Bantu harmony locality variation is autosegmental

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Contents

1 Introduction

1.1 Talk summary

- **Topic**: locality problem in long-distance assimilatory processes
  - how do we define what should be visible to a process?
  - how do we define what should participate in a process?
- **Study**: micro-variation in Bantu height harmony
- **Problem**: ternary typology with respect to non-assimilating segments
  - * popular approaches to harmony locality only predict 2
- **Solution**: Privative Contrastive Hierarchy Theory (Sandstedt 2018, Iosad 2017)
  - ternary contrast in feature specifications
  - combined with simple harmony licensing (Walker 2005)
  - traditional autosegmental spreading
    - ☞ predicts exactly the observed typology

1.2 Linguistic background

This paper contrasts three closely related languages:

- Chewa (N.31, Chichewa; Downing & Mtenje 2017)
  - spoken in Zambia, Malawi, and Mozambique
- Mbunda (K.15, aka Kimbunda; Gowlett 1970)
  - spoken in Angola and Zambia
- Ndendeule (N.101, aka Kindendeule; Ngonyani 2004)
  - spoken in the Namtumbo district, Ruvuma region of Tanzania

Phonological similarity

All three languages display similar phonological and morphological patterns

- **Today**: [-el, -il] height harmony and non-assimilating low vowels in (1)

(1) **Mbunda height harmony on APPL.-FV. [-el-a, -il-a]**

HIGH	lum-il-a	'cultivate'	tung-il-a	'build'
MID	nen-el-a	'bring'	oc-el-a	'roast'
LOW	kwat-el-a	'hold'		

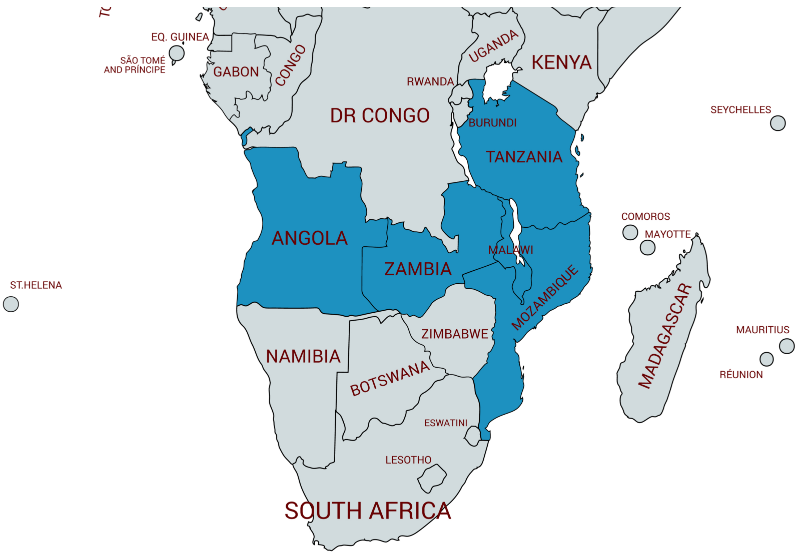


Figure 1: Chewa, Mbunda, and Ndendeule geography

Bantu locality variation

Harmony variation comes in different kinds

- representational, prosodic, metrical, and morphological restrictions
  - harmony applies roughly within the verbal derivational stem
  - prefixes do not harmonise
  - word-final vowels do not harmonise in Chewa

Today: representationally generalisable locality exceptions

- e.g. low vowels never harmonise
  - regardless the morphology or position

Fundamental claim: phonological variation which is generalisable in terms of representations relates to representational structure

1.3 Vowel systems

5V and 7V inventories

The vowel inventories of Chewa, Mbunda, and Ndendeule are provided below in (2).

- all three display similar high /i, u/ vs. non-high /e, o/ contrasts and alternations (1)

- Ndendeule displays an additional tongue root contrast as well as tongue root harmony on mid vowels
- for the sake of space, I abstract away from these tongue root contrasts today, but see Sandstedt (2018: §2.4) for a fuller analysis of Ndendeule dual height and tongue root harmony

(2) **Mbunda, Chewa, and Ndendeule 3 and 4 height contrasts**

(a) Mbunda (K.15)	(b) Chewa (N.31)	(c) Ndendeule (N.101)
i u	i u	i u
e o	e o	e o
a	a	ɛ ɔ
		a

Vowel length is generally not contrastive in these languages

- but they may display penultimate lengthening as a reflex of predictable stress placement
  - e.g. Chewa [**góo**n-a] 'to sleep' but [gón-**éé**l-á] 'to sleep on something' (Hyman 2009, Downing & Mtenje 2017)

Vowel length has no effect on vowel harmony

- for the ease of explication of harmony patterns vowel length is not represented in this paper

1.4 Harmony descriptive generalisations

Mbunda, Ndendeule, and Chewa display cognate harmony patterns in (3)

- spreading from root-initial to non-initial syllables
- resulting in high/non-high [i, u] ~ [e, o] alternations on suffixes

High/non-high harmony patterns

(3) **Non-/high harmony alternations: applicative [-il, -el]**

a) Mbunda (K.15):

lim-il-a	'cultivate for'	tung-il-a	'build for'
nen-el-a	'bring to'	oc-el-a	'roast for'

b) Ndendeule (N.101):

yib-il-a	'steal from/for'	tul-il-a	'skin with/for/on'
yemb-el-a	'sing for/with'	bol-el-a	'teach for/with/at'

c) Chewa (N.31):

phík-il-a	'cook for'	khút-il-a	'be satisfied with'
tsék-el-a	'close for'	kók-el-a	'pull out for'

