Abstract: This chapter surveys the main phonological phenomena found in Bantu languages. One such phenomenon is vowel harmony, where suffixes typically alternate in height depending on the preceding vowel. Combinations of nasal plus consonant are also frequently subject to various modifications, and such clusters also play an important role in the debates over syllable structure, since Bantu language seem to exhibit the peculiarity that the only onset clusters of consonantals is composed of nasal followed by obstruent, reversing the more general tendency for sonority to rise in the syllable onset. The tone systems of Bantu languages are especially well-known for their complex systems of alternations in the form of spreading, dissimilation and grammatically-conditioned melodic alternation. A key feature of interest in the study of Bantu phonology is the considerable variability in the exact details of operation in a highly similar set of rules.

Keywords: Bantu, phonology, tone, vowel harmony, nasals, syllable, compensatory lengthening

There are around 500 Bantu languages in Africa, spoken in an area ranging from near Nigeria to southern Somalia and south to the tip of the continent. Bantu languages are conventionally classified into zones designated by letters A through S, following criteria and an enumeration of languages in Guthrie (1971). These languages are clearly related to neighboring language-groups also termed “Bantu” such as Jarawan, Mamfe, Grassfields and Ekoid, and constitute a node on a highly-branching genetic tree (one constantly being revised), under increasingly broader subgroups such as Bantoid, Benue-Congo, Volta-Congo and Niger-Congo. See Williamson & Blench (2000) for the position of Bantu within Niger-Congo. Maho (2003) gives a contemporary version of the Guthrie classification of Bantu. Relationships of Bantu languages to each other are quite controversial and unsettled: see Bennett & Sterk (1977), Bastin et al. (1999), Nurse & Philippson (2003) for proposals.

The reconstructed phoneme inventory of proto-Bantu is simple, being composed of the consonants *p *t *c *k *b *d *g *j *m *ɲ, the vowels *i *ɪ *e *a *o *ʊ *u, and H and L tone (L typically being unmarked). Classical works on Bantu phonological reconstruction are Meinhof (1932) and Guthrie (1967-71). The phonetic values of *c *j are difficult to ascertain, but may have been [s z] or [s j], and *d probably allophonically varied with [l]. The phonetics of the vowel system is open to debate, so while it is clear that there are three distinctive vowel heights or degrees, it is not clear whether the phonetic vowels are closer to [i ɪ e a ø o u] or to [i e ø e ø u]. In synchronic descriptions it is often difficult to assign the second-degree vowels ø œ firmly to canonical [i u] or to [e o] – the third-degree vowels are in fact most often closest to [e ø]. Complicating matters, there is a tradition of reconstructing and describing Bantu with the letters <i ø a ø u> (Guthrie 1967-71, Meeussen 1967) where <i u> are “super-close” or “super-high”, a property intended to reflect the propensity for the highest vowels to spirantize a preceding stop. Syllables are presumed to have the canonical shape (N)CV(V), with distinctive vowel length and

* My thanks go to Lee Bickmore, Helen Eaton, Larry Hyman, Constance Kutsch Lojenga, Mike Marlo, Deo Ngon­yani, Mary Paster, Thilo Schadeberg and an anonymous reviewer for their helpful comments and data. Unsourced data are from my notes.
one tone per syllable. NC onset clusters may also be considered to be single phonemes (Schadeberg 2003).

Synchronic inventories tend to preserve these patterns, though the distinction *i, *u versus *ɪ, *ʊ is frequently neutralized to [i, u], and vowel-length distinctions are frequently lost. Consonant inventories, on the other hand, tend to expand especially in connection with the reduction of the 7-vowel system to a 5-vowel system, thus Shona has 35 consonants and Xhosa has 18 clicks plus 44 non-click consonants (not counting NC clusters).

Four areas of Bantu phonology are reviewed here. Very many languages have some version of vowel-height harmony, discussed in section 1. It is also common to find significant alternations pertaining to NC clusters (section 2). Processes of vowel hiatus resolution, especially involving compensatory lengthening, have played a significant role in the development of theories of syllable structure, seen in section 3. Bantu languages are well-known for their highly variable and complex tonal systems, considered in Section 4.

An understanding of Bantu phonology is facilitated by an understanding of Bantu morphology. A detailed reconstruction of proto-Bantu grammatical morphemes is given in Meeussen (1967). Nouns have somewhat arbitrary genders which are marked with singular versus plural class prefixes, conventionally numbered from 1 to 22 or higher and generally paired so that nouns with a singular in cl. 1 have a plural in cl. 2, and so on. The probable class prefixes and gender pairs of proto-Bantu are given in (1).

(1) 

<table>
<thead>
<tr>
<th>Cl.</th>
<th>Cl. (pl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>mo-</td>
</tr>
<tr>
<td>2</td>
<td>ba-</td>
</tr>
<tr>
<td>3</td>
<td>mo-</td>
</tr>
<tr>
<td>4</td>
<td>ma-</td>
</tr>
<tr>
<td>5</td>
<td>di-</td>
</tr>
<tr>
<td>6</td>
<td>ma-</td>
</tr>
<tr>
<td>7</td>
<td>ki-</td>
</tr>
<tr>
<td>8</td>
<td>bi-</td>
</tr>
<tr>
<td>9</td>
<td>n-</td>
</tr>
<tr>
<td>10</td>
<td>n-</td>
</tr>
<tr>
<td>11</td>
<td>do-</td>
</tr>
<tr>
<td>12</td>
<td>to-</td>
</tr>
<tr>
<td>13</td>
<td>to-</td>
</tr>
<tr>
<td>14</td>
<td>bo-</td>
</tr>
<tr>
<td>15</td>
<td>ko-</td>
</tr>
<tr>
<td>16</td>
<td>pa-</td>
</tr>
<tr>
<td>17</td>
<td>ko-</td>
</tr>
<tr>
<td>18</td>
<td>mo-</td>
</tr>
<tr>
<td>19</td>
<td>pi-</td>
</tr>
<tr>
<td>20</td>
<td>go-</td>
</tr>
<tr>
<td>21</td>
<td>gi-</td>
</tr>
<tr>
<td>22</td>
<td>ga-</td>
</tr>
</tbody>
</table>

Verb morphology is especially rich but also highly variable across languages in the area of tense-inflection. (2) gives a template of the main features of productive verb morphology, with an instantiation in Karanga Shona.\(^1\)

---

\(^1\) SP=Subject Prefix, TNS = tense-aspect-mood-polarity-clause inflection, OP = Object Prefix, EXT = extension, FV = final inflection.
Prefixes have the shape (C)V-, roots are CVC-, and suffixes are -VC- except the final vowel which is V— in other words, the morphology conspires to guarantee that syllables are open.

The root and extensions exhibit the greatest degree of phonological coherence and interaction, and this grouping is often termed the Derivational Stem (DS). The DS then groups with the FV, which expresses tense distinctions, to yield the Inflectional Stem (Downing 1997). Addition of object prefixes results in a higher domain known as the Macrostem, and finally, other prefixes join with the Macrostem to form the fully-inflected verb. Proto-Bantu roots may have all been monosyllabic, as are the vast majority of synchronic roots.

The combinatorial riches of Bantu morphology are directly relevant to how the phonology works, because paradigmatic variation in the sounds of morphemes and control over environmental variables can usually be accomplished easily. Thus a possible rule of post-nasal voicing can usually be motivated by looking at the 1s. vs. 1p. present with the prefixes /n-/ vs. /tʊ/.

Sometimes, though, such evidence is not available thanks to reanalysis of grammatical morphemes (e.g. the 1s. prefix is /ndi-/ in Shona), in which case a considerable amount of evidence for a phonological process can be lost.

An extensive bibliography of Bantu linguistics is Maho (2009).

1. **Vowel Harmony**

A widespread characteristic of Bantu phonology is vowel height harmony (broadly construed). See Hyman (1999) for more details on historical reconstruction and complications. While any vowel quality can appear in the first root syllable, affixes draw from a more restricted vowel inventory. Typically, affix vowels distinguish only three vowels: [a], and a front/back pair not of the third degree of height, i.e. [i u], [i o], or [e o] (but not [e ɔ]) depending on the language. The FV affix is usually drawn from /i~ɪ/ for negation, /ɛ~ɪ/ for subjunctive, and /a/ otherwise. Rules of vowel harmony frequently give rise to surface vowel types in non-canonical positions, e.g. [ɔ] outside the first root syllable.

A very common historical change is reduction of the 7-vowel system to 5-vowel [i e a o u] (where <e o> may be [ɛ ɔ]). In 5-vowel languages, one almost universally encounters a height-harmony rule whereby suffixal /i/ becomes [e] after [e,o], as exemplified by Shona (Fortune 1955, Beckman 1997) with the applied suffix /-ir/.

<table>
<thead>
<tr>
<th>Shona</th>
<th>V+APPL</th>
</tr>
</thead>
<tbody>
<tr>
<td>pera</td>
<td>perera</td>
</tr>
<tr>
<td>sona</td>
<td>sonera</td>
</tr>
<tr>
<td>ipa</td>
<td>ipira</td>
</tr>
</tbody>
</table>

---

2 It should be noted that authors frequently give examples using abstractions such as roots or stems, to which various prefixes and tones would be added to form specific words. Usually, a verb stem ending in /-u/ with the right tone pattern happens to form a singular imperative.
ruma  rumira  ‘bite’
vava  vavira  ‘itch’

7-vowel languages have the potential for greater variation in vowel harmony. Harmony in Matumbi (Odden 1996) points to two parameters of variation: how many heights a suffix assimilates to, and what value a vowel has in the absence of harmony. As we see in (4), the front vowels of the passive and causative suffixes agree completely in height with the preceding non-low vowel – after a low vowel, suffixes have the highest vowel, [i], which can be assumed to be underlying.

