

## Segmental Phonology

### 1. Introduction

As in other parts of the grammar, Bantu segmental phonology can be characterized as a theme and variations: Despite the large number of languages and great geographic expanse that they cover, the most noteworthy properties concerning Bantu syllable structure, consonant/vowel inventories, and phonological processes are robustly attested throughout the Bantu zone. These shared features, although striking, however mask a wide range of differences which are equally, if not more, important in understanding Bantu phonology in general. It is helpful in this regard to consider both the phonological system inherited from Proto-Bantu, as well as the innovations, often areally diffused, which characterize present-day Bantu sub-groups and individual languages.

### 2. Proto-Bantu

According to most Bantuists, e.g. Meeussen (1967), Proto-Bantu (PB) had the relatively simple consonant and vowel systems in (1).

(1) a.	consonants				b.	vowels (long and short)	
	p	t	c	k		i	ɥ
	b	d	j	g		i	u
	m	n	ɲ			e	o
							a

Of the two series of oral consonants in (1a), all scholars agree that the voiceless series \*p, \*t, \*k were pronounced as stops. There is, however, disagreement as to whether \*b, \*d, \*g should be reconstructed as stops or as continuants, i.e. \*β, \*l, \*ɣ, as they are pronounced in many daughter languages today. It also is not clear whether \*c and \*j should be viewed as palatal stops or affricates—or whether they were palatal at all. Many Bantu languages realize \*c as /s/, and some realize \*j as /z/. Realizations of the

latter as /y/ or /j/ (i.e. [dʒ]) are, however, probably more common. Although various scholars have occasionally posited additional consonants and series of consonants (e.g. fortis vs. lenis stops) in the proto system, none of these have been demonstrated to the satisfaction of the Bantuist community. On the other hand, much more complex systems have been innovated in the daughter languages as seen in Chapter XX [Maddieson] and below.

There is, by comparison, more stability in the vowel system, which is reconstructed as in (1b). Most scholars agree that PB had seven distinct vowels (7V). As transcribed in (1b), there would have been an opposition in the high vowels between [+ATR] \*i [i] and \*u [u] and [-ATR] \*i [ɪ] and \*u [ʊ]. Such a system, exemplified from Nande DJ.42 in (2a), is widely attested, especially in eastern Bantu:

(2) a.	l̥im-	‘exterminate’	l̥um-	‘be animated’
	lim-	‘cultivate’	lúm-	‘bite’
	lem-	‘fail to carry sth. heavy’	tom-	‘put aside’
	lam-	‘heal’		
b.	ting-	‘hook’	tung-	‘become thin’
	beng-	‘chase’	tóng-	‘construct’
	kéng-	‘observe’	tóng-	‘gather up’
	tang-	‘flow’		

Other Bantu languages such as Koyo C.24 in (2b) have the 7V system /i, e, ε, u, o, ɔ, a/, where there is instead an ATR opposition in the mid vowels. Such a system is particularly frequent in western Bantu. (See Stewart 1983 and Hyman 1999 for further discussion of the reconstructed PB vowel system.)

The syllable structures allowed in PB were limited to those in (3).