Labial restrictions on harmony

All three languages display an orthogonal harmony restriction based on vowel backness or rounding

- labial vowel suffixes will only harmonise with other labial vowels (4a)
  - /tomb-ul-a/ → [tomb-ol-a]
  - /tek-ul-a/ → [tek-ul-a], not *[tek-ol-a]

(4) **Non-/labial height harmony asymmetries: reversive [-ul, -ol]**

a) Mbunda (K.15):

zit-ul-a	'untie'	kup-ul-a	'bail out'
tek-ul-a	'draw water'	tomb-ol-a	'uproot'
*tek-ol-a			

b) Ndendeule (N.101):

hib-ul-a	'unplug'	humb-ul-a	'discover'
hyek-ul-a	'uncover'	tong-ol-a	'pick fruit from tree'
*hyek-ol-a			

c) Chewa (N.31):

pitík-ul-a	'overturn'	fúnth-ul-a	'loosen'
tsék-ul-a	'open'	wónj-ol-a	'spring a trap'
*tsék-ol-a			

The patterns in (4) are an example of so-called *parasitic harmony*

- harmony for some feature [F] is limited by orthogonal [G] feature specifications

- results in a marked/unmarked asymmetry where labial harmony targets are picky harmony recipients while non-labial segments are not; cf. non-labial, non-picky suffixes in (3)
- for the sake of space, I abstract away from labial contrasts and parasitic harmony asymmetries in this talk, but see Sandstedt (2018: §3.3) for a contrastive hierarchy theoretic treatment of parasitic harmony

> **Parasitic harmony insight**: all three languages involve **height harmony via vowel lowering**
>
> ☞ in neutral harmony contexts, vowels display failed *lowering*, not failed vowel *raising*

Low vowel neutrality

Low vowels are invariably non-alternating/non-harmonising in all three languages

- e.g. [sikam-a], not *[sikɔm-ɔ] (5a)

(5) **Low vowels are non-participants**

a) Mbunda (K.15):

sikam-a	'pay a visit'	tumam-a	'sit'
jendam-a	'bow'	okam-a	'become thin'

b) Ndendeule (N.101):

yig-an-a	'imitate each other'	tum-an-a	'send each other'
peng-an-a	'block each other'	yop-an-a	'ask each other'

c) Chewa (N.31):

chingam-il-a	'welcome someone'	lungam-a	'be righteous'
welam-a	'bend'	polam-a	'stoop'

Non-participants are harmonically neutral

Bantu /a/ is an example of **neutral segments**

> **Neutral segment**: a segment which categorically fails to harmonise; a non-alternating segment

Low vowel variation

Low /a/ is invariably non-alternating but displays three different patterns in word-medial and root-initial positions (6)

- active and visible — harmonic blocking in Mbunda
- inactive but visible — neutral blocking in Chewa
- inactive and invisible — transparency in Ndendeule

(6) **/a/ harmony in/activity and in/visibility across three Bantu languages**

a) Mbunda (K.15) harmonic blocking /a/:

kwat-el-	'hold'-APPL.	*active*	/a...i/	→	[a...e]
tumam-el-	'sit'-APPL.	*visible*	/u...a...i/	→	[u...a...e]
okam-el-	'become thin'-APPL.		/o...a...i/	→	[o...a...e]

b) Ndendeule (N.101) transparent /a/:

kang-il-	'push'-APPL.	*inactive*	/a...i/	→	[a...i]
hiɣal-il-	'become white'-APPL.	*invisible*	/i...a...i/	→	[i...a...i]
koβal-el-	'stumble'-APPL.		/o...a...i/	→	[o...a...e]

c) Chewa (N.31) neutral blocking /a/:

vál-il-	'get dressed'-APPL.	*inactive*	/a...i/	→	[a...i]
chinga-il-	'welcome someone'-APPL.	*visible*	/i...a...i/	→	[i...a...i]
polam-il-	'stoop'-APPL.		/o...a...i/	→	[o...a...i]

Variation in activity and visibility

The behaviour of neutral segments may be summarised along two dimensions

- phonological **activity** and **visibility** as in (7)

(7) **Ternary contrast in neutral segments' harmony visibility and activity**

	visible	**invisible**
active	Mbunda (K.15) *harmonic blocker*	
inactive	Chewa (N.31) *neutral blocking*	Ndendeule (N.101) *transparent segments*

The divisions in (7) illustrate two dichotomies

- segments trigger harmony (Mbunda) or they don't (Chewa, Ndendeule)
- segments are transparent to harmony (Ndendeule) or they're not (Mbunda, Chewa)

The greyed out category (active but invisible) is unattested

- e.g. active in trigger positions but invisible in target positions

☞ activity and visibility are not entirely independent

  – presumably, if a segment has the harmony feature (evidenced by triggering)
  – then it has the structure that harmony targets in target positions
    * in other words, visibility is a precondition for activity

1.5 The problem with harmony neutrality

The problem: presumed activity = visibility equivalence

The issue is that existing approaches to harmony variation typically do not appreciate the nuanced relationship in (7)

- equating phonological activity and visibility

Specifically, a feature or segment is commonly assumed to be phonologically *active* + *visible*:

- in derivational terms if it is present in the structural or applicational description of some rule (Dresher 2015; Hall & Hall 2016)
  - the rule in (8) refers *both* to visible targets (i.e. /i/) and active triggers (−high vowels)