(4)  

<table>
<thead>
<tr>
<th>Matumbi</th>
<th>passive infin.</th>
<th>causative infin.</th>
</tr>
</thead>
<tbody>
<tr>
<td>infin.</td>
<td>infin.</td>
<td>causative infin.</td>
</tr>
<tr>
<td>t'áaga</td>
<td>t'áagilwa</td>
<td>t'áagija</td>
</tr>
<tr>
<td>íña</td>
<td>ínilwa</td>
<td>ínija</td>
</tr>
<tr>
<td>kúna</td>
<td>kúnilwa</td>
<td>kúnija</td>
</tr>
<tr>
<td>óoga</td>
<td>óogilwa</td>
<td>óoija</td>
</tr>
<tr>
<td>twíka</td>
<td>twíkilwa</td>
<td>twíkija</td>
</tr>
<tr>
<td>bòšōla</td>
<td>bòšōlewá</td>
<td>bòšōla</td>
</tr>
<tr>
<td>t'ëŋìga</td>
<td>t'ëŋìgélwa</td>
<td>t'ëŋìgeja</td>
</tr>
</tbody>
</table>

to grind’
‘to dance’
‘to grate coconut’
‘to bathe’
‘to lift a load’
‘to tear bark off a tree’
‘to build’

The same harmony arises in the southern Tanzanian languages Matengo (Yoneda 2000) and Ndendeuli (Deo Ngonyani, p.c.), languages with [i e e a o u], the latter language exemplified in (5).

(5)  

<table>
<thead>
<tr>
<th>Ndendeuli</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘they V (past)’</td>
</tr>
<tr>
<td>bakijiba</td>
</tr>
<tr>
<td>bakitula</td>
</tr>
<tr>
<td>bakikaŋga</td>
</tr>
<tr>
<td>bakijemba</td>
</tr>
<tr>
<td>bakibola</td>
</tr>
<tr>
<td>bakikëma</td>
</tr>
<tr>
<td>bakitòla</td>
</tr>
<tr>
<td>‘steal’</td>
</tr>
<tr>
<td>‘skin’</td>
</tr>
<tr>
<td>‘push’</td>
</tr>
<tr>
<td>‘sing’</td>
</tr>
<tr>
<td>‘teach’</td>
</tr>
<tr>
<td>‘call’</td>
</tr>
<tr>
<td>‘take’</td>
</tr>
</tbody>
</table>

Matumbi, Ndendeuli and Matengo are relatively close historically, and share a number of unusual features.

A variant of this harmony pattern is found in Kinga (Schadeberg 1971 and p.c.), Vwanji (Helen Eaton, p.c.) and Malila (Kutsch Lojenga 2009), also spoken in southern Tanzania, where vowels after a have degree-2 height ([i]).

(6)  

<table>
<thead>
<tr>
<th>Kinga</th>
</tr>
</thead>
<tbody>
<tr>
<td>oxōglīlala</td>
</tr>
<tr>
<td>oxōsūglīlala</td>
</tr>
<tr>
<td>oxōlīlala</td>
</tr>
<tr>
<td>oxōpūlīx ĭla</td>
</tr>
<tr>
<td>oxoxēhēx ĭla</td>
</tr>
</tbody>
</table>
Outside of southern Tanzania, multi-height harmony is found in Komo (Thomas 2011) spoken in D.R. Congo, and Lugungu (Diprose 2007) spoken in Uganda. Along with Malila, these languages also have bidirectional ATR harmony which affects prefixes and which allophonically derives [e o] from /ɛ ɔ/ – in all of these languages, suffixes with alternating vowels have [i] when harmony does not apply.

The most widespread Bantu harmony variant in 7-vowel languages is single-height harmony exemplified by Kikuyu (Peng 2000) in (7) and Nyamwezi (Maganga & Schadeberg 1992) in (8), where suffix vowels have [e] after [ɛ ɔ], and degree-2 vowels otherwise – [e] in Kikuyu and Kamba, [i] in Nyamwezi, Sukuma, Lega, Rimi and Langi. \(^3\)

(7) **Kikuyu**

- tiyereka ‘abandon’
- tumereka ‘join’
- yerereka ‘have s.t fetched for’
- hoθereka ‘be used’
- βaθereka ‘become rich’
- temereka ‘cut into specific shapes’
- βejerera ‘calm down’

(8) **Nyamwezi**

- żikila ‘arrive’
- βitia ‘pass’
- lekela ‘let’
- apila ‘collect honey’
- βonila ‘see’
- golila ‘buy’
- zugila ‘cook’

An interesting complication in harmony is that while the front vowel harmonizes to any vowel, the back vowel usually does not harmonize with e. (9) gives examples in the 5-vowel single-height harmonizing language Bukusu (Mutonyi 2001): virtually all 5-vowel languages with harmony exhibit this backness asymmetry.

(9) **Bukusu**

- xuut'uxulula ‘to pour out completely’
- xuutafulula ‘to scoop out’
- xůuxomólólá ‘to pull out’

---

\(^3\) Caution is called for in interpreting the orthographic distinction <e o> vs. <i o> as the phonetic value of degree-2 vowels. The degree-2 vowels <e o> employed in works on Kamba by Odden and Roberts-Kohno is somewhere between canonical [ɪ o] and [ɛ o], being noticeably higher than the corresponding vowels of Kikuyu, but lower than those of Matumbi. In this case the choice of symbols is arbitrary. Batibo (1985) likewise represents the degree-2 Sukuma vowels phonemically as <e o>, but describes them phonetically as [i o], which agrees with the description of Yukawa (1989).
xuuketulula ‘to pour to the last drop’

In 7-vowel single-height harmonizing languages (e.g. Kikuyu, Nyamwezi and numerous other languages), the corresponding restriction is that only /ɔ/, and not /ɛ/, triggers vowel harmony.

(10) **Nyamwezi**

hɔgɔla ‘break off’
zeɛŋgɔla ‘build’
bisóla ‘find out’
pründola ‘overturn’
gaβɔla ‘divide’
guβɔla ‘unlid’
foonola ‘show teeth’

There is variation in the backness asymmetry among languages with multiple-height harmony. In Ndendeuli and Matengo, only back vowels trigger height-harmony on the round vowel, which totally assimilates to the height of the preceding vowel. When not harmonized, the back vowel appears as [u], as it does after the non-trigger vowel /a/.

(11) **Matengo**

dɛ̄muka ‘wake up’
hjékuka ‘be de-lidded’
njembuka ‘be flexible’
tábuka ‘separate’
túmbuka ‘start’
hógoka ‘be openable’
dɔsmɔka ‘be over’

**Ndendeuli**

hibula ‘unplug’
hjekula ‘uncover’
tegula ‘undo a trap’
pangula ‘disorganize’
hɔmɔla ‘pull out knife, spear, etc’
tongula ‘pick fruit from tree’
humbula ‘discover’

On the other hand, in Matumbi (12) and Kinga (13), as well as Vwanji and Lugungu, only /ɛ/ among the front vowels is excluded from the class of triggers of harmony on back vowels.

(12) **Matumbi**

júpulwa ‘to be served’
libulwa ‘to be ground’
tikulwa ‘to be broken’
kʊombolwa ‘to be beaten’
Kinga

oxodísuxa    ‘to burst open intr.’
oxosúkula   ‘to kindle fire’
oxopítola   ‘to get hold of sth. from below in order to lift it’
oxopólola  ‘to smoothe’
oxohěmbola ‘to dig up’
oxosóx̩xa  ‘to be lean’
oxomátola ‘to take off plaster’

Kinga

ʊxʊdítsuxa  ‘to burst open intr.’
ʊxʊsúkula   ‘to kindle fire’
ʊxʊpítola   ‘to get hold of sth. from below in order to lift it’
ʊxʊpólola   ‘to smoothe’
ʊxʊhěmbola ‘to dig up’
ʊxʊsóx̩xa  ‘to be lean’
ʊxʊmátola ‘to take off plaster’

The only difference between Matumbi and Kinga+Vwanji in their harmony systems is that the non-harmonizing vowel has degree-two height in Kinga but degree-one height in Matumbi.

Though the front/back asymmetry in height harmony is quite widespread, it is not universal, and especially in 7-vowel languages of zones A-C and adjacent languages (Hyman 1999), symmetrical harmony is found. For example, Nkundo lowering harmony applied to /o/ is triggered equally by [ɛ] and [ɔ] (Hulstaert 1965).

Progressive stem-internal height harmony thus exhibits a substantial degree of parametric variation.

There are other kinds of height harmony in Bantu. In the languages of western Lake Victoria, one frequently encounters multiple height harmony rules. In Kuria (Chacha & Odden 1998) there is progressive stem-internal lowering from degree 2 to degree 3 (oko-rɔ̀g-ɛ́r-á ‘to bewitch for’, cf. ugu-súraaŋg-ɛ́r-a ‘to praise for’), regressive stem-internal lowering from degree 1 to degree 2 (ogo-séék-ɛ́r-á ‘to close for’, cf. ugu-súk-á ‘to close’), regressive raising in all domains from degree 2 to degree 1 (umu-rím-i ‘farmer’, cf. oko-rɛ́m-a ‘to farm’), and regressive stem-internal raising from degree 3 to degree 2 (omo-rɔ̀g-i ‘witch’, cf. oko-rɔ̀g-a ‘to bewitch’).

Closely related Ikoma (Higgins 2012) has prefixal height disharmony and multiple progressive and regressive height harmonies, and is of interest because of rampant asymmetries between front versus back vowels in the harmony system. In (15), prefixes show regressive raising disharmony from degree-2 to degree-1, triggered by the lowest vowels [ɛ ɔ a], which explains the distribution of [o] vs. [u] in the infinitive prefix /ko-/l. The applied suffix is /-ɛ́r-/l, contrary to the general pattern that the applied has an underlying degree-2 vowel. In the first column of (15), that suffix vowel raises to degree-2 after a degree-2 vowel – contrast this to usual Kikuyu-style harmony (see (7)) where degree-2 /ɛ/ lowers to degree-3 only after a degree-3 vowel. The subjunctive FV on the other hand is /ɛl/ rather than more typical Bantu /el/, and causes raising of pre-
ceding root /ɛ/ to [e], but is itself lowered to [ɛ] after /ɔ/ (second column). Regressive raising of /ɛ/ is also triggered by the degree-1 causative and passive suffixes /i/ and /u/.