(3) a.	CV, CVV	b.	V, N
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Most syllables in PB had one of the two shapes in (3a): a single consonant followed by a vowel that was either short (V) or long (VV), e.g. \*pád- ‘scrape’, \*páad- ‘quarrel’. The syllable shapes in (3b) were most likely limited to prefixes, e.g. \*à- ‘class 1 subject prefix’, \*Ñ- ‘class 9 noun prefix’. PB roots with non-identical vowels in sequence have also been reconstructed, e.g. \*bàij- ‘carve’, \*bìad- ‘give birth, but may have involved “weak” intervening consonants, e.g. glides, that dropped out in pre-PB. Many vowel sequences, including some identical ones, e.g. \*tú-ud- ‘rest, put down load’, are analyzeable as heteromorphemic, such that Meeussen (1979) questioned whether PB actually had long vowels at all. Others have subsequently arisen through the loss of PB consonants, e.g. \*ŋ-gobi, \*n-jidá, \*n-jogu > Kamba E.55 ŋ-goi ‘baby sling’, n-zia ‘hunger’, n-zou ‘elephant’ (Hinnebusch 1974). In many languages this consonant loss is restricted and results in synchronic alternations between C and Ø. For example, while \*did- ‘cry’ is realized li-a (with FV -a) in Swahili G.42, the final \*d is realized [l] before the applicative suffix -i-: lil-i-a ‘cry to/for’. Since this form derives from \*did-id-a, Swahili appears to disallow /l/-deletion in two successive syllables (forbidding \*li-i-a in this case, even though words with three vowels in a row do appear in the language, e.g. teu-a ‘appoint’). In contrast with PB \*VV sequences, which are tautosyllabic, neo-VV sequences typically remain heterosyllabic. On the other hand, many Bantu languages have lost the inherited V/VV opposition, e.g. \*dóot- ‘dream’ > Tonga M.64 lót-, Cewa N.31b lót-, Tswana S.31 lór-. Others have lost the vowel length contrast only in onsetless syllables, but have retained and even favor CVV, where possible. This is the case in roots such as -(y)er- ‘sweep’ in Ganda EJ.15, where the initial “unstable-y” is realized in all environments except when preceded by a CV- prefix with which the following vowel fuses, e.g. tw-éer-a ‘we sweep’ vs. a-yér-à ‘he sweeps’, ñ-jér-a ‘I sweep’.

The last syllable type, a low tone nasal, is reconstructable in class 9 and 10 noun prefixes, while syllabic nasal reflexes of the first person singular subject- and object prefixes derive from earlier \*ni-. The nasal of morpheme-internal NC sequences

appears never to be itself syllabic, although it frequently conditions length on a preceding vowel, e.g. \*gènd- [gè:nd-] ‘walk’. If correctly analyzed as two segments, NC constitutes the only consonant cluster in PB. This includes heteromorphemic N+N sequences, although these are subsequently degeminated in many Bantu languages. At the same time, new syllabic nasals often derive from the loss of the vowel of \*mV- prefixes, especially \*mu-CV > ṁ-CV > Ṇ-CV.

Some Bantu languages have developed additional syllable structures, typically by the loss of vowels or consonants—or through borrowings. Most word-final vowels have been lost in Ruwund L.53, whose word-final syllables therefore usually end in a consonant, e.g. \*m-bũda, \*du-kúni > ní-vùl ‘rain’, rú-kùŋ ‘firewood’ (Nash 1992). Basaá A.43, on the other hand, has not only lost final vowels, e.g. \*mu-dúme > n-lóm ‘male’, but also creates non-final closed syllables by syncopating the medial vowel of CVCVCV stems, e.g. tiŋil ‘untie’ + a ‘passive suffix’ tiŋla (Lemb & Degastines 1973). Closed syllables may also be found in incompletely assimilated borrowings, e.g. Swahili G.42 m-kristo ‘Christian’; Yaka H.31, mártóo ‘hammer’ (< French marteau)

Most Bantu languages maintain a close approximation of the PB situation as far as syllable structure is concerned. The open syllable structure is, in fact, reinforced by the well-known Bantu agglutinative morphology. The typical structures of nouns and verbs are schematized in (4).