(8) $i \rightarrow e \; / \; \begin{bmatrix} \text{+syllabic} \\ \text{-high} \end{bmatrix} \_$

- in non-derivational frameworks if it is referred to by an 'active' constraint (a constraint which is visible in at least some derivation; Kiparsky 2017)

☞ satisified **both** by active triggers and visible targets
  - if visible targets must be active triggers and vice versa:
  - no way to be visible but inactive
    * ruling out Chewa-style neutral blocking (6)

The activity–visibility dichotomy across frameworks

The activity–visibility equivalence is formalised in a variety of ways across frameworks

Agreement by Correspondence:

- either included (active/visible) or excluded (inactive/invisible) from the correspondence set (Rose & Walker 2004)

Binary contrastive hierarchy scope asymmetries:

- segments either within (active/visible) or outside (inactive/invisible) the scope of the harmony feature (Dresher 2009)

Featural under/specification:

- specified (active/visible) or underspecified (inactive/invisible) for a harmony feature (Archangeli 1988)

Contrastive relativisation:

- processes may compute all or only contrastive specifications (Nevins 2010; Calabrese 1995, 2005)

Neutral blocking doesn't fit

Chewa neutral blocking breaks the activity=visibility equivalence

- /a/ fails to trigger harmony: implies inactive/invisible transparency
- /a/ is a visible blocker of harmony: implies active/visible harmonic blocking

Neutral blocking requires something extra

Neutral blocking = transparency + syllable adjacency

- /a/ is inactive (non-triggering) and invisible (non-target)
  - but harmony cannot skip syllables
  - resulting in what looks like neutral blocking

Neutral blocking = harmonic blocking + trigger–target simililarity for [low]

- /a/ is visible (blocking) and active (triggering)
  - but [−low] /i, u/ and [+low] /a/ are too dissimilar
  - therefore /a/ fails to trigger harmony
  - resulting in what looks like neutral blocking

Problems with composite approaches to neutral blocking

- **ad hoc**
  - little independent motivation
    - syllable adjacency and trigger-target similarity are only motivated by the data they're supposed to explain (restatement of the facts)
- **no unified account**
  - only harmonic blocking and transparency
  - neutral blocking is an epiphenomenon of a variety of constraint interactions

- **potentially wrong typological predictions**
  - neutral blocking requires more complex or more specific grammatical machinery
  - nevertheless, the canonical pattern in Bantu
  - all three patterns widely attested
- **no one size fits all**
  - Old Norwegian height harmony (Sandstedt 2018)
    - harmonic blocking /æ, a/ + neutral blocking /ɛ, ɔ/
  - Khalkha or Halh (Mongolian) labial harmony (Svantesson et al. 2008)
    - transparent /i/ + neutral blocking /u, ʊ/

☞ independent phenomena; neutral blocking not reducible to one solution

Too restrictive and too permissive

Existing approaches are:

- **Too restrictive**:
  - recurringly ruling out commonly attested sound pattern
  - requiring additional constraints, parameters, etc.
    - no unified solution
    - ad hoc, weakly motivated
    - potentially incorrect typological predictions

☞ risking making our frameworks too permissive

2 The Contrastive Hierarchy approach

2.1 Representational preliminaries

I present a new approach based on a novel version of Contrastive Hierarchy Theory (CHT; Sandstedt 2018)

- using privative features and feature-nodes (cf. Iosad 2017)

This approach incorporates insights from emergent and substance-free feature theories (Mielke 2008; Blaho 2008; Iosad 2017)

- i.e. features and class organisation do not exist a priori but must be extracted from the data; principally abstract categories independent of articulatory or acoustic substance/reference

Emergent feature geometry: The hierarchical organisation of the CHT architecture combined with non-innate, substance-free features produces a kind of emergent feature geometry

- posited by the language learner based on language-particular phonological activity (i.e. contrasts and alternations) and visibility (i.e. locality asymmetries)

Contrastive hierarchies

Fig. 3 provides an abstract example of a contrastive hierarchy

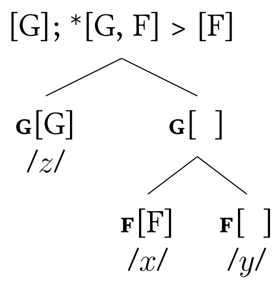


Figure 3: Feature classes and sub-classes in a privative contrastive hierarchy

Contrastive hierarchies are built via the recursive division of an inventory according to a set of features and feature co-occurrence restrictions, as described by Iosad (2017: 42):

> The hierarchy is essentially a bootstrapping device, which allows the learner to introduce order into the system of phonological contrasts by breaking the phonological space down into more manageable subinventories.

2.2 The Successive Division Algorithm

Contrastive hierarchies are built according to the Successive Division Algorithm (SDA)

- producing [F] vs. (non-F) sub-inventories for each feature

A slightly simplified version of the SDA from Sandstedt (2018: 42) is provided in (9).