(15) Ikoma

\[
\begin{array}{|c|c|c|c|}
\hline
\text{infin+applied} & \text{lp subjunct.} & \text{infin+caus.} & \text{infin + pass.} \\
\hline
\gamma\ot i\beta e & \tau\ot i\beta e & \gamma\ot i\beta i & \gamma\ot i\beta u & \text{‘weed’} \\
\gamma\ot u\kappa e & \tau\ot u\kappa i & \gamma\ot u\kappa u & \text{‘dig’} \\
kore\kappa e & to\kappa e & kore\kappa i & kore\kappa u & \text{‘pay’} \\
koro\kappa e & tor\kappa e & kor\kappa i & kor\kappa u & \text{‘weave’} \\
\gamma\gamma e\gamma e & t\gamma e\gamma i & \gamma\gamma e\gamma u & \text{‘carry’} \\
yuk\omega\kappa e & tu\omega\kappa e & yu\omega\kappa i & yu\omega\kappa u & \text{‘do’} \\
\gamma\gamma a\beta e & tu\gamma a\beta e & \gamma\gamma a\beta i & \gamma\gamma a\beta u & \text{‘inherit’} \\
\hline
\end{array}
\]

It is hard to characterize the behavior of the suffixes *-ok-, *-ol- in terms of phonetically natural processes. After the vowels [u a], [u] appears; after [i e o], [o] appears; after [ɔ], [ɔ] appears.

(16) Ikoma

\[
\begin{array}{c}
\text{ko\beta uusuka ‘to fade’} \\
\gamma u\beta a\beta a\beta u ‘to boil’ \\
\gamma\ot i\beta m\beta oka ‘to be loose’ \\
yo\beta e\beta oka ‘to sprout’ \\
koh\beta o\beta oka ‘to come from’ \\
\gamma u\beta o\beta \beta oka ‘to leave’
\end{array}
\]

Higgins presents acoustic evidence that /ɛ/ and /e/ completely neutralize to [e] under this regressive raising process, and also shows that /ɔ/ is somewhat raised, but without neutralization. In other words, the unphonologized seeds for symmetric harmony are present in this language.

Regressive harmonies assimilating height in the prefix domain are found predominantly in more northern Bantu languages especially in zone C, and exist in Kuria, Gusii, Logoori, Lika, Nkundo, Ntomba, Nande, Koyo, Mokwe, Elembe-Nkutu, Tetela and Malila. In a number of instances, regressive harmony gives rise to an allophonic 9 or 10-vowel system where /i e a ɔ o u/ expands to /i e a ɔ o o u/ in Nande (Valinande 1984, Gick et al. 2006).

Finally in the realm of height harmonies, Sotho, Basaa and Nzebi have what Parkinson (1996) terms ‘one-step’ raising harmony, where vowels are ( regressively) raised by one degree, exemplified by raising in Nzebi which is conditioned by the tense suffix -i associated with the ‘perfective stem’ in Bantu.

(17) Nzebi

\[
\begin{array}{c|c|}
\text{basic} & \text{‘perfective’} \\
\hline
\beta a & \beta i & \text{‘carry’} \\
\beta o\beta o & \beta u\beta i & \text{‘breathe’} \\
\sigma e\beta a & \sigma e\beta i & \text{‘laugh’}
\end{array}
\]

4 Unusually, the expected final vowel /a/ is lacking after these vowel-final extensions.

5 There is no clear example of /e/ followed by either of these suffixes.
A different type of harmony, complete harmony, is found in a number of languages in the northwest zone C area (Leitch 1997), where the vowel /a/ assimilates completely to preceding /ɛ ə/. This is exemplified in (18) with the final suffix /-a/ and the passive /-am-/ in Babole.

(18) *Babole*

<table>
<thead>
<tr>
<th>Verb</th>
<th>Meanings</th>
</tr>
</thead>
<tbody>
<tr>
<td>silámá</td>
<td>‘sharpen!’</td>
</tr>
<tr>
<td>kelámá</td>
<td>‘make!’</td>
</tr>
<tr>
<td>sálámá</td>
<td>‘do!’</td>
</tr>
<tr>
<td>kohámá</td>
<td>‘take’</td>
</tr>
<tr>
<td>tsumámá</td>
<td>‘dip!’</td>
</tr>
<tr>
<td>hékémé</td>
<td>‘cut!’</td>
</tr>
<tr>
<td>kósömô</td>
<td>‘gather!’</td>
</tr>
</tbody>
</table>

2. **NC Clusters**

NC clusters, which are usually one of the only two consonantal clusters in Bantu, have some interesting phonological properties. Roots generally do not begin with NC clusters (and in Proto-Bantu, C is nearly always voiced in tautomorphic NC clusters – reconstructed roots like *ntu* ‘person, thing’ are extremely rare. NC clusters can arise by combining the prefix N- for classes 9 and 10, and in numerous languages if not in the proto-language, the verbal prefix for 1s (subject or object) has the shape *n* or *ɲ*. Consequently, it is generally easy to combine a nasal plus any consonant that can appear at the beginning of the stem, so rules pertaining to NC sequences could easily be learned from surface alternations.

2.1. **nasal + voiced C**

One pattern of alternation probably should be attributed to proto-Bantu, namely the hardening of approximants to voiced stops after a nasal. Commonly, voiced stops and fricatives or approximants are in an allophonic relation, with [b d g] appearing after a nasal in the syllable onset,\(^6\) and voiced continuants appearing after vowels and word-initially (i.e. syllable-initially). Kuria exemplifies this relationship in (19).

(19) *Kuria*

<table>
<thead>
<tr>
<th>Verb</th>
<th>Meanings</th>
</tr>
</thead>
<tbody>
<tr>
<td>oko-rémérá</td>
<td>to farm for</td>
</tr>
<tr>
<td>oko-γésérá</td>
<td>to pluck for</td>
</tr>
<tr>
<td>uku-βúúrjá</td>
<td>to ask</td>
</tr>
<tr>
<td>okoó-n-démerá</td>
<td>to farm for me</td>
</tr>
<tr>
<td>okoó-ŋ-gésérá</td>
<td>to pluck for me</td>
</tr>
<tr>
<td>ukuú-m-buurjá</td>
<td>to ask me</td>
</tr>
</tbody>
</table>

This allophonic relation between voiced stops and fricatives is wide-spread enough that there are competing theories as to what the proto-Bantu consonants fundamentally were – [β 1 γ] in the reconstruction of Meinhof (1932), but [b d g] according to Guthrie (1967-71).

\(^6\) See section 3.1 for discussion of syllable structure.
One frequently finds a synchronic relationship between post-nasal voiced stops [b d g] and a related voiced sound such as an approximant, fricative or implosive. For example, in Matumbi (also Mushunguli, Hehe and dialects of Pare), voiced stops are regularly implosive unless preceded by a nasal.

(20) **Matumbi**

<table>
<thead>
<tr>
<th>Infinitive</th>
<th>1s subjunct.</th>
</tr>
</thead>
<tbody>
<tr>
<td>gōloka</td>
<td>ŋ-goloke</td>
</tr>
<tr>
<td>bālaanga</td>
<td>m-balaāngē</td>
</tr>
<tr>
<td>dūumu</td>
<td>n-duumū</td>
</tr>
</tbody>
</table>

Implosive *d* is not the regular correspondent of proto-Bantu *d* in Matumbi; it is actually a rare phoneme found only in loan words. The etymological correspondent of *d* is [l], which along with the glides [w] and [j] undergoes post-nasal hardening.

(21) **Matumbi**

<table>
<thead>
<tr>
<th>Infinitive</th>
<th>1s subj.</th>
</tr>
</thead>
<tbody>
<tr>
<td>láabuka</td>
<td>n-daabǘke</td>
</tr>
<tr>
<td>jōba</td>
<td>n-ɗəbē</td>
</tr>
<tr>
<td>wikilja</td>
<td>ŋ-gʷikilí</td>
</tr>
</tbody>
</table>

In other words, the original situation may have involved lenition of voiced stops unless preceded by a nasal, but subsequent addition of new phonemes has led to reanalysis of the process as post-nasal hardening.

The voiced NC clusters [mb nd ŋg] are generally not subject to phonological change. The Makua group of languages are an exception, where proto-Bantu NC clusters underwent deletion of the nasal and voiced stops were devoiced, so PB *mbud* appears in Makua as epúri ‘goat’ and *ŋgoma* appears as ekóma ‘drum’. Since all original sources of NC sequences have been reanalyzed (the cl. 9-10 prefix is /e-/ and the 1s verbal prefix is /ki-/), there is no longer a synchronic basis for the earlier nasal-dropping rule.

In dialects of Kikuyu,7 historical NC clusters (C is always voiced) simplify to C, for example orthographic kündora ‘to look at me’ is dialectally [koodɔra]. This results in a somewhat perplexing surface alternation: after the prefix for 1s object, often assumed to be /n/, root-initial /β r γl/ become [m n ŋ] if a voiced stop (oral or nasal) follows in the next syllable, and otherwise, oral consonants (excluding /ð h/) become voiced stops. The alternation is historically explicable: [b d g] derive from *mb nd ŋg*, and a common rule in Bantu, Meinhof’s Law, dissimilated NCVN to CVN.

(22) **Kikuyu**

<table>
<thead>
<tr>
<th>Infinitive</th>
<th>1s obj</th>
<th>Historical antecedent</th>
</tr>
</thead>
<tbody>
<tr>
<td>korórà</td>
<td>koodɔra *koo-n-dɔra</td>
<td>‘look at’</td>
</tr>
<tr>
<td>korɔtɔra</td>
<td>koodɔtɔra *koo-n-dɔtɔra</td>
<td>‘dream for’</td>
</tr>
<tr>
<td>koromá</td>
<td>koonomá *koo-n- OMIT</td>
<td>‘bite’</td>
</tr>
</tbody>
</table>

---

7 Overton (1972) identifies this as a typical feature of the Nyeri dialect.
koreega  kooneega  *koo-n-Øeeŋga  ‘tear’
koŋɔŋa  koŋɔŋa  *koo-ŋ-gɔŋa  ‘praise’
koŋɔatá  koŋɔatá  *koo-ŋ-goatá  ‘grab’
koŋanera  koŋanera  *koo-ŋ-Øanera  ‘tell story to’
koŋaaba  koŋaaba  *koo-ŋ-Øambera  ‘make noise for’
gɔtara  koodara  *koo-n-dará  ‘count’
gɔtomá  koodomá  *koo-n-domá  ‘to send me’

It is not clear whether there is sufficient synchronic motivation for claiming that the 1sg. prefix is /n/, since its only manifestation is as voicing or nasalization of the following consonant and lengthening of the preceding vowel.8

Deletion of prefixal nasals before underlyingly voiced consonants is also found in Mbunga, though not ones derived from voiceless consonants via post-consonantal voicing.

