixes are contrastive

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

# Suffixes are contrastive

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

- ▶ which define important morphological distinctions (11)

# Suffixes are contrastive

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

▶ which define important morphological distinctions (11)

(11) **Person and number inflections in Bondu-so: 'heal'-ɪᴍᴘᴇʀꜰ.**

|  | Sɪɴɢ. | Pʟᴜʀ. |
|---|---|---|
| 1. | ʤóŋ-ónʤ-ὸm | ʤóŋ-ónʤ-ójì |
| 2. | ʤóŋ-ónʤ-ὸὸ | ʤóŋ-ónʤ-ὲ |
| 3. | ʤóŋ-ónʤ-ὸ | ʤɔ́ŋ-ɔ́nʤ-ɛ́ɛ̀ |

# Outline

# Reorganisation of the data

# Reorganisation of the data

Recorded the data provided by Hantgan & Davis (2012) in a .csv file

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

# Reorganisation of the data

Recorded the 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]

# Reorganisation of the data

Recorded the 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]

(12) **Example data**

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

# Bondu-so revised inflectional classes

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

Table 1: Nominal inflections in Bondu-so

# Bondu-so revised inflectional classes

(13) **Noun class examples**

|  | Form | Morph. | Gloss |
|---|---|---|---|
| Class 1 | ól-<u>òò</u> | singular | 'house' |
|  | ól-<u>èè</u> | plural | 'house' |
| Class 2 | kɔ́b-<u>ɔ̀ɔ̀</u> | singular | 'sheath' |
|  | kɔ́b-<u>ɛ̀ɛ̀</u> | plural | 'sheath' |
| Class 3 | òb-<u>áà</u> | singular | 'flexible liana branch' |
|  | ɔ̀b-<u>ɛ́ɛ̀</u> | plural | 'flexible liana branch' |

# Bondu-so revised inflectional classes

|           | 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

# Bondu-so revised inflectional classes

(14) **Verb class examples**

|  | Form | Morph. | Gloss |
|---|---|---|---|
| CLASS 1 | némbíl-lòŋ | infinitive | 'beg' |
|  | némbíl-ó | imperative | 'beg!' |
|  | nèmbil-íjé | mediopassive | 'beg' |
|  | nèmbil-è | perfective | 's/he begged' |
| CLASS 2 | kédʒ-ìlòŋ | infinitive | 'cut' |
|  | kédʒ-á | imperative | 'cut!' |
|  | kɛ́dʒ-íjɛ́ | mediopassive | 'be cut' |
|  | kɛ̀dʒ-ɛ̀ | perfective | 's/he cut' |

# Missed inflectional generalisations

# Missed inflectional generalisations

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

# Missed inflectional generalisations

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

(1) **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] |

# Missed inflectional generalisations

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

▶ this leaves unexplained ATR mediopassive suffixes

# Missed inflectional generalisations

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

▶ this leaves unexplained ATR mediopassive suffixes

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

| RTR [-íjɛ́] | | ATR [-íjé] | |
|---|---|---|---|
| [kɛ́ʤ-íjɛ́] | 'cut' | [nɛ̀mbìl-íjé] | 'beg' |
| [dɔ̀g-íjɛ́] | 'leave' | [sòŋg-íjé] | 'curse' |
| [jàmb-íjɛ́] | 'cover' | [dàŋ-íjé] | 'be stuck' |

# Missed inflectional generalisations

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

- ▶ this leaves unexplained ATR mediopassive suffixes
- ▶ Hantgan & Davis (2012: 9, fn. 8): nasals contribute to [+ATR] realisations
  - ▶ but this too admits exceptions: e.g. [jàmb-íjɛ́] 'cover'

(15) **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
(16)

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

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

|           | Class 1   | Class 2   |
| --------- | --------- | --------- |
| PERF.     | -è        | -ɛ̀        |
| MED-PASS. | -íjé      | -íjɛ́      |
| IMP.      | -ó        | -á        |
| IMPERF.   | -óndʐ-    | -ándʐ-    |

# Inflectional class summary

We have clear evidence for:

# Inflectional class summary

We have clear evidence for:

I. Distinct inflectional classes
   - ▶ Class 2 [kɔ́b-ɔ̀ɔ̀] 'sheath'-sɢ. vs. Class 3 [kób-áá] 'brick mold'-sɢ.

# 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-ɛ̀ɛ̀] 'heal'-IMPERF.-2.PL./3.PL.

# 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-ɛ̀ɛ̀] '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-]

# Outline

# Conclusions and final notes

Bondu-so has been previously analysed as displaying:

# Conclusions and final notes

Bondu-so has been previously analysed as displaying:

* a complex, directionally-asymmetric tongue root harmony system

# Conclusions and final notes

Bondu-so has been previously analysed as displaying:

* a complex, directionally-asymmetric tongue root harmony system
* ternary [ATR] feature specifications on mid vowels

# Conclusions and final notes

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

# Conclusions and final notes

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

# Conclusions and final notes

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

# Conclusions and final notes

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

# Conclusions and final notes

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

# Conclusions and final notes

# Conclusions and final notes

Crux of the problem:

# Conclusions and final notes

Crux of the problem:

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

# Conclusions and final notes

Crux of the problem:

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

Reanalysis:

- Unidirectional suffix-controlled [RTR] harmony with harmonically transparent non-contrastive vowels

# Conclusions and final notes

Crux of the problem:

▶ misinterpretation the direction of harmony in ambiguous cases (dɔgɛ)
  ▶ 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

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

| | | | | | |
|---|---|---|---|---|---|
| a. | /kedʒ-iloŋ/ | [kédʒ-ìlòŋ] | 'cut'-INF. | i | u |
| b. | /kedʒ-ijɛ/ | [kédʒ-íjɛ́] | 'cut'-MED-PASS. | e | o |
| c. | /sem-andʒ-e/ | [sém-ándʒ-è] | 'slaughter'-IMPERF.-2.PL. | ɛ | ɔ |
| d. | /sem-andʒ-ɛɛ/ | [sɛ́m-ándʒ-ɛ́ɛ̀] | 'slaughter'-IMPERF.-3.PL. | a | |

# The 'Abstractness Controversy'

# The 'Abstractness Controversy'

This reanalysis of Bondu-so has important implications for abstract phonology

# The 'Abstractness Controversy'

# The 'Abstractness Controversy'

Do other languages display abstract segments?

# The 'Abstractness Controversy'

Do other languages display abstract segments?

- e.g. Standard Yoruba (Ọla Orie 2001, 2003)
    - **harmony exceptions**:

        [e-bi̩] 'hunger' vs. [ɛ̀-bi̩] 'guilt'

# The 'Abstractness Controversy'

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]

# The 'Abstractness Controversy'

Do other languages display abstract segments?

- ▶ e.g. Standard Yoruba (Ọla Orie 2001, 2003)
    - **harmony exceptions**:
        - [e-bi̠] 'hunger' vs. [ɛ̀-bi̠] 'guilt'
    - ▶ **abstract harmony**:
        - /e-bɪ̠/→/ɛ-bɪ̠/→[ɛ-bi̠]
- ▶ e.g. Esimbi (Hyman 1988)
    - **7-affixal contrasts > 3-root contrasts**:
        - [u-mu] 'drink' vs. [o-mu] 'go up' vs. [ɔ-mu] 'sit'

# The 'Abstractness Controversy'

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-mu̱] 'drink' vs. [o-mu̱] 'go up' vs. [ɔ́-mu̱] 'sit'
    - **abstract height transfer**:
        /u-mɔ̱/→/ɔ-mɔ̱/→[ɔ́-mu̱]

# The 'Abstractness Controversy'

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

# Final questions

If not here then where?

# Final questions

If not here then where?

- ▶ What would satisfactory evidence of abstract contrasts look like?

# Final questions

If not here then where?

▶ What would satisfactory evidence of abstract contrasts look like?

▶ How can abstract segments be independently motivated?

# Final questions

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?

# Final questions

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?

# Final questions

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?

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

# Final questions

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

# Thanks for listening!

# References I

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*, 2., 40–67. Oxford: Blackwell.

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.

# References II

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.

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

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

# References III

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 PhD thesis.

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.