(9) **Successive Division Algorithm**

a. The input (I) to the algorithm is one or more ordered feature and feature co-occurrence restrictions (e.g. [F]; *[F, G] > [G])

b. If I is found to contain a feature, then it is divided into two (non-empty) sub-inventories: a marked set M, to which is assigned F[F], and its unmarked complement set $\bar{M}$, to which is assigned F[ ], obeying *[F, G] co-occurrence restrictions

c. M and $\bar{M}$ are then treated as the input to the algorithm; the process continues until all features are divided

The SDA consists of three important components:

1. features are hierarchically divided into binary-branching feature classes

   ☞ hierarchical organisation of features

2. each sub-inventory is associated with an emergent feature-node

   ☞ geometric grouping into classes

3. the relative hierarchical ordering of features is cross-linguistically variable

   ☞ emergent or cross-linguistically varying phonological classes

Features vs. feature-nodes

Features and feature-nodes are very similar phonological objects

- they define relationships of *sameness* and *difference*
  - only at different levels

Feature-nodes define feature contrastivity

- a feature node F indicates the existence of a contrast
  - distinguishing the [F]-contrastive set /*x y*/ from non-contrastive /*z*/
    * feature-nodes are emergent; class behaviour is strictly a function of feature scope in the hierarchy
    * no class organisation independent of the hierarchy

Features differentiate sub-inventories of each feature contrast (e.g. /*x*/ vs. /*y*/)

- the marked (dominant) class is assigned a feature-node F as well as a privative feature specification [F]
  - e.g. F[F] /*x*/
- the unmarked (recessive) class bears an empty or bare node F[ ] and is non-specified for the feature
  - e.g. F[ ] /*y*/

Phonological visibility ≠ activity

This framework formally distinguishes *phonological activity* from *phonological visibility*

Phonological visibility

- defined by feature scope
  - feature-nodes define locality domains in classic autosegmental phonology fashion (Avery & Rice 1989; Odden 1994)
  - bearing an F-node guarantees visibility to [F] processes

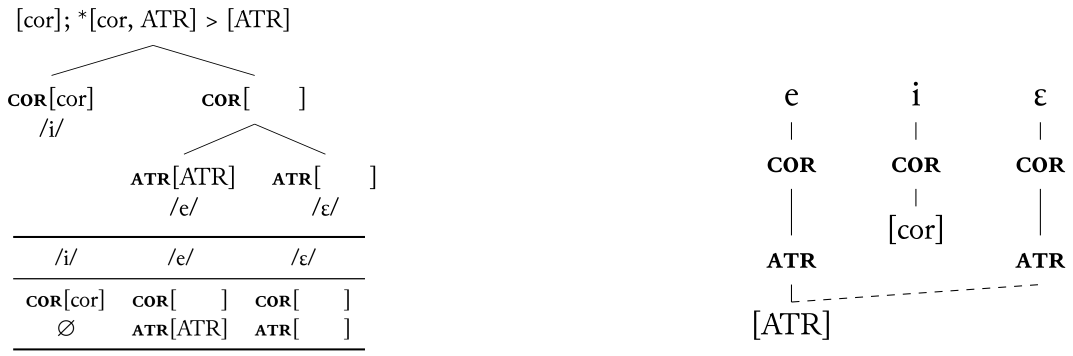
Phonological activity

- defined by feature specifications
  - [F]-specified segments are active feature donors
  - non-specified segments are not

Activity and visibility illustrated

Fig. 4 provides a toy example of a contrastive hierarchy and [ATR]-spreading with /i/-transparency

- the order of features and feature-nodes in Fig. 4b is defined by the contrastive hierarchy
- /e ɛ/ are contrastive for [ATR]
  - ATR[ATR] /e/ is a dominant trigger
  - ATR[ ] /ɛ/ is a recessive target
- /i/ is non-contrastively underspecified
  - inactive and invisible to [ATR]-processes



(a) A two-feature contrastive feature hierarchy

(b) Local [ATR]-spreading

Figure 4: Local [ATR]-spreading between contrastively specified triggers and non-specified targets as defined by a hierarchy with ternary ATR[ATR], ATR[ ], and ∅ featural specifications

Phonological activity and visibility are not independent

The CH architecture captures the nuanced relationship between phonological activity/visibility

- visibility is a pre-condition for activity
- activity guarantees visibility
- i.e. having [F] implies having F
  - ruling out unattested active but invisible neutral segments

2.3 Building contrastive hierarchies

Bantu representational diagnostics

A set of represenational diagnostics based on Bantu harmony patterns are outlined in (10)

- based on observed phonological activity in the three languages

(10) **Descriptive generalisations and representational diagnostics**

a) /e/ displays systematic harmony alternations with /i/ in (3)

☞ /e, i/ must be minimally paired for the harmony feature [F]

b) Harmony targets are non-open in neutral harmony contexts in (4)

– i.e. [F]-harmony involves active vowel lowering

☞ /e/ is specified [F]; /i/ is contrastively non-specified (non-F)

c) /a/ vs. /e i/ contrasts; /a/ fails to undergo [F]-harmony in (5)

☞ /a/ must be specified for some orthogonal feature [G] which cannot freely co-occur with [F]

Formalising the representations

The representational diagnostics in (10ab) imply the contrastive hierarchy in Fig. 5

- i.e. pairing /e, i/ for some lowering/non-raising harmony feature specified on /e/
  - labelled [open] for clarity's sake