(23) **Mbunga**

‘he V-ed me’  ‘he V-ed us’
ka-n-zeka  ka-tu-seka  ‘laugh at’
ka-n-dova  ka-tu-tova  ‘beat’
ka-ŋ-gamula  ka-tu-kamula  ‘grab’
ka-Ø-d’imisila  ka-tu-d’imisila  ‘extinguish for’
ka-Ø-bota  ka-tu-bota  ‘beat’
ka-Ø-guvila  ka-tu-guvila  ‘fall on’

The Sotho-Tswana subgroup has an active synchronic process of post-nasal devoicing, which poses a problem for theories of phonology holding that phonological processes must be phonetically ‘natural’. See Hyman (2001) for discussion of such facts in Tswana: the process is illustrated in (24) with data from Shekgalagari (Solé et al. 2010).

(24) **Shekgalagari**

infin  infin + 1s obj.
χʊ-b’ɔná  χʊ-m-p’ɔná  ‘see’
χʊ-dʊɔxa  χʊ-n-tɔɔxa  ‘anoint’
χʊ-jísá  χʊ-j-císá  ‘feed’
χʊ-zits’há  χʊ-n-tsits’há  ‘inform’

2.2.  nasal + voiceless C

Voiceless postnasal consonants are frequently subject to allophonic aspiration, as exemplified by the adjectival alternations of Mushunguli (the Zigu a dialect of Somalia).

(25) **Mushunguli**

c. 4  c. 9
mí-kulu  n-k’ulu  ‘big’

---

8 Vowel-initial roots receive an epenthetic palatal [d̥] or [n], depending on whether a voiced stop appears in the following syllable, so such roots do not provide adjudicating evidence for a prefix nasal.
mí-kali n-kₐlî ‘fierce’
mí-tali n-tₐlî ‘long’
mí-tana n-tₐnî ‘good-looking’

Postnasal aspiration is found in a number of eastern Bantu languages including Pokomo, Sham-baa, Pare, Kagulu, Gogo, Sukuma, Kongo, Kwanyama, Pogoło, Rwanda-Rundi, Tumbuka and Chewa. The pronunciation of such clusters varies considerably among the languages with this process. The nasal may be partially devoiced (as it is in Mushunguli), and the oral stop may be very reduced to the point of deletion so that /mp/ → [m], as reported for Kagulu and Gogo. In Shona, /mp nt/ become breathy-voiced /m ŋ/ and /ŋk/ becomes [fi].

Postnasal deaspiration is encountered in Nguni languages such as Zulu (Doke 1954, Doke & Vilakazi 1972).

The contrary process of post-nasal deaspiration is found in Ngindo, Yao, Mwera, Nande, Ndali, Fuliiru, Tembo, Kikuyu, Kamba, Chaga-Taita, nearly all Luyia languages, Herero and Banggubangu.

Another very common rule affecting voiceless stops after nasals is voicing, illustrated in (28) with data from Matumbi. Post-nasal voicing is found in Ngindo, Yao, Mwera, Nande, Ndali, Fuliiru, Tembo, Kikuyu, Kamba, Chaga-Taita, nearly all Luyia languages, Herero and Banggubangu.

---

9 See Petzel (2008) for phonetic evidence from Kagulu. The judgment regarding Gogo is based on my own experience and is supported by Grosserhode who observed dialectal variation between [mpʰ], [mp̥] and [m].

10 The unaspirated voiceless stops are weakly and variably ejective (compared to ejection found in e.g. Salishan, Ethiopian Semitic or Chechen). There is no clear evidence indicating whether ejection is a phonological characteristic of unaspirated stops.
Consonants not preceded by a nasal are frequently subject to diachronic lenition, so earlier *s may become h, *p may become f or h, and so on. Such lenitions are generally unstable and frequently undergo reanalysis as post-nasal fortition, especially when new sources of the lenited phoneme enter the language. A typical example is h in Kerewe, which in native words comes from *p, probably via f (which only exists in the language before *u and w). As seen in (29), roots can contrast underlying initial /p/ and /h/, and the underlying form is preserved word-initially or post-vocally. After a nasal, the distinction between /p/ and /h/ is neutralized to [p].

(29) Kerewe

<table>
<thead>
<tr>
<th>1s hab.</th>
<th>cl. 1 hab</th>
<th>imper.</th>
</tr>
</thead>
<tbody>
<tr>
<td>m-pááŋgá</td>
<td>a-hááŋgá</td>
<td>hááŋgá</td>
</tr>
<tr>
<td>m-páŋga</td>
<td>a-há̱gá</td>
<td>hágá</td>
</tr>
<tr>
<td>m-péésá</td>
<td>a-héésá</td>
<td>héésá</td>
</tr>
<tr>
<td>m-prká</td>
<td>a-híká</td>
<td>híká</td>
</tr>
<tr>
<td>m-póóndá</td>
<td>a-hóóndá</td>
<td>hóóndá</td>
</tr>
<tr>
<td>m-púúlá</td>
<td>a-húúlá</td>
<td>húúlá</td>
</tr>
<tr>
<td>m-pááŋgá</td>
<td>a-pááŋgá</td>
<td>pááŋgá</td>
</tr>
<tr>
<td>m-páká</td>
<td>a-páká</td>
<td>páká</td>
</tr>
<tr>
<td>m-pekétʃ</td>
<td>a-pekétʃ̣̂</td>
<td>pekétʃ</td>
</tr>
<tr>
<td>m-pímá</td>
<td>a-pí̱má</td>
<td>pí̱má</td>
</tr>
<tr>
<td>m-póóná</td>
<td>a-póóná</td>
<td>póóná</td>
</tr>
<tr>
<td>m-púúpá</td>
<td>a-púúpá</td>
<td>púúpá</td>
</tr>
</tbody>
</table>

Given that the choice of [p] versus [h] is not synchronically predictable, the underlying forms of the above roots must contrastively contain both /h/ and /p/. In Kerewe, /p/ as an autonomous phoneme in syllable-initial position is not common, and can usually be attributed to the loanword status of words that it appears in. So even though the historical source of the h ~ p alternation in Kerewe is a rule where *p → h, the contemporary language has reanalyzed the process as one strengthening /h/ to [p] after a nasal.

An analogous example involving the historical change of *s to [h] in Ntomba (Mamet 1955) reveals that in this language, due to new instances of s (which, again, are not numerous in the language), the original lenition process has been reanalyzed as one strengthening /h/ to [s] after a nasal.

---

11 The verbs -paang- and -haang- both derive from proto-Bantu *pang- ‘do, make’, and Kerewe -paang- is borrowed from Swahili.
A striking example of multiple reanalyses is found in Nyole (Musimami & Diprose 2012). The cl. 10 prefix in this language is /eŋ/, as is evident from (31a-b). Although Bantu did not contrast [dʒ] and [j], [d] and [l], or [b] and [β], Nyole synchronically contrasts all of these, with /b, d, dʒ/ deriving from secondary sources (e.g. oludège and oludangadi are loanwords from Luganda). Fortition of voiced approximants after a nasal can be seen in (31a). In (31b) we see that synchronic /k/ and /h/ neutralize to [k] after a nasal, which deleted before voiceless consonants. The historical source of Nyole [h] is Bantu *k, which lenited to h unless preceded by a nasal, thus the appearance of [k] after a nasal is understandable. However, since k and h now contrast (compare [ohukondola] ‘to commit burglary’, [ohuhondola] ‘to pluck’), what was once “lenition except after a nasal” has become “fortition after a nasal”. In the same vein, in (31c) we see that /ŋ/ and /p/ neutralize to [p] after a nasal. This is because Bantu *p became /ŋ/ (according to Schadeberg 1989 via intermediate h). Since [p] has been re-introduced as a separate phoneme in the language, the synchronic analysis has changed from /p/ → h (except after a nasal) → [ŋ], to /ŋ/ → [p] after a nasal.

2.4. Multiple nasal effects

In most Bantu languages, there is a single set of post-nasal effects triggered by the prefixes for 1s, cl. 9-10, or possibly the presentative /n/. A number of languages have also introduced a sec-

---

12 Morris transcribes <x> where other sources transcribe <h>, which may reflect a dialect difference.

13 This noun is a morphological and phonological reanalysis of Swahili ruhusa ‘permission’, which ultimately derives from Arabic ruḥṣa. 

---
ondary set of NC clusters, derived from reduction of prefixes of the shape /mu/ (cl. 1, 3, locative mu, cl. 1 OP and 2 pl SP) before a consonant. Examples of such reduction of the cl. 3 noun prefix /mu-/ in Pare are seen in (32). In this case, the reduced nasal constitutes an entire syllable.

(32) **Pare**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>mw-óto</td>
<td>‘fire’</td>
<td>mw-éji</td>
</tr>
<tr>
<td>m-tí</td>
<td>‘tree’</td>
<td>m-lango</td>
</tr>
<tr>
<td>m-teré</td>
<td>‘husked rice’</td>
<td>m-jíyò</td>
</tr>
<tr>
<td>m-yonggo</td>
<td>‘back’</td>
<td>m-kono</td>
</tr>
<tr>
<td>m-haká</td>
<td>‘boundary’</td>
<td>m-janggága</td>
</tr>
</tbody>
</table>

Such reduction may be obligatory as in Swahili, Shambaa, Pare, Pogolo, Chaga, optional as in Hehe, or properly part of phonetic implementation since the vowel is not fully deleted, as in Kerewe. Before labial stops, this can lead to syllabicity minimal pairs such as Swahili [mbúni] ‘coffee tree’ vs. [mbúni] ‘ostrich’.

Usually, the reduced prefix is invariant syllabic [m] which does not interact with the following consonant. In some languages, though, the reduced nasal does interact phonologically. In the Rufiji-Ruvuma languages of southern Tanzania (Odden 2003) there are competing NC effects, depending on whether the nasal is the cl. 9-10 prefix on nouns and adjectives or the 1s SP or OP on verbs, versus underlying /mu/ (cl. 3, 4, 18 NCP, cl. 1 OP, 2p SP, OP). In Matumbi, after /n(i)/, glides and liquids harden to voiced stops (33b), nasals degeminate (33c) and voiceless consonants voice (33d), whereas after reduced /mu/, all voiced consonants nasalize (33a-b), geminate nasal remain (33c), and voiceless consonants are unchanged (33d). The forms in (33) have undergone optional vowel deletion in the subject prefix: alternative forms are nibájite ‘I said’, mubájite ‘2p said’.