(4) a. Nouns	AUGMENT- CV V	PREFIX- CV N V	STEM CV(V)CV CV(V) VCV
e.g. Bukusu EJ.31	kú-mu xono ó-mu-xasi é-n-juxi cí-n-juxi lí-i-beele	‘arm’ ‘woman’ ‘bee’ ‘bees’ ‘breast’	(class 3) (class 1) (class 9) (class 10) (class 5)

b.	Verbs	PI-	SP-	NEG	TP-	AP-	OP-	STEM
		CV	CV	CV	CV	CV	CV	CV(V)CV...
		V	V		V		N	
			N					

e.g. Nande      mó-tu-téta-ya-mú túm-a  
 DJ.42      PI- SP- NEG- AP- OP- ROOT-FV  
 ‘we didn’t go and send him’

(PI = pre-initial morpheme, including augment; SP = subject prefix; NEG = negative, TP = tense prefix, AP = aspect prefix, OP = object prefix, FV = inflectional final vowel)

c.	Verb Stems	ROOT-	EXTENSION(S)-	FV
		CVC	VC	V
		CV	V	

e.g. Cewa N.31b      lim-its-il-an-a      ‘cause to cultivate for  
 ROOT-CAUS-APPL-REC-FV      each other’

(CAUS = causative; APPL = applicative; REC = reciprocal)

In the above schemas, V stands for any of the seven PB vowels, while C stands for any of the proto-consonants, including, potentially, NC. The most common shape of each morpheme is given in the first row. As seen in (4a,b), pre-stem morphemes (prefixes) are restricted to the shapes CV-, V- and N-. In (4c), on the other hand, we see that post-root morphemes (suffixes) have the shapes -VC- and -V-. Since most roots begin and end with a C, morpheme concatenation provides almost no potential for consonant clusters, but rather a general alternation of consonant-vowel-consonant etc. The one exception to this occurs when Vs meet across a morpheme boundary. In this case specific rules modify the resulting V+V inputs (see §3.2). Other assimilatory and dissimilatory alternations occur when morphemes meet, some of which are restricted to specific domains, e.g. the stem (root+suffixes). Many of these alternations produce output segments beyond those in the above V and C inventories. The most widespread phenomena are treated in the following sections, first for vowels (§3), then for consonants (§4).

### 3. Vowel phonology

While PB had the 7V system in (1b), the majority of Bantu languages spoken in a large and contiguous area have merged the degree 1 and 2 vowels to achieve the five-vowel (5V) system in (5a).

(5)	Swahili G.40	Budu D.35	Bafia A.53
a.	i      u ε      ɔ a	b.	i      u ɪ      ʊ e      o ε      ɔ a
		c.	i      ɯ      u e      ə      o ε      a      ɔ

A few languages have gone the other direction and developed the 9V system in (5b). While this system appears to be underlying in Budu D.35 (Kutsch-Lojenga 1994), other languages such as Nande DJ.42 in nearby Northeast République Démocratique du Congo and the Sotho-Tswana S.30 group in South derive the 8th and 9th vowels [e] and [o] from the tensing/raising of the degree 3 vowels \*E and \*O, respectively. Finally, some of the languages in zone A, such as Bafia A.53 in (5c), have developed “rectangular” vowel systems with back unrounded vowels (see Guarisma, this volume) and also nasalized vowels, e.g. in the Teke B.70 group, both of which also appear in Grassfields Bantu (see Watters, this volume).

### 3.1. Distributional constraints on underlying vowels

As indicated in §2, Bantu phonology is highly sensitive to morphological considerations. Underlying vowel distribution within specific morphological slots and morphological or prosodic domains is thus highly restricted in both 7V and 5V languages. Meeussen (1967), for example, allows for the following vowels in each of the indicated positions:

## (6) PB vowel reconstructions by position

	*i	*u	*i	*u	*e	*o	*a
first stem syllable	x	x	x	x	x	x	x
final stem vowel	x	x	x	x	x	x	x
elsewhere	x		x	x			x

As seen, the seven vowels of PB contrast in the first and last syllables of a stem, but not in prefixes, extensions or stem-internal position, where only four vowels contrast. In a few cases involving reduplication, the vowel \*u appears in the first two syllables of a verb, e.g. \*dudum- ‘rumble, thunder’, \*pupum- ‘boil up, boil over’. The root \*takun- ‘chew’, on the other hand, appears to be exceptional.