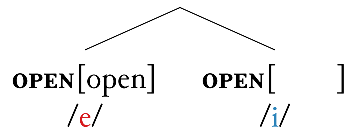


Figure 5: [open] /e/ vs. non-open /i/ contrasts

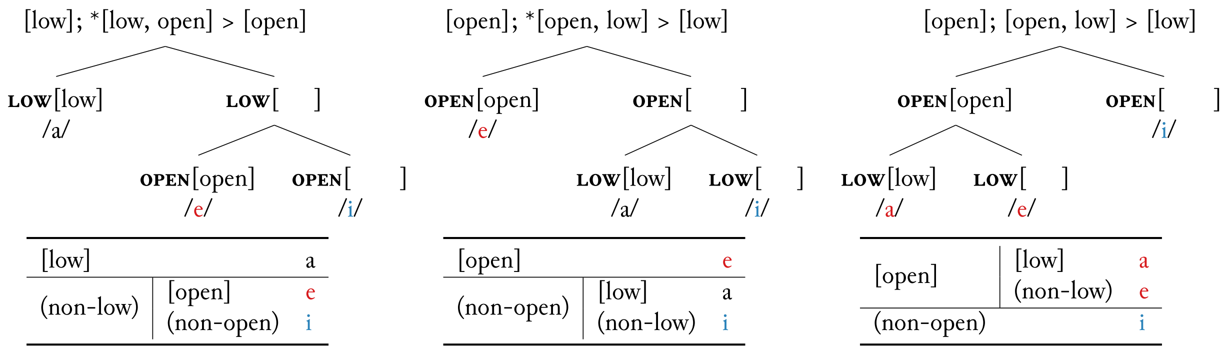
Hierarchically organising an asymmetric inventory

The third representational diagnostic in (10c) indicates some inventory asymmetry

- low /a/ is specified for some feature [G] which cannot freely co-occur with [F]
- we will label [G] as [low] for clarity's sake

According to CHT, there are exactly three ways low vowels could be categorised with respect to open/non-open vowel contrasts

- outside the scope of open contrasts (Fig. 6a)
- within the scope of open contrasts (Fig. 6ab)
  - co-occuring with [open] (Fig. 6c)
  - not co-occurring with [open] (Fig. 6b)



(a) ∅ /a/ **(b)** OPEN[ ] /a/ **(c)** OPEN[open] /a/

Figure 6: Ternary OPEN[open], OPEN[ ], and ∅ /a/-specifications in three privative contrastive feature hierarchies

The representations in Fig. 6 reflect the logical range of ways in which any asymmetric set of three things can be hierarchically organised while maintaining the harmonic pairing between /e, i/ for [open]

We may logically divide the set into one of the following:

- Fig. 6a:
  - 1) low /a/ vs. non-low /e i/
  - 2) mid /e/ vs. high /i/
- Fig. 6b:
  - 1) mid /e/ vs. non-mid /a i/
  - 2) low /a/ vs. high /i/
- Fig. 6c:
  - 1) non-high /a e/ vs. high /i/
  - 2) low /a/ vs. mid /e/

Representational equivalence

The representations in Fig. 6 are very similar, assuming the same features and varying only in scope and feature co-occurrence restrictions

- Fig. 6a and Fig. 6b differ only with respect to hierarchical scope
  - [low] > [open] in Fig. 6a
  - [open] > [low] in Fig. 6b
- Fig. 6b and Fig. 6c differ only with respect to feature co-occurrence
  - *[open, low] (prohibited co-occurrence) in Fig. 6b
  - [open, low] (obligatory co-occurrence) in Fig. 6c[1]

[1]Obligatory feature co-occurrence may be interpreted as a form of licensing (cf. Iosad 2017: §4.2.5; Walker 2005, 2011), as defined in (i) below. According to these approaches, the relationship between [open] and [low] features is uni-directional; [low] must co-occur with [open] but not necessarily the other way around. For example, the inventory in Fig. 6c includes [open, low] /a/, [open] /e/, but no non-open *[low] /ɘ/. As with prohibited *[open, low] co-occurrence restrictions, obligatory [open, low] co-occurrence prohibits /a/ from undergoing harmony alternations (i.e. /a, *ɘ/), consistent with the representational diagnostics in (10).

(i) License([low], [open]): '[low] must be associated with [open]'.

2.4 Harmony grammar

Harmony as feature licensing

The basic insights of Bantu height harmony can be captured by the simple licensing principle in (11)

- adapted from Walker (2005) – inspired by Nevins (2010)

(11) License(Non-Initial-V–**open**, [open]):
'Non-initial vowels which are contrastive for [open] should be associated with [open]'

The licensing principle in (11) specifies:

1. what positions harmonise
2. for what feature

License(non-initial-V–**open**, [open]) motivates [open]-spreading from initial to non-initial syllables in all three languages

☞ the languages differ only with respect to their featural organisation

Contrastive hierarchy limitations

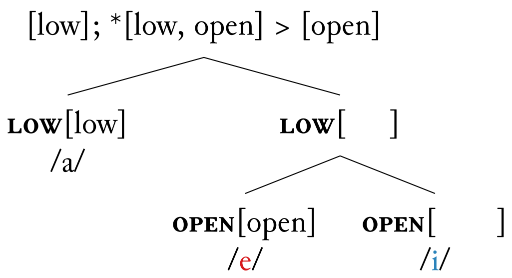
The licensing principle in (11) is limited by the representations in the contrastive hierarchy

> **Representational restrictions on outputs**: the contrastive hierarchy represents limitations on permissible phonological *outputs* at the relevant stratum

Example harmony derivations

An illustration of the harmony licensing principle in action in Ndendeule is provided below in (12)

- based on the representations in Fig. 6a or Fig. 7 where [low] is categorised outside of [open]-contrasts (the Ndendeule transparent type)
- note that the feature specifications and order of feature nodes in (12) are defined by the specifications and order of featural divisions in Fig. 7