(33) **Matumbi**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1s</td>
<td>2p</td>
<td>2s</td>
</tr>
<tr>
<td>a. m-bájite</td>
<td>m-májite</td>
<td>u-bájite</td>
</tr>
<tr>
<td></td>
<td>m-góondíte</td>
<td>u-góondíte</td>
</tr>
<tr>
<td>b. n-dímite</td>
<td>n-nímite</td>
<td>u-límite</td>
</tr>
<tr>
<td></td>
<td>n-dáánite</td>
<td>u-jáánite</td>
</tr>
<tr>
<td>c. m-mátite</td>
<td>m-mátite</td>
<td>u-mátite</td>
</tr>
<tr>
<td>n-ólite</td>
<td>n-nólite</td>
<td>u-nólite</td>
</tr>
<tr>
<td></td>
<td>n-gáatite</td>
<td>u-gáatite</td>
</tr>
<tr>
<td>d. m-báangite</td>
<td>m-páangite</td>
<td>u-páangite</td>
</tr>
<tr>
<td>n-dábite</td>
<td>n-tábite</td>
<td>u-tábite</td>
</tr>
<tr>
<td></td>
<td>n-gáatite</td>
<td>u-gáatite</td>
</tr>
</tbody>
</table>

Similar effects are found in Makonde and Yao.

3. **Syllable Structure**

There are two main issues of recurring interest in Bantu phonology pertaining to syllable structure, namely the syllabic status of consonant clusters, and the resolution of vowel hiatus. See

3.1. Consonant clusters

As a general rule, Bantu languages do not have obvious syllable codas (see below for NC clusters), though Sotho languages among others do allow some word-final nasals as a result of vowel-deletion applying to /ni/ and /mu/, and due to historical and sometimes synchronic vowel-deletions, more general word- and syllable-final consonants are possible in a number of A and B-zone languages such as Basaa and the Beti-Fang languages (for example Ntumu mvúi ‘guitar’), as well as a collection of languages such as Ruwund, Hungan and Kanyok, spoken in D.R. Congo. Due to contact with Afroasiatic languages word-internal clusters which are clearly not onset clusters are found in some eastern Bantu languages (Mushunguli barshi ‘pillow’, Mwiini k-aafa ‘to kill’, Swahili yafla ‘suddenly’).

Aside from CG and NC, there are generally no onset clusters, though they do arise due to prefixal high-vowel vowel deletions in Pogolo (l-tambi ‘branch’, f-kombi ‘cup’) and Mwiini (x-finika ‘to cover’, l-piindo ‘edge’). Ganda has developed geminate consonants, which can appear word-initially (ggáalí ‘vehicle’, vvííví ‘knee’ (see Muller 2002 for theoretical analysis).

The main argument for a bisegmental treatment of such sequences is that they frequently have an obviously bisegmental synchronic source, due to glide formation applied to high vowels. For instance, the cl. 5 prefix of Matumbi /li-/ seen in li-nóolo ‘sharpening stone’ surfaces as [lj] before a vowel, as in lj-óoli ‘tear’. This is due to a general glide-formation rule whereby /u,i/ becomes [w,j] before a vowel, uncontroversially observed in the alternations of the cl. 8 prefix /i-/ – cf. [i-wó] ‘deaths’, [j-ɪɪ́mbe] ‘knives’. Such patterns would seem to challenge the secondary-articulation theory of CG, because they would necessitate a further complication whereby derived ljóoli becomes [lóoli].

Another argument for a cluster analysis, is that multiple secondary articulations within a segment are unordered, whereas there can be evidence for ordering of multiple glides. As seen in (34a), in Kerewe, the vowels /u o/ always become glides before another vowel, even between words. Under the no-cluster theory of CG sequences, this involves converting palatality and labi-
ality into a secondary articulation on the preceding consonant. A word-final vowel may itself be preceded by a CG cluster, as in (34b), where we would also expect glide formation in the consonant-cluster theory of CG, which results in contrasting orders of segments in the intermediate form – endosjojw iísátu versus ekízwíjw ééťo. A glide never follows w in Kerewe, and j deletes in the surface form [ekízwíjw ééťo].

(34) Kerewe

a. ibugu ‘tsetse fly’ ibugw iihááŋgo ‘large tsetse fly’
   amagazi ‘oil palms’ amagazj áábíli ‘two oil palms’
   endimo ‘lemon’ endimw éémó ‘one lemon’

b. endosjoj ‘spoon’ endosjw iísátu ‘three spoons’
   ekízwí ‘knee’ ekízw ééťo ‘that knee’

The problem for the secondary-articulation theory is that the differential treatment of intermediate Cjw vs Cwj requires an ordering between the two vocalic elements, which is generally held to be impossible within a single segment. Since it is very hard to generate consecutive glides within a word in Bantu, and most languages do not have phrase-level glide formation, this argument can not be made very often.

Turning to NC sequences, there are two separate issues, namely whether NC is a single segment or a cluster, and if it is a cluster, how the components syllabify. See Herbert (1986), Downing (2005) for discussion of issues and evidence. A basic reason to treat [nt nd] etc. as bisegmental is that they are frequently bimorphemic, and arise by concatenation of an autonomous nasal with another consonant. As we have seen in (33), Matumbi [mb] in [mbajite] ‘I said’ derives from /ni+bájite/, which is optionally realized as [nibájite], and [mp] in [mpáangite] ‘2p did’ derives from /mu+páangite/, likewise optionally realized as [mupáangite]. A basic reason to not treat [nt nd] etc. as bisegmental is that this would endow Bantu languages with typologically uncommon syllable structure, with onset clusters which violate the Sonority Sequencing Principle (Sievers 1881, Clements 1990). Although authors may employ the term “prenasalized stop” to refer to NC (e.g. Heath 2003: 336 ‘Makaa has twenty-two simple consonants, plus eight prenasalized stops...’; Alnet 2009:47 lists a series of ‘pre-nasalized’ consonants in Shimaore), it is generally not clear what representational claim is being made. Sometimes the theoretical interpretation is clear: Clements (1986) refers to a process of “prenasalization” in Ganda, which prosodically realigns the nasal segment of a pre-consonantal nasal cluster so that it shares a C-slot with the following onset consonant.

(35) C V V C V  C V  
    m u n t u  →  m u n t u  [muuntu] ‘person’

A recurrent and puzzling fact about NC sequences in Bantu is that vowels are frequently lengthened before them. The classic example of this is Ganda, where vowels are always long before NC clusters, as exemplified in (35) by muuntu. Such a length regularity holds in numerous languages such as Holoholo, Luyia, Kerewe, Nyambo, Haya, Kamba, Kikuyu, Kuria, Sukuma, Yao, Hehe, Lungu, Bemba and Ruwund. The theoretical puzzle surrounding this regularity is the mechanism whereby a vowel becomes lengthened before NC. The standard analysis since Clements (1978, 1986) has been to assume that a preconsonantal nasal has a special prosodic
status, that it is dominated by V rather than C, or translated into moraic terms, preconsonantal nasals are moraic. This would normally result in syllabification of the nasal into the coda of the preceding syllable, but the fact that words do not end with any consonant is taken to argue against positing nasals in the coda. The nasal is then syllabified in the onset of the following syllable, which leads to compensatory lengthening of the preceding vowel by reassociation of the stranded timing unit.

As Herbert (1986) and Downing (2005) point out, this analysis depends crucially on the assumption that the nasal in a /VNC/ sequence must be in the onset, which has been assumed in non-linear analyses (Clements 1986, Bickmore 1989, Downing 1990), with pre-NC lengthening being treated as compensatory lengthening coming from the fact that the nasal is deprived of its V-slot or mora because it is moved into the onset. Further assumptions have to be made to explain the special timing slot on the nasal, especially if nasals are not syllabified in the coda. In the Clements 1986 analysis of Ganda, it is simply an unexpressed generalization that nasals are dominated by V if they precede C in underlying forms. Bickmore (1989) explains pre-NC lengthening in Nyambo by making a pre-consonantal nasal be a full syllable (hence moraic), and then restructures the nasal to be in the onset of the following C. For Jita, Downing (1990) postulates an rule assigning a mora to any consonant sharing place features with the following consonant.

The phonological evidence for onset status of N in NC is not absolutely clear. The only phonological argument that it is in the onset is that no words end in a consonant, even a nasal, which leads to the conclusion that syllables cannot end with consonants. The validity of that argument is challenged by languages with stricter conditions on word edges than word-internally, for example Chadic Kotoko disallows all word-final obstruents and inserts schwa when such codas would arise ([hàm-à] ‘yawn (inf.), [hám] ‘yawn (past)’ but [làb-à] ‘tell (inf.), [làbà] ‘tell (past)’), while allowing word-internal obstruent codas ([àbỳwàj] ‘stomach’, [bàtkúm] ‘punctured’, [àksùm] ‘rat’). Following the Coda Filter approach of Ito (1989), it is predicted that there should be a language which strictly prohibits autonomous place specifications in the coda without the mechanism of final-exceptionality, which perfectly describes Bantu syllable structure – place specifications in the coda are allowed only when they are shared with the onset.

Drawing on an idea from phonetic studies of duration in Bantu VNC sequences e.g. Hubbard (1995), Downing posits that long vowels before NC share a mora with the nasal, and that the moraicity of the nasal derives from a version of “Weight By Position”. Other OT-specific machinery then guarantees that the nasal’s mora associates to the preceding vowel. The resulting surface form would be something like (36), a Nyambo example from Hubbard (1995).  

---

15 This argument would not hold in those languages which allow final consonants, which however do not seem to have pre-NC lengthening.