Some languages, particularly 5V ones, have further restricted this distribution by position within the stem or word. Thus, Punu B.43, which has the underlying system /i, u, ε, ɔ, a/, restricts /ε/ and /ɔ/ to stem-initial syllables only (Kwenzi Mickala 80). In Bobangi C.32 (7V), /u/ may not occur in prefixes, nor may any of the rounded vowels /u, o, ɔ/ appear later than the second syllable in stems.

### 3.2. Vowel alternations

In addition to underlying constraints on vowel distribution, most Bantu languages severely restrict the sequencing of vowels, particularly within stems. Thus, while Punu B.43 allows only /i, u, a/ in post-stem position, /a/ is reduced to schwa in this position, and the expected post-stem sequences [əCi] and [əCu] surface instead as [iCi] and [uCu], e.g. the historical suffix sequences /-am-il-/ (positional-applicative) and /-am-ul-/ (positional-reversive tr.) are realized [-imis-] and [-umun-]. In addition, a post-stem /a/ ([ə]) assimilates to a FV -i, and both post-stem /a/ and /i/ assimilate to a FV -u (Fontaney 1980). The Punu case demonstrates two general properties of Bantu vowel systems: (i) There are typically more contrasting underlying vowels in the stem-initial syllable, and (ii) vowels in this position may be exempt from reduction and assimilation processes that post-stem vowels undergo. Ruwund L.53 (5V) once had the same vowel

distribution as Punu, disallowing mid vowel from post-stem position. However, it has since undergone considerable vowel reduction, e.g. by dropping most word-final vowels, e.g. \*mu ána > mwáàn ‘child’, \*mu kádì > mú kàj ‘wife’ (Nash 1992). While unusual in tolerating word-final closed syllables (analyzed with a phantom vowel by Nash), Ruwund is perhaps unique in its overall vowel system in (8a).

- (8) a.            i            u                    ii            uu  
    ee            oo  
    a                    aa
- b.        \*e > i            e.g.    \*dèm- > lím ‘be lame’, \*dèd- > -lil ‘raise (child)’  
           \*u > a e.g.    \*bón- > -màn ‘see’, \*pót- > pwàt ‘twist’

As seen in (8a), short /e, o/ are missing, since they have reduced, respectively, to the peripheral vowels [i] and [a], respectively, as illustrated in (8b). In this atypical case, vowels in the stem-initial syllable were successfully targeted.

By far the most widely attested assimilatory process is vowel harmony, particularly vowel height harmony (VHH). As indicated in (9) and (10),

(9) Front height harmony (FHH)

- a.    General        :    i        e /    { e, o }    C    \_\_\_  
 b.    Extended     :    i        e /    { e, o, a }    C    \_\_\_

(10) Back height harmony (BHH)

- a.    General        :    u        o /    { o }        C    \_\_\_  
 b.    Extended     :    u        o /    { e, o }     C    \_\_\_

the historical degree-2 vowels (\*i, \*u) harmonize in height with a preceding mid vowel. The process is frequently different with respect to the front vs. back vowel (Bleek 1862). In a wide range of central and eastern Bantu languages, degree-2 /i/ lowers after both /e/ and /o/, while degree-2 /u/ lowers only after /o/. Examples of such “asymmetric” FHH vs. BHH are seen from Nyamwezi F.22 in (11), based on Maganga & Schadeberg (1992):



(11)	Root + Applicative -êl-		Root + Separative -Ûl-	
a.	Bis-êl-	‘hide for/at’	Bis-Ûl-	‘find out’
	gub-êl-	‘put on lid for/at’	gub-Ûl-	‘take off lid’
	pêend-êl-	‘bend for/at’	pêend-Ûl-	‘overturn’
	shÛn-êl-	‘gnaw for/at’	shÛn-Ûl-	‘show teeth’
	gaB-êl-	‘divide for/at’	gaB-Ûl-	‘divide’
b.	Bon-él-	‘see for/at’	hong-ól-	‘break off’
c.	zeeng-el-	‘build for/at’	zeeng-Ûl-	‘build’