/a/	/e/	/i/
LOW[low]	LOW[ ]	LOW[ ]
∅	OPEN[open]	OPEN[ ]

Figure 7: Ndendeule height contrasts with non-contrastively underspecified non-open /a/

(12) **Ndendeule height harmony as privative [open]-spreading**

(a) High harmony as [open] non-spreading   **(b)** Non-high harmony as [open] spreading

According to the licensing principle in (11)

- non-initial vowels which have an OPEN node will copy [open] from local [open]-specified vowels where possible
  - resulting in harmonic spreading in [yemb-el] 'sing for/with'
  - but no harmony in [yib-il] 'steal from/for'

2.5 Harmony generalisations

The CHT approach provides a unified account of all three neutral harmony types

- harmony is implemented in exactly the same way in each language
- the variation in /a/-activity/visibility are predictable by-products of varying [open]/[low] hierarchical organisation outlined in Fig. 6

2.5.1 Ndendeule transparency

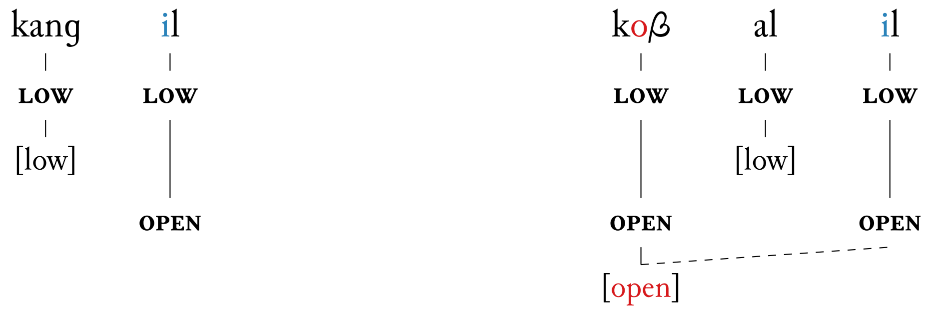
According to the Ndendeule contrastive hierarchy in Fig. 7

- [low] /a/ is non-contrastively underspecified for [open]; lacking any [open]-specification or OPEN-node

  ☞ ergo both *inactive* and *invisible* to [open]-harmony

Ndendeule transparency via underspecification

(13) **Ndendeule /a/-inactivity/invisibility via underspecification**



(a) Non-lowering [kang-il] **(b)** Transparent [koβal-el]

2.5.2 Chewa neutral blocking

Ndendeule vs. Chewa vowel classes

Comparing the contrastive feature hierarchies for Ndendeule and Chewa in Fig. 10

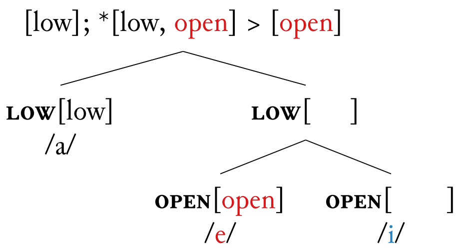
- speakers of both languages assume the exact same phonological primitives
  - a) [open]; b) [low]; and *[open, low]
- they differ only with respect to the featural ranking

  ☞ [open] has broader scope in Chewa but narrower scope in Ndendeule

This has important implications for the *visibility* of [low]-specified segments

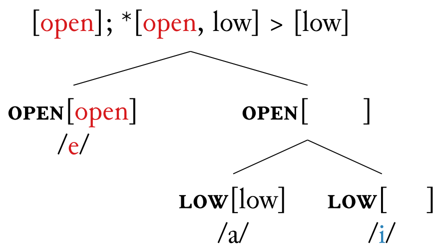
- crucially, [low] /a/ is contrastively non-specified for [open] in Chewa; bearing an OPEN-node but no [open]-specification

  ☞ ergo *inactive* **but** *visible* to [open]-harmony



/a/	/e/	/i/
LOW[low]	LOW[ ]	LOW[ ]
∅	OPEN[open]	OPEN[ ]

(a) Ndendeule: [low] > [open]



/a/	/e/	/i/
OPEN[ ]	OPEN[open]	OPEN[ ]
LOW[low]	∅	LOW[ ]

(b) Chewa: [open] > [low]

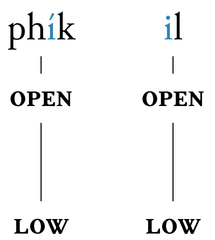
Figure 10: Ndendeule and Chewa contrastive feature hierarchies

Chewa height harmony

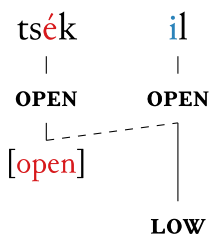
Harmony applies in exactly the same way in Chewa as in Ndendeule

- only the order of [low]/[open] contrasts is reversed (14)

(14) **Chewa height harmony via [open]-spreading**



(a) High harmony as [open] non-spreading



(b) Non-high harmony as [open] spreading

Neutral blocking via contrastive non-specification

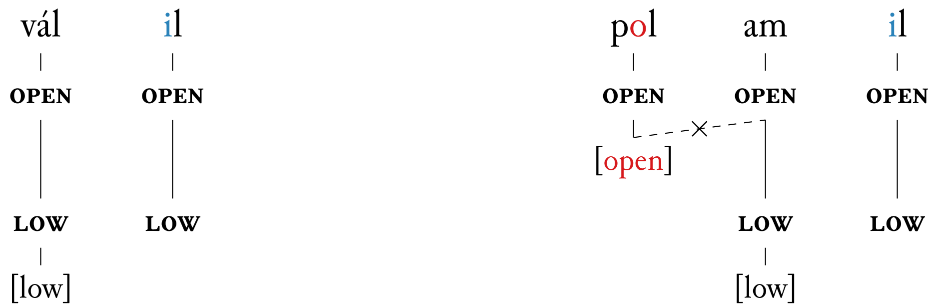
In (15a) we observe how contrastive non-specification makes /a/ an *inactive* non-trigger