16 Downing does not give a fully syllabified output example and does not give candidates with NC onsets in her formal analysis, so this representation is a conjecture based on various statements in the article. It is also claimed that word-initial preconsonantal nasals are (surface) moraic, which is a possible analysis in some languages like Jita where syllabicity / moraicity of initial preconsonantal nasals is noncontrastive, but is not tenable for languages like Swahili where it is contrastive ([mbuni] ‘coffee tree’, [mbuni] ‘ostrich’).
3.2. Vowel hiatus

It is very common in Bantu languages for morpheme-concatenation to give rise to underlying sequences of vowels, where such sequences are partially or completely eliminated at the surface. At one end of the logical continuum of hiatus-resolution, Kerewe has absolutely no vowel sequences,\(^\text{17}\) even at the phrasal level. Underlyingly, such sequences arise by combining vowel-final prefixes with vowel-initial roots or prefixes, or by combing any word (necessarily vowel-final) with a vowel-initial word. Within words, if V1 is any of /i e o u/, it becomes the corresponding glide and the following vowel is lengthened. High vowels undergoing glide formation are illustrated with noun class prefixes in (37).\(^\text{18}\)

(37) **Kerewe**  
<table>
<thead>
<tr>
<th>cl. 3 sg.</th>
<th>cl. 4 pl.</th>
</tr>
</thead>
<tbody>
<tr>
<td>omu-bato</td>
<td>emi-bato</td>
</tr>
<tr>
<td>omw-ááka</td>
<td>emj-ááka</td>
</tr>
<tr>
<td>omw-éénda</td>
<td>emj-éénda</td>
</tr>
<tr>
<td>omw-óónu</td>
<td>emj-óónu</td>
</tr>
<tr>
<td>omw-íísjo</td>
<td>em-íísjo</td>
</tr>
</tbody>
</table>

Glide formation also applies to the output of optional deletion of root-initial /j/ seen in (38). Since subject prefixes include mid vowels, this gives an opportunity to include nonhigh vowels undergoing glide formation.\(^\text{19}\)

(38) **Kerewe**  
| tu-jániká | twaaníká |
| mu-jé́gá  | mwéégá   |
| ki-játíká | tʃátíká  |
| zi-jáswá | zjááswá  |
| li-jóká  | ljóóká   |
| o-jaatʃá | wáátʃá   |
| e-jáswá  | jááswá   |

\(^{17}\) Long vowels as found in [kutééka] ‘to cook’ only orthographically resemble vowel sequences: they are single long segments.

\(^{18}\) Glides always delete before homorganic high vowels.

\(^{19}\) Postconsonantal glides delete before homorganic vowels, so *emjíísjo* surfaces as [eműísjo].

\(^{20}\) It is also possible that these prefixes are underlyingly /i,u/ and word-initial vowels are lowered – the only initial high vowel [i-] ‘cl. 5’ derives from /eli-/.
The combination of /a/ plus a vowel results in a lengthened non-high vowel.

(39) **Kerewe**

gájélélá  geelélá  ‘they (cl. 6) float’

ba-jibá  bébá  ‘they steal’

ba-jólélá  boolélá  ‘they point’

ga-jómá  góómá  ‘they (cl. 6) are dry’

ba-játá  báátá  ‘they kindle’

Sentence-level vowel sequences are also eliminated, though by somewhat different rules. The vowels /i u o/ undergo glide formation with compensatory lengthening.

(40) **Kerewe**

émbú  ‘mosquito’  embw éémó  ‘one mosquito’

olúhú  ‘hide’  oluwh óólwo  ‘that hide’

ibogomelo  ‘waterfall’  ibogomelw iinóólíó  ‘small waterfall’

amagigo  ‘molars’  amagigw áátáánu  ‘five molars’

énsí  ‘land’  ensj éé nú  ‘this land’

amáti  ‘trees’  amatj áásátu  ‘three trees’

However, the vowels /e a/ simply delete (again, with compensatory lengthening).

(41) **Kerewe**

íbáále  ‘stone’  íbáál’ íí gúmé  ‘hard stone’

omugóóbé  ‘fisherman’  omugoob’ óógwo  ‘that fisherman’

amééle  ‘thundercloud’  améél’ áago  ‘those clouds’

akabóna  ‘he saw’  akabón’ óómuuntu  ‘he saw a person’

éndá  ‘louse’  end’ éé  ‘that louse’

Bantu languages may have less-thorough systems of hiatus-resolution. Matumbi, for example, has a number of morpheme-internal vowel sequences (baa’i ‘end’, fáidika ‘to profit’, ka-laái ‘basin’, kibáo ‘stool’, kikói ‘clothing’, kiléu ‘chin’, lubáu ‘rib’). Glide Formation obligatorily desyllabifies prevocalic high vowels in word-initial prefixes such as noun class and subject prefixes (42a), but GF is optional with a prevocalic high vowel in a non-initial syllable.

(42) **Matumbi**

a.  ki-báo  ‘stool’  kj-úki  ‘stump’

i-báo  ‘stools’  j-úki  ‘stumps’

li-pápajo  ‘wing’  lj-aákapí  ‘leaf’

lu-pááwa  ‘ladle’  lw-eéla  ‘coin’

ni-tééliike  ‘I cooked’  nj-aákapí  ‘I built’

tu-tééliike  ‘we cooked’  tw-aákapí  ‘we built’

u-tééliike  ‘you cooked’  w-aákapí  ‘you built’

b.  ku-tu-téélike ‘to cook for us’  ku-tu-áákapí  ‘to hunt for us’

~ ku-tu-áákapí
ku-ni-télékja ‘to cook for me’  ku-ni-ákja ‘to hunt for me’
~ ku-nj-ákja

Glide formation is optional or blocked in a number of contexts largely having to do with H tone on the first vowel, for example kí-ukumú ‘the Ukumus’, niibweni mú-aandú ‘I saw it in the firewood, cf. mwaandú ‘in the firewood’). Contraction of /a-i, a-u/ to [ee, oo] is optional and limited to prefix vowels.

(43)  Matumbi
a-i-télíike   eetélíike ‘he cooked them’
pa-ú-kaátité  poó-kaátité ‘when you cut’
pa-bá-i-káátité pa-bée-káátité ‘when they cut it’
a-óníte *eéníte ‘he danced’
a-úttíte *oótíte ‘he pulled’

There is obligatory merger of /a-a/ into a long vowel, a change that is discernible tonally, but only in word-initial syllables.

(44)  Matumbi
/a-aáandiike/ /ni-ga-aáandiike/ áandiike ‘he wrote’
 niga.áandiike ‘I wrote’
 *nigáandiike


4.  Tone

Bantu languages are especially known for their often complex tone systems. The vast majority, perhaps 97%, have distinctive tone. Nearly all tonal Bantu languages are fundamentally two-level languages with one tone per syllable, frequently augmented with downstep. A few western languages (e.g. Tuki, Yabassi) which have undergone final vowel deletion have true 3-level systems. Some languages have expanded the surface inventory via contextually-restricted modifications of the basic High/Low (H/L) contrast, for example Kamba has developed now-contrastive “extreme” tones at the ends of words where H becomes Superhigh and L becomes Superlow. Some western Bantu languages (Ntumu, Kombe, Bafia) have a contrast between pre-pausal falling L versus non-falling L (arising from final L vs. rise), and Swati has developed an “extra-low” from pitch-depression effects induced by preceding voiced consonants (which has become phonologized and now exists where there was no consonantal cause).

It has been been recognised at least since Stevick (1969) that there is a behavioral asymmetry between surface H and L in Bantu, which frequently leads to an analysis of the system in terms of a privative H-Ø opposition rather than H-L. See Hyman (2001) for critical discussion of arguments for privativity. For example, the location of H is frequently quite restricted but the location of L is free; tense-inflection is typically characterized by addition of H, and almost never by the addition of L. The sequence /HH/ is often dissimilated to [HL] or [LH], but /LL/
never dissimilates in like fashion. Myers (1998) thus proposes that Chewa never phonologically specifies L. Bickmore (2000) pursues an OT analysis of Namwanga which entirely dispenses with surface L tones, even in the face of contrastive downstep, and Hyman & Ngunga (1994) propose for Yao that L tone is not specified except at the very end to represent downstep and for the formulation of a late rule changing long rising tone into level H. On the other hand, even though Stevick’s privative analysis is based on Ganda tone, that same language provides evidence for specified L being the result of H-dissimilation, since surface-L syllables block a general leftward H-spreading rule (Hyman 1982). Underlying /a-bá-tá-lí-láb-il-il-a bápákasi/ undergoes Meeussen’s Rule (section 4.2) becoming abátàlìlàbilila bápákasi, and then the last H spreads leftward, but only to underlingly toneless syllables, resulting in [abátàhìlàbilà bápákasi] ‘they who will not look after porters’. Following common practice, H is indicated here with acute accent and L – whatever its phonological status – is unmarked.

Surface-distinctive rise, fall and level H on long syllables are not rare, but usually the position of H in a long syllable is rule-governed, albeit with some opacity. In Tachoni, long penults with H have falling tone (oxutëexa ‘to cook’) and before the penult a long H syllable is level-H (oxutëéxela ‘to cook for’). Rising tones always become level H, so underlying /oxu-íra/ undergoes glide formation which should yield oxwiíra, but this surfaces as [oxwiíra] ‘to kill’. This gives rise to a limited derivational contrast between level H versus fall on the penult. Matumbi has no long level H tones (except in the Swahili loan sáána ‘very’), but has both rise and fall on long vowels. The choice, however, is ultimately rule-governed. Rise results either from retracting final H to a long vowel (/lu-seend'ëma/ → [lu-seend'ëmá] ‘mosquito’), or when a mora-counting rule targets the second half of a long vowel (H is assigned to the 3rd Macrostem mora in the subjunctive so /u-kalaangé/ → [ukalaangé] ‘you should fry’), or when a H vowel is compensatorily lengthened after a L-toned prefix vowel via glide formation (/ki-áti/ → [kjaáti] ‘family farm’). Fall is the regular realization of lexical or phrasal assignment of H to a syllable with a long vowel (/ki-bwéeja/ → [kibwéejá] ‘jackal’, /ki-goombo/ → [kigóombo] ‘load’), and also arises in the system of mora-counting tone assignment (/u-ki-kaláaŋgë/ → [ukikaláaŋgë] ‘you should fry it’).

As a general rule, Bantu noun stems can exhibit the combinatorial limit on H and L freely distributed over the two syllables of canonical stems, and class prefixes have no underlying tone. Certain patterns may be rare due to historical tone changes (e.g. proto-Bantu stems with the tone pattern HL have HH in Shona so *ŋkáta → [hátá] ‘headpad’, but HL exists in loanwords e.g. [t'ikóro] ‘school’. In a few languages there are more root-governed surface contrasts in nouns than can be attributed to the number of TBUs in the root, e.g. Shimakonde (Liphola 2001) with eight surface possibilities in disyllabic stems; on the other hand, in Kuria, noun tone is almost completely predictable except for a contrast between [c‘vcv] and [c’vcv] roots. Verbs, on the other hand, have very limited underlying contrasts but great potential for surface differences. Roots have only a two-way distinction between H and L roots regardless of length, with no underlying distinctions in where the tone is realized – some languages lack even that contrast. Prefixes may contrast H vs. L tone, but the choice often depend on the verb’s tense), for example 3rd person subject prefixes are H in Shona (áf’atórá ‘he will take’), except in subject-headed

---

21 Because OT has no means of characterizing underlying properties, input-specified L cannot be explicitly ruled out. Downstep is analyzed as the phonetic implementation of consecutive H autosegments: see Odden (1982) for arguments in Shambaa showing that downstep does not necessarily require specified L.