There is no harmony in (11a), where the root vowel is either high or low. In (11b) VHH applies to both -êl- and -Ûl- when the root vowel is /o/. However, in (11c), where the root vowel is /e/, -êl- lowers to -el-, but -Ûl- remains unchanged. This contrasts with the situation in the E.40 group, e.g. Gusii E.42 (7V), as well as in many Northwest Bantu languages, e.g. Mongo C.61 (7V), whose vowel systems are analyzed as /i, e, ε, u, o, ɔ, a/. In languages such as Mongo-Nkundo in (11), the back degree-2 vowel also harmonizes, and FHH and BHH are thus “symmetric”:

(11)	Root + Applicative -el-		Root + Separative -ol-	
a.	-íy-el-	‘steal for/at’	-is-ol-	‘uncover’
	-lúk-el-	‘paddle for/at’	-kund-ol-	‘dig up’
	-ét-el-	‘call for/at’	-bét-ol-	‘wake up’
	-tóm-el-	‘send for/at’	-komb-ol-	‘open’
	-kamb-el-	‘work for/at’	-bák-ol-	‘untie’
b.	-kOt-El-	‘cut for/at’	-mOm-Ol-	‘unglue’
	-kEnd-El-	‘go for/at’	-téng-ɔl-	‘straighten out’

As indicated in (9b), harmony of /i/ to [e] after /a/ is also attested, particularly in languages towards the Southwest of the Bantu zone, e.g. Mbundu H.21a, Kwangali K.33a, Herero R.31. While VHH is generally perseverative and limited to the stem domain minus the FV, some languages—particularly those with symmetric FHH/BHH—have extended harmony to the FV and to prefixes. It is important to note that in many 5V Bantu languages, only those /i/ vowels that derive from \*i harmonize, while those that derive from \*ĩ do not. Other languages have modified this original situation and harmonize the perfective ending \*-ĩd-e as well (Bastin 1983). In Yaka H.31

and certain dialects of Kongo H.10, VHH is anticipatory and is triggered primarily by the \*-e of perfective \*-iɖ-e. In addition, some of the same languages that have symmetric VHH have extended the process to prefixes, e.g. Mituku D.13 (7V) /tú-mú-lok-é/ tó-mó-lok-é ‘we bewitch (subjunctive)’. For more discussion of variations in Bantu VHH, see Leitch (1996), Hyman (1999) and references cited therein.

Besides height, other features may also participate in vowel harmony. Closely related Konzo DJ.41 and Nande DJ.42 have introduced an advanced tongue root (ATR) harmony, whereby /ɪ, ʊ, ɛ, ɔ/ become [i, u, e, o] when followed by /i/ or /u/. They thus have an underlying 7V system (cf. (2)), but introduce two additional, non-contrasting vowels, [e] and [o], by ATR harmony. Clements (1991) provides an overarching framework to treat VHH and ATR harmony in related fashion. Other Bantu languages have innovated rounding harmonies, e.g. perseverative i u / u \_\_\_ in Lengola D.12 vs. anticipatory i u / \_\_\_ u in Punu B.43. In Maore G.44?, regressive rounding harmony even reaches the root vowel: u#finiki-a ‘cover’, u-funuku#a ‘uncover’. Finally, it should be noted that many Northwest Bantu 7V languages modify /a/ to [ɛ] after /ɛ/ and to [ɔ] after /ɔ/, e.g. Bakweri A.22, Tiene B.81, Lingala C.36d or, in the case of Bembe H.11 (5V), to [e] and [o], respectively.