- but being contrastive for OPEN predicts that /a/ nevertheless should be visible to [open]-spreading
- however, spreading [open] to /a/ would produce an illicit *[open, low]-co-occurrence (see Fig. 10b)

☞ harmony fails to apply, resulting in neutral blocking

✓ neutral blocking is derived just as straightforwardly as transparency

(15) **Chewa /a/-inactivity but visibility**



(a) Inactive [vál-il]

(b) Neutrally blocked: [polam-il]

2.5.3 Mbunda harmonic blocking

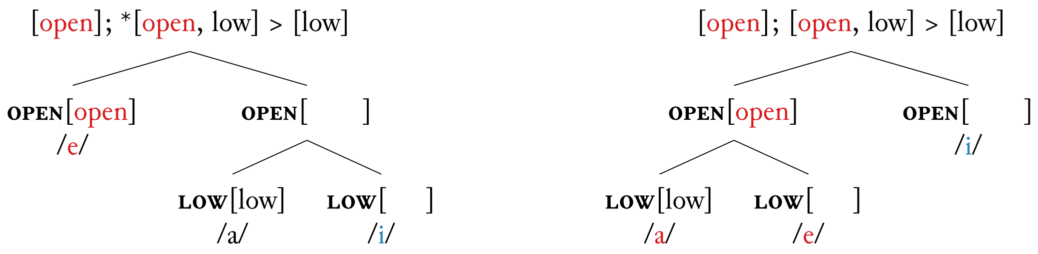
Chewa vs. Mbunda vowel classes

Comparing the contrastive feature hierarchies for Chewa and Mbunda in Fig. 13

- speakers of both languages assume the exact same features and feature ordering
  - i.e. [open] > [low]
- they differ only with respect to the featural co-occurrence restrictions
  - ☞ [open] is prohibited from co-occurring with [low] in Chewa
  - ☞ [low] is required to co-occur with [open] in Mbunda

This has important implications for the *activity* of [low]-specified segments

- crucially, [low] /a/ is contrastively specified for [open] in Mbunda; thereby bearing an OPEN-node and [open]-specification
  - ☞ ergo both *active* **and** *visible* to [open]-harmony



/a/	/e/	/i/
OPEN[ ] LOW[low]	OPEN[open] ∅	OPEN[ ] LOW[ ]

(a) Chewa: *[open, low]

/a/	/e/	/i/
OPEN[open] LOW[low]	OPEN[open] ∅	OPEN[ ] LOW[ ]

(b) Mbunda: [open, low]

Figure 13: Chewa and Mbunda contrastive feature hierarchies

Mbunda height harmony

Harmony applies in exactly the same way in Mbunda as in Chewa

- only the co-occurrence restriction on [open, low] differs

(16) **Mbunda height harmony via [open]-spreading**

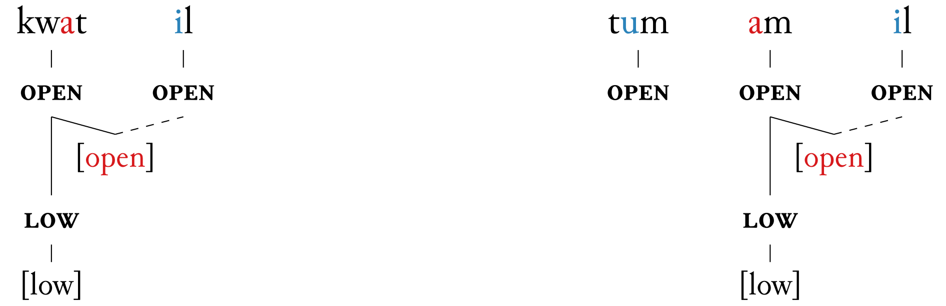
(a) High harmony as [open] non-spreading

(b) Non-high harmony as [open] spreading

Being contrastively specified for the harmony feature

- OPEN[open] /a/ triggers harmony lowering regardless its position
  - ☞ resulting in harmonic blocking in (17)
    - ✓ harmonic blocking is derived just as straightforwardly as neutral blocking and transparency