22 H is assigned to the final vowel when the penult is underlyingly H-toned.
relative clause verbs (*afátórá* ‘he who will take’). Stems may have additional floating tones – ‘melodic Hs’ – which partially mark verb tense (section 4.3).

Especially in verbs, the highly agglutinative morphology of Bantu makes possible great variation in the position of an underlying tone relative to other tones and ends of words, so that the environment in which a tone appears is subject to easily-controllable variation, often giving rise to complex tonal morphophonemics. Many factors are at play in Bantu tonology: see Marlo (2013) for an overview of relevant factors, expressed as a questionnaire methodology for investigating Bantu verbal tone. We consider three factors contributing to tone complexity here, namely tone mobility, H-dissimilation, and systems of melodic tones.

4.1. Tone Mobility

Very many languages have processes expanding the domain of H to the right or to the left. The most common expansion is to the right, except that final tones frequently expand to the left. Kerewe has a tone doubling rule which spreads H one syllable to the right, as long as another syllable follows.

\[(45)\]

**Kerewe**

<table>
<thead>
<tr>
<th>Kerewe</th>
<th>'to count'</th>
<th>'to count Magayane'</th>
<th>'to bite Magayane'</th>
</tr>
</thead>
<tbody>
<tr>
<td>kubala</td>
<td>'to count'</td>
<td>kulúma</td>
<td>'to bite'</td>
</tr>
<tr>
<td>kubala Magajáne</td>
<td>'to count Magayane'</td>
<td>kulúmá Magajáne</td>
<td>'to bite Magayane'</td>
</tr>
<tr>
<td>kubalana</td>
<td>'to count e.o'</td>
<td>kulúmána</td>
<td>'to bite e.o'</td>
</tr>
<tr>
<td>kubalilana</td>
<td>'to count for e.o'</td>
<td>kulúmílana</td>
<td>'to bite for e.o'</td>
</tr>
</tbody>
</table>

Rightward tone doubling is found as a general rule in a number of languages such as Chewa, Makua, Yao, Kuria, Gusii, Holoholo, and Sotho-Tswana, and in specific environments in Karanga Shona, Logoori and other Luyia languages, Makonde and Kwanyama.

Unbounded rightward spread occurs in Shambaa (not affecting word-final vowels).

\[(46)\]

**Shambaa**

<table>
<thead>
<tr>
<th>Shambaa</th>
<th>'to do'</th>
<th>'to do them'</th>
</tr>
</thead>
<tbody>
<tr>
<td>kúgyófoa</td>
<td>'to do'</td>
<td>kuvígyófoa</td>
</tr>
<tr>
<td>ní kúgyófoa</td>
<td>'it is to do'</td>
<td></td>
</tr>
<tr>
<td>kuhandijana</td>
<td>'to plant for e.o'</td>
<td>kufúmbátiįįjána</td>
</tr>
</tbody>
</table>

Unbounded spreadsings, sometimes with domain restrictions (e.g. stems only, prefixes only), are found in Nguni, Shona, Lungu, Namwanga, Digo, and as part of the system of melodic tones in Kamba and Pare.

An unusual rule of tone tripling is found in Shona, where H roots spread that H to the following two syllables within the word, but no further.

\[(47)\]

**Shona**

<table>
<thead>
<tr>
<th>Shona</th>
<th>'to take'</th>
</tr>
</thead>
<tbody>
<tr>
<td>kútórá</td>
<td>'to take'</td>
</tr>
<tr>
<td>kútórésá</td>
<td>'to make take'</td>
</tr>
<tr>
<td>kútóréséra</td>
<td>'to make take for'</td>
</tr>
<tr>
<td>kútórésérana</td>
<td>'to make take for e.o'</td>
</tr>
<tr>
<td>kufímwáriď’a</td>
<td>'to befriend'</td>
</tr>
<tr>
<td>kufímwáriď’isirana</td>
<td>'to befriend for e.o'</td>
</tr>
</tbody>
</table>
This process is also found in Venda, Kanye Tswana, Tsonga and Copperbelt Bemba.

Related to tone spreading, a number of languages have rules of tone shifting. The most common form of shift is rightward shift by one syllable, illustrated in Jita (Downing 1990), where H moves to the following syllable as long as some syllable follows.

(48) **Jita**

okuβóna 'to see'
okuβoná iipoñi ‘to see a bird’
okuβonána ‘to see e.o’
okuβonérana ‘to see for e.o’

Such rightward shift also occurs in Holoholo, Nyamwesi, Taita, Chaga, Rimi, Kikuyu and Kwanyama.

Long-distance tone shift is found in Zigua (Kenstowicz & Kisseberth 1990, Kisseberth 1992). In (49), H shifts from the root initial syllable of /lómbez/ and the H subject prefix /á/ to the penult: the source of the H is underlined.

(49) **Zigua**

kudamaña ‘to do’
kudamañiza ‘to do for’
kudamañizana ‘to do for e.o’
kulombéza ‘to ask’
kulombézéza ‘to ask for’
kulombézezána ‘to ask for e.o’
nahugusahugusa ‘I shell repeatedly’
aghugusahugúsa ‘he shells repeatedly’
kuguha matungúdá ‘to take tomatoes’
kufiśa matungúdá ‘to hide tomatoes’

Similar tone shifting is found in Digo (shifting to the final vowel) and Nguni (shifting to the antepenult).

Leftward movement of H tone is significantly less common. Leftward shift by one syllable occurs in Totela (also Nande and Tonga), thus the toneless OP /mu/ has H before the H root /bíik/, and /la/ has H before the H-toned OP /bá/ (Crane 2011).

(50) **Totela**

oku-mu-ziika ‘to bury him’
oku-mů-biika /oku-mu-bíika/ ‘to hide him’
ndi-la-mu-jatawula ‘I am cutting him up’
ndi-lá-ba-jatawula /ndi-la-bá-jatawula/ ‘I am cutting them up’

Unbounded leftward spread is found in a large set of Lacustrine languages such as the Luyia language Logoori.
Interestingly, there seem to be no attested cases in Bantu of unbounded leftward shift, or leftward doubling.

4.2. H dissimilation

Concatentations of Hs are frequently modified by deletion (lowering) of one of the Hs or by fusing them into a single tone. As with tone movement, deletion comes in a number of varieties pertaining to which tone is affected and the maximum distance allowed between the tones.

The most common form of tone dissimilation is deletion of H immediately after H, a process commonly termed “Meeussen’s Rule” (MR; Goldsmith 1982). Although the process is found in quite a number of languages, it is typically difficult to motivate directly, and usually the evidence for MR has to be filtered through an understanding of tone movements which obscure the application of MR. An example is Kerewe, which as we saw in (45) has rightward Tone Doubling. OPs have underlying H, as seen when they come before toneless verb roots in (52a). When an OP stands before a H root (52b), the root H is deleted, though later application of Tone Doubling re-supplies that syllable with H. Likewise, after -lá-, a root H or an OP H is deleted. The fact that there is no H on the syllable after the root-initial syllable or after the OP is, in light of the doubling rule, evidence that H has been deleted. The same argument holds of an OP after another OP, seen in (52c). Even clearer evidence for deletion of H comes from the surface pattern arising when three or more underlyingly H-toned syllables are concatenated. As (52d) shows, all of the underlyingly H-toned syllables in a sequence of Hs are surface L, except the first H and the immediately following H which is due to Tone Doubling.

(52) Kerewe

<table>
<thead>
<tr>
<th>Type</th>
<th>Syllable</th>
<th>Pronunciation</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>ku-káláángila</td>
<td>/ku-kálaangila/</td>
<td>to fry for</td>
</tr>
<tr>
<td></td>
<td>ku-tú-kálila</td>
<td>/ku-tú-kalila/</td>
<td>to dry for</td>
</tr>
<tr>
<td></td>
<td>ku-tú-kálila</td>
<td>/ku-tú-kalila/</td>
<td>to dry for us</td>
</tr>
<tr>
<td></td>
<td>ku-gí-kálila</td>
<td>/ku-gí-kalila/</td>
<td>to dry it for</td>
</tr>
<tr>
<td>b.</td>
<td>ku-gí-kálaangila</td>
<td>/ku-gí-kálaangila/</td>
<td>to fry it for</td>
</tr>
<tr>
<td></td>
<td>ku-tú-kálaangila</td>
<td>/ku-tú-kálaangila/</td>
<td>to fry for us</td>
</tr>
<tr>
<td></td>
<td>ba-lá-kálaangiile</td>
<td>/ba-lá-kálaangiile/</td>
<td>they had already fried for</td>
</tr>
<tr>
<td></td>
<td>ba-lá-tú-kaliile</td>
<td>/ba-lá-tú-kaliile/</td>
<td>they had already fried for us</td>
</tr>
<tr>
<td>c.</td>
<td>ku-gí-tú-kálaangiile</td>
<td>/ku-gí-tú-kálaangiile/</td>
<td>to dry it for us</td>
</tr>
<tr>
<td>d.</td>
<td>ku-gí-tú-kalaangila</td>
<td>/ku-gí-tú-kalaangila/</td>
<td>to fry it for us</td>
</tr>
<tr>
<td></td>
<td>ba-lá-gí-kálaangiile</td>
<td>/ba-lá-gí-kálaangiile/</td>
<td>they had already fried it for</td>
</tr>
<tr>
<td></td>
<td>ba-lá-tú-gí-kalaangiile</td>
<td>/ba-lá-tú-gí-kalaangiile/</td>
<td>they had already fried it for us</td>
</tr>
</tbody>
</table>

Versions of this rule are found in many languages, including Tonga, Ganda, the Luyia languages, Jita, Digo, Chewa, Hehe, some Makonde dialects, and significantly morphologized or domain-restricted versions are found in Shona, Venda, Matumbi and Nkore.
A less-frequent H-dissimilation process, sometimes termed “Reverse Meeussen’s Rule” (RMR), turns H into L before H. This process arises in Xhosa and other Nguni languages, as well as Rimi. In Xhosa (Claughton 1992, Cassimjee 1998), object prefixes have underlying H, seen before a monosyllabic L root as in [nija-wáá-lw-a] 23 ‘2p are fighting them’. When prefixed to a long-enough L verb, the H of the OP shifts to the antepenult, so /nija-wá-fukumisa/ → [ni-jawafukúmiisa] ‘2p are shaking them’ (cf. [nijafukumiisa] ‘2p are shaking’), because of a general shift of pre-antepenultimate H to the antepenult. If H appears underlingly in the antepenult, it shifts to the penult, thus /nija-bá-balá/ → [nijababáála] ‘2p are counting them’ (cf. [nijabaalá] ‘2p are counting’). Likewise, H of the root /bón/ shifts to the penult when underlingly in the antepenult as in [nijabóóna] ‘2p are demonstrating’, cf. [nijabóóna] ‘2p see’. RMR, the deletion of the first H in a sequence of underlying Hs, is seen in H roots with an OP such as [nijawabóóna] ‘2p see them’ and [nijawabóóna] ‘2p are demonstrating them’, from /nija-wá-bóna/ and /nijawá-bóóna/.