The above shows the assimilation of one vowel to another across a consonant. When vowels occur in direct sequence, they typically undergo gliding or deletion. Thus, in Ganda EJ.15, when followed by a non-identical vowel, e.g. the FV -a, the front vowels /i, e/ glide to [y], as in (12a), and the back vowels /u, o/ glide to [w], as in (12b):

(12) a.	/lí-a/	‘eat’	[lyáà...]	cf.	a lí-dd-è	‘he has eaten’
	/ke-a/	‘dawn’	[kyáà...]		lú kê-dd-è	‘it has dawned’
b.	/gu-a/	‘fall’	[gwaa...]		a gú-dd-è	‘he has fallen’
	/mo-a/	‘shave’	[mwaa...]		a mwé-dd-è	‘he has shaved’
c.	/bá-a/	‘be’	[báà...]		a bâ-dd-è	‘he has been’
	/tá-a/	‘let go’	[tâa...]		a tâ-dd-è	‘he has let go’

(SM + Root + Perf + FV)

As seen in the outputs, gliding of /i, e/ and /u, o/ is accompanied by compensatory lengthening of the following vowel. In Ganda, this length will be realized if word-internal (or if the above verb stems are followed by a clitic). Otherwise it, as well as the length obtained from concatenation of /a/ + /a/ in (13c) will undergo final vowel shortening (FVS), e.g. ku lyáa =kô ‘to eat a little’ vs. ku lyâ ‘to eat’.

The details of vowel coalescence may depend on whether the vowels are tautomorphemic vs. heteromorphemic, and whether the vowel sequence is contained within a word or not. Thus, instead of gliding, the mid vowels /e, o/ join /a/ in undergoing deletion when followed by a non-identical vowel across a word boundary:

(13) a.	mu sibê + o mû	[mu.si.bòò.mû]	‘one prisoner’
	mu walâ + o mû	[mu.wa.lòò.mû]	‘one girl’
b.	m bogô + e mû	[m.bo.géè.mû]	‘one buffalo’
	n diga + e mû	[n.di.gee.mû]	‘one sheep’
c.	ba sibê + a ba-o	[ba.si.báà.bo]	‘those prisoners’
	ba kô + a ba-o	[ba.káà.bo]	‘those in-laws’

As also seen, deletion, like gliding, is accompanied by compensatory lengthening.

In many cases, the expected glide may not be realized if preceded by a particular consonant or followed by a particular vowel. In Ganda, an expected [w] is not realized when preceded by /f, v/, e.g. /fu-a/ fw-aa [faa...] ‘die.’ Similarly, an expected [y] is “absorbed” into a preceding by /s/, /z/ or palatal consonant, e.g. /se-a/ sy-aa [saa...] ‘grind’. In Ruwund L.53, [w] is usually absorbed when preceded by an /m/ or /k/ and followed by /o/, e.g. /ku ooš-a/ [kwooš] ~ [kooš] ‘to burn’.

In cases where /a/ is followed by /i/ or /u/ (typically from PB \*i and \*u), a coalescence process can produce [ee] and [oo], respectively, e.g. Yao P.21 /ma ísó/ méésó ‘eyes’. This coalescence also occurs in the process of “imbrication” (§4.2), whereby the [i] of the perfective suffix is infixated and fuses with a base vowel, e.g. Bemba M.42 ísal-il-e ísail-e íseel-e ‘close (tr.) + perfective’.

With these observations, we now can summarize three of the five sources of vowel length in Bantu: (i) from underlying representations (lim- ‘cultivate’, liim- ‘extinguish’), (ii) from vowel concatenation, e.g. /bá agal-a/ [báàgala] ‘they want’; (iii) from gliding + compensatory lengthening, e.g. /tú agal-a/ [twáàgala] ‘we want’. A fourth source is the rule of vowel lengthening that occurs before a moraic nasal + consonant, e.g. /ku-ń sib-a/ [kúúnsiba] ‘to tie me’ (cf. §4.1.5). A fifth source is penultimate vowel lengthening, which occurs in most eastern and southern Bantu languages which have lost the lexical vowel length contrast, e.g. Cewa N.31b, t-a meeny-a ‘we have hit’, t-a meny-eel-a ‘we have hit for’, t-a-meny-el-aan a ‘we have hit for each other’.

Besides these lengthening processes, vowel shortening may also apply in one of three contexts. First, there may be final vowel shortening (FVS) with languages varying as to whether this occurs at the end of a word or phrase (or “clitic group,” as in Ganda EJ.15). Second, there are a number of languages which restrict long vowels to penultimate or antepenultimate position. Thus, any long vowel that precedes phrase-antepenultimate position will be shortened in Mwiini G.4?? (Kisseberth & Abasheikh 1974): reeba ‘stop’, reeb-er-a ‘stop for’, reb-er-an-a ‘stop for each other’. Similar observations have been made about the Kongo H.10 languages and nearby Yaka H.31 (which also restricts long vowels to occurring within the stem-initial syllable): zááy-á ‘know’, zááy-íl-á ‘know+appl’, zááy-ís-á ‘cause to know’; but: záy-ákán-á ‘be known,’ with shortening. In Safwa M.25, the shortening process appears to count the two moras of a CVV penultimate syllable: a-gaa gúz-y-a ‘he can sell’, a-ga buúz-y-a ‘he can ask’ vs. a-ga buz-y-aág-a ‘he may ask’. Finally, a few languages have closed syllable shortening, e.g. before geminate consonants in Ganda EJ.15: /tú-a-eé ‘tt-a/ [twéttà] ‘we killed ourselves’.

In addition to length, vowel height may be sensitive to boundaries. In a number of Interlacustrine languages, historical \*i and \*u lower to [e] and [o] at the beginning of a

constituent. This is particularly noticeable in comparing the augment+prefix sequences across languages, e.g. class 3/4 u-mu-/i-mi- in Rwanda DJ.61 vs. o-mu-/e-mi- in Haya EJ.22. In Nyambo EJ.21, lowering of /i/ and /u/ occurs only initially in a phrase. As a result, the lowered [o] of the phrase-initial form, o-mu kázi ‘woman,’ alternates with [u] in ku-bón ú-mu kázi ‘to see a woman,’ where the final -a of ku bón-a ‘to see’ has been deleted—in this case, without compensatory lengthening. Besides lowering, vowels are sometimes deleted initially, especially in roots, e.g. PB \*jǐb-a > íb-a > Cewa N.31b [ba] ‘steal’. Although restructured as a prefix, the original [i] appears in the imperative form i-ba ‘steal!’ (phrase-finally, [iiba]), where it is needed to fill out the bisyllabic minimality condition on Cewa words.

#### 4. Consonant phonology

As indicated in §2, PB is believed to have had a relatively simple consonant system. In addition, all syllables were open in PB, and syllable onsets mostly consisted of a single consonant. The two possible exceptions to this are nasal+consonant and consonant+glide.

##### 4.1. Nasal+consonant

Besides the consonants in (1a), PB and most present-day languages also have nasal complexes (NC), written mp, mb, nt, nd, ŋk, ŋg, etc., and analyzed either as clusters of homorganic nasal+consonant or single prenasalized consonants, e.g. \*búmb- ‘mould’, \*génd- ‘go’, \*táŋg- ‘read’. The class 9/10 nasal prefix N- produces equivalent NCs across morphemes, e.g. Tuki A.64 m̄ b̄ā ‘dog’, ñ d̄òàñ ‘cow’, ñ ḡì ‘fly’. The PB first person singular morpheme is also often realized as a homorganic nasal in present-day languages, e.g. Ganda EJ.15 m̄ bal-a ‘I count’, ñ d̄úm-à ‘I bite’, ñ gw-a ‘I fall’. While the prefix is an underspecified homorganic N- in 9/10, we know from such forms as Yao P.21 n-áá díp-il-é ‘I paid,’ where the nasal appears before a vocalic tense marker, that the 1sg prefix has an underlying /n/. In some languages where 9/10 is N-, the 1sg

prefix has a CV shape, e.g. Swahili G.42, Cewa N.31b ni-, Shona S.10 ndi-, Nande DJ.42 ni- (alternating with n-). The 9/10 prefix N-, on the other hand, rarely occurs directly before a vowel, since roots generally begin with a consonant.

In PB, noun and verb roots did not begin with NC. Root-initial NC has subsequently been introduced in Bantu languages which have lost root-initial \*j̥ or \*ji, e.g. Kalanga S.16 ngín-a ‘enter’ (\*j̥ngid-), mb-á ‘sing’ (\*jimb-). This is true also of the root -ntu ‘person, thing, entity’, which derives from \*j̥ntu. In other cases where a stem appears to begin with NC, the nasal may have originally been a prefix, e.g. transferred from 9/10 with the N- to another class, which then imposes its own prefix. It is sometimes still possible to analyze such forms as double prefixes, e.g. Cewa N.31b chi-m bombó 7/8 ‘glutton’ (cf. m bombó 1/2 ‘greedy person’).

While most Bantu languages preserve NC, many have restrictions either on which N+C combinations are possible, or in where within the word structure NC may occur. Thus, Tiene B.81 allows NC across morpheme boundaries, e.g. class 9 n tàbà ‘goat’, but simplifies stem-internal NC, e.g. mù òtò ‘person’ (\*(j̥)ntu). In the same language, stem-internal \*mb, \*nd become [m, n] with compensatory lengthening or diphthongization of the preceding vowel, while \*ŋ is deleted with no trace, e.g. tùm-à ‘cook’ (\*t̥mb-), kúón-a ‘desire’ (\*kúnd-), tú-a ‘build’ (\*t̥ng-). On the other hand, Yao P.21 deletes a root-initial voiced consonant after the 1sg prefix N-, but not after the 9/10 prefix N-. Thus, /ku-n gaadil-a/ kuu ŋáádila ‘to stare at me’ vs. ñ gùbò ‘cloth’ (< PB \*ŋ gùbò).

Where a consonant C is realized differently (C’) after N, it is important to note that this may be due to either of two logical possibilities: C is modified to C’ after N; or C’ becomes C except after N. The latter situation is frequently found with respect to the weakening of \*p to [h] or [w], which is typically blocked after a homorganic nasal, e.g. Nyambo EJ.21 kú h-a ‘to give’ vs. mí p-a ‘give me!’. Through subsequent changes, the relation between C and C’ can become quite distant. In Bukusu EJ.31c, the [h] observed

in Nyambo has dropped out, and the preserved labial stop becomes voiced after N, such that the alternation is now úxu a ‘to give’ vs. mí b-a ‘give me!’. Depending on the nature of the post-nasal consonant, the various N+C inputs can undergo a variety of processes:

**4.1.1. Nasal + voiceless stop.** Perhaps the most widespread process affecting NC is post-nasal voicing, attested in Nande DJ.42, Kikuyu E.51, Bukusu EJ.31c, and Yao P.21. Examples from Yao are illustrated in (14).

- |         |            |            |    |               |                  |
|---------|------------|------------|----|---------------|------------------|
| (14) a. | ku pélék-a | ‘to send’  | b. | kuu-m bélek-a | ‘to send me’     |
|         | ku túm-á   | ‘to order’ |    | kuu-n dúm-a   | ‘to order me’    |
|         | ku cápíl-a | ‘to wash’  |    | kuu-ε jápil-a | ‘to wash for me’ |
|         | ku kwéél-á | ‘to climb’ |    | kuu-^ gwéel-a | ‘to climb on me’ |

Another process affecting voiceless stops is aspiration, e.g. in Cewa N.31b, Kongo H.10, Pokomo E.71 and Swahili G.42. The illustration in (15) is from Kongo:

- |         |               |               |                 |
|---------|---------------|---------------|-----------------|
| (15) a. | /ku-N pun-á/  | kú-m phun-á   | ‘to deceive me’ |
| b.      | /ku-N tál-a/  | kú-n thal-a   | ‘to look at me’ |
| c.      | /ku-N kiyíla/ | kú-ŋ khiyíl-a | ‘to visit me’   |

The resulting NCh