(17) **Mbunda /a/-activity and visibility**



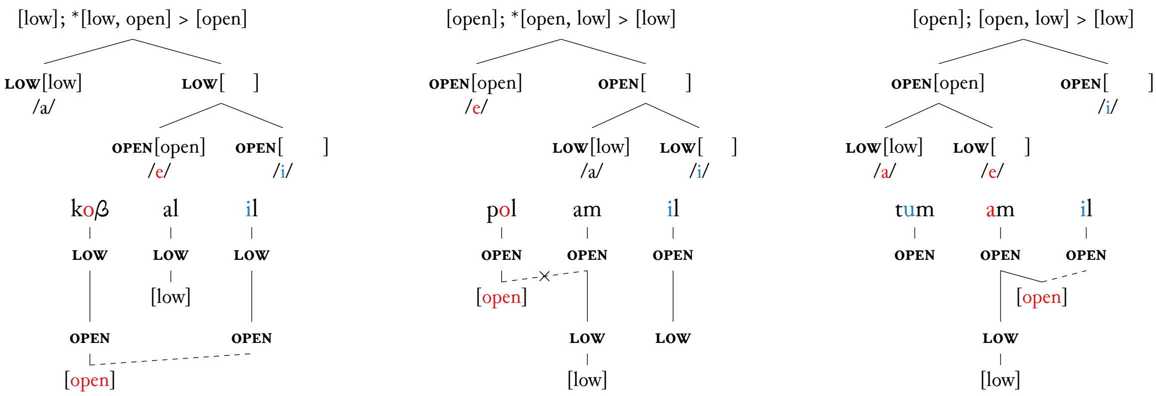
(a) Active [kwat-el] **(b)** Harmonically blocked: [tumam-el]

2.5.4 Neutral harmony summary

The predicted alternative categorisations of asymmetric contrasts predicted by the CH architecture with the simple licensing principle in (11)

- produces exactly the typology of harmony and neutral patterns observed in (3–6)
  - summarised in (18)
    - ✓ transparency via non-contrastive underspecification
    - ✓ neutral blocking via contrastive non-specification
    - ✓ harmonic blocking via contrastive specification

(18) **Summary /a/-neutrality patterns**



(a) Ndendeule: [koβal-el] transparency **(b)** Chewa: [polam-il] neutral blocking **(c)** Mbunda: [tumam-el] harmonic blocking

3 Conclusions

1. Harmony languages display a ternary distinction with respect to neutral segments

    - transparency (e.g. Ndendeule, N.101)
    - harmonic blocking (e.g. Mbunda, K.15)
    - neutral blocking (e.g. Chewa, N.31)

2. CHT which incorporates privative features and feature-nodes

    - predicts three ways to categorise asymmetric contrasts while maintaining a harmonic pairing
    - produces different class shapes and ternary feature specifications
        - contrastive specification (e.g. **OPEN**[open] /a/ in Mbunda)
        - contrastive non-specification (e.g. **OPEN**[ ] /a/ in Chewa)
        - non-contrastive underspecification (e.g. ∅ /a/ in Ndendeule)

3. A simple feature licensing procedure applied to the representations predicted by CHT

    - produces exactly the observed typology of harmony and neutral patterns
        - nothing more and nothing less

Good explanatory mileage

The CHT approach:

- provides the first fully unified account of harmony neutrality across harmony systems
    - harmony as an operation is grammatically identical
    - ☞ representationally generalisable harmony locality variation is simply an emergent effect of the logically alternative ways in which feature classes can be hierarchically organised

- explains the cross-linguistic correlation between asymmetric inventory shape and harmony neutrality (Kiparsky & Pajusalu 2006)
    - ☞ the feature co-occurrence restrictions that define the inventory asymmetry are ultimately also responsible for the harmony neutrality

Predicted harmony typology

A schema of the predicted CHT harmony typology for a feature [F] is provided in Fig. 17

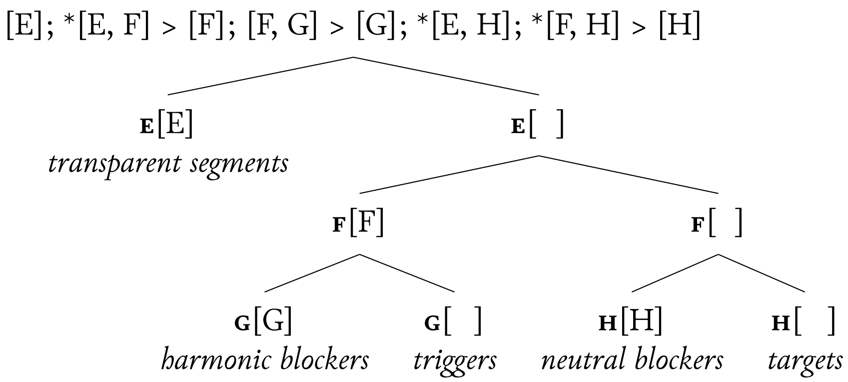
According to the CHT approach:

- neutral blocking vowels are simply regular visible harmony targets

- except that they are specified for some feature [H] which is *prohibited* from co-occurring with [F], barring [H] ~ [F, H] harmony alternations

- harmonic blocking vowels are simply regular active harmony triggers
  - except that they are specified for some feature [G] which is *required* to co-occur with [F], barring [G] ~ [F, G] harmony alternations

Figure 17: Harmony typology according to contrastive feature hierarchies



The typology in Fig. 17 illustrates the one-to-one relationship between specific representations and specific phonological behaviour types

- providing both the language-learner and the phonologist with an explicit harmony methodology
- highlighting the role phonological representations play in phonological patterning

Concluding remarks

From this comparative study, we may conclude:

1. Surface locality variation in harmony processes illustrates a nuanced relationship between phonological activity and visibility

   ☞ another example of surface ternarity in phonology

2. The intersection of phonological activity and visibility reveals hierarchical asymmetries

   ☞ reflects the hierarchical organisation of feature classes

3. The content and shape of phonological classes is cross-linguistically varying

   ☞ emergent features and feature classes

A version of CHT which incorporates emergent features and feature-nodes and which assumes cross-linguistically varying feature scope provides a minimalistic, constrained, and highly predictive framework which captures each of these insights

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