Often, both of these H-deletion processes coexist in a language (though not in Nguni). The Nkore data (Poletto 1998) in (53) show that OPs are H-toned, and when an OP comes before another H (that of a root or another OP), only the last of the Hs surfaces, indicating that RMR operates on OPs.

(53)  
Nkore

<table>
<thead>
<tr>
<th>OP</th>
<th>Surface Form</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>okureeba</td>
<td>/oku-reeba/</td>
<td>‘to see’</td>
</tr>
<tr>
<td>okubáreeba</td>
<td>/oku-bá-reeba/</td>
<td>‘to see them’</td>
</tr>
<tr>
<td>okubóona</td>
<td>/oku-bóona/</td>
<td>‘to see’</td>
</tr>
<tr>
<td>okubabóona</td>
<td>/oku-bá-bóona/</td>
<td>‘to see them’</td>
</tr>
<tr>
<td>akagabájáb-a</td>
<td>/aka-gá-bá-jaba/</td>
<td>‘he asked them for it’</td>
</tr>
<tr>
<td>akagabamújábira</td>
<td>/aka-gá-bá-mú-jabira/</td>
<td>‘he asked them for it for her’</td>
</tr>
<tr>
<td>akagabatéétéra</td>
<td>/aka-gá-bá-téétéra/</td>
<td>‘he cooked them for them’</td>
</tr>
</tbody>
</table>

MR, deletion of the second in a sequence of Hs, applies to root-initial Hs, affecting H-H sequences that do not undergo RMR. The reflexive prefix -é- does not undergo RMR, nor do the tense prefixes -rí-, -rá-, and the combination of such prefixes plus a H root results in lowering of the root H. If an OP comes after -rí-, -rá-, the OP’s H is unaffected, though as the last form in (54) shows, OP Hs may be lowered by application of RMR.

(54)  
Nkore

<table>
<thead>
<tr>
<th>OP</th>
<th>Surface Form</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>okwéébona</td>
<td>/okw-éé-bóna/</td>
<td>‘to see self’</td>
</tr>
<tr>
<td>taríbóona</td>
<td>/tarí-bóona/</td>
<td>‘he will not find’</td>
</tr>
<tr>
<td>abaríbóona</td>
<td>/abarí-bóona/</td>
<td>‘ones who will not find’</td>
</tr>
<tr>
<td>atarábóoniire</td>
<td>/atará-bóoniire/</td>
<td>‘one who did not see’</td>
</tr>
<tr>
<td>taríbábara</td>
<td>/tarí-bá-bábara/</td>
<td>‘he will not count them’</td>
</tr>
<tr>
<td>tarígalagabatéétër</td>
<td>/tarí-gá-bá-téétër/</td>
<td>‘he will not cook them for them’</td>
</tr>
</tbody>
</table>

Lowering of H in the context of another H generally only affects adjacent Hs, but a few long-distance lowerings are attested. In Matumbi, a word-final H in a verb is deleted phrase-medially, as long as another H precedes somewhere within the stem.

23 Penults are automatically lengthened.
(55) **Matumbi**

- paníin-télekjá ‘when I cook for him’
- paníin-télekja Libulúle ‘when I cook for Libulule’
- kwíí-tjatjákikijá ‘to plaster for oneself’
- kwíí-tjatjákikija puúmba ‘to plaster a house for oneself’
- panáa-temité ‘when I chopped’
- panáa-temité mikóongó ‘when I chopped trees’
- u-teleké ‘you should cook’
- u-teleké kindoóló ‘you should cook sweet potato’

Long-distance RMR is actually relatively well attested in connection with inflectional melodic Hs (section 4.3). In many languages, all Hs within the macrostem or word are lowered if a melodic H is added towards the end of the verb. This is illustrated in (56) with Kerewe data, where in certain tenses H is assigned to the penult, and in others it is assigned to the final and then spreads to the left, prepausally.

(56) **Kerewe**

*Penult H pattern*

/tíbá-kálaangíla/ tibakalaangíla ‘they don’t fry for’
/abálaa-tú-kálaangíla/ abalaatukalaangíla ‘they who will fry for us’

*Final H pattern*

/tíbá-kálaangíiłé/ tibakalaangíįlé ‘they didn’t fry for (yesterday)’
/báa-tú-kálaangílá/ baatukalaangílá ‘they fried for us’
/bálí-tú-kálaangílá/ balitukalaangílá ‘they will fry for us (remote)’

Such deletion is widespread in the Lacustrine group.

4.3. **Melodic Tones**

In apparently all tonal Bantu languages, the tonal system is augmented by tone-patterns associated with certain grammatical categories, especially verb tenses, which are usually realized as the positioning of additional tones in some position in the stem, referred to as Melodic H (MH) patterns. See Bickmore & Odden (to appear) and the associated papers in *Africana Linguistica XX* for further exemplification. For example, in Kerewe, the remote past and hodiernal perfective in (57a) have whatever H is lexically present on the root (plus Tone Doubling). In the simple past and hesternal past (57b), there is an added H on the final vowel (which spreads leftward, when prepausal) and causes deletion of preceding Hs. In the habitual negative and near future (57c), there is an added H on the penult which likewise causes deletion of preceding Hs.

(57) **Kerewe**

<table>
<thead>
<tr>
<th>H root</th>
<th>L root</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘fry for’</td>
<td>‘descend’</td>
</tr>
<tr>
<td>a. remote past</td>
<td>baka-káláängíla</td>
</tr>
<tr>
<td>hodiernal perfective</td>
<td>baa-káláängílile</td>
</tr>
</tbody>
</table>
b. simple past  baa-kalaaŋflá  baa-hanaantúká
  hesternal past  ba-kalaanggiílé  ba-hanaantukílé

c. habitual negative  tiba-kalaangfíla  tiba-hanaantúka
  near future  balaa-kalaangflá  balaa-hanaantúka

The positioning of the melodic H may be significantly affected by the underlying H vs. L status of the verb root. For example, in Tachoni, the melodic H of the remote future appears from the second stem syllable to the penult with L verb roots, but from the third syllable to the penult with H roots (58a). In the negative imperative, there is H on the syllable containing the second stem mora in toneless roots, but no surface H in underlyingly H-toned roots (58b). In the positive imperative, L roots do not realize the melodic tone, but H roots have H from the third syllable to the penult. In all cases, underlying root Hs (underlined) are deleted when a melodic H is added.

(58)  

**Tachoni**

a. bali-sukúwáníla  ‘they will scrape for e.o.’
  bali-botooxánáníla  ‘they will go around for e.o.’

b. oxa-bééchakala  ‘don’t belch!’
  oxa-purúxa  ‘don’t fly!’
  oxa-karaanga  ‘don’t fry!’

b. oxa-bééchakala  ‘belch!’
  botooxáníla  ‘go around for!’

Systems of melodic tone inflection can become quite complex, so that in Marachi (Marlo 2007) there are nearly a dozen different tense-determined patterns, involving parameters such as whether H appears at the right versus left edge of the stem; shifting of H into the stem from an OP; deletion of root H; complete deletion of all Hs.

Some languages historically neutralized the lexical contrast between H and L roots in verbs, and all surface tones in verbs come from assignment of melodic Hs, according to tense. Matumbi exemplifies this pattern, with Hs assigned according to inflectional construction to the initial, final, third, second and final, or initial and third vowels of the stem.

(59)  

**Matumbi**

*Initial V*

gúndumuka  ‘to fear’
  baa-gúndumuka  ‘they will fear’
  ba-gúndumwiike  ‘they are afraid’

*Final V*

baatí-gundumuká  ‘they feared (v-focus)’
  eendaá-gundumuká  ‘they are fearing’

*V₁*

ba-gundumúke  ‘they should fear’
  kaba-gundumúka  ‘while they were afraid’

*V₂*

pabá-gundúmuka  ‘when they fear’
waŋga-gundúmuka ‘without fearing’
baká-gundúmuka ‘if they were afraid’

V₂ and final
pabá-gundúmuká ‘when they feared’
 Initial and V₃
ŋ-ŋúndumúki ‘one who fears’

Such systems are found in a range of languages of southern Tanzania, Kuria, SW Luyia languages such as Khayo, Ruwund, and Kanyok.

5. Summary

A desideratum of general linguistic theorizing is some method of validating claims about the nature of human language. In the realm of grammatical theory, it is often difficult to fill this lacuna as it pertains to phonology, since it is impossible to construct specific grammars to see if they are learnable, or to see whether one kind of fact entails another. Instead, we must observe what types of languages exist. The phonology of Bantu languages is of particular interest for testing grammatical theories, because on the one hand one can find a high degree of sameness in many aspects of their grammars, but on the other hand one also encounters a high degree of difference between languages in specific details. That is, Bantu languages as a whole constitute a naturally-occurring controlled experiment that varies the building blocks of phonological systems. Variations in Bantu tone systems are well-known and have attracted much theoretical attention. Likewise, the problem of asymmetries in vowel harmony, where the conditions for harmony involve a complex of factors regarding the target and the trigger, where languages differ in the specific requirements for harmony, poses a problem for the theory of phonological rules – theories of rules are founded on the assumption of symmetry in the class of elements participating in a rule, so how do we account for asymmetry? Even the simple matter that the synchronic phoneme /h/ can harden post-nasally to [p], [s], [k] or [ŋ] constitutes a challenge to phonetically-based theories of representation. These and many similar facts will continue to feed the highly productive interaction between language description and linguistic theorizing for the foreseeable future.

References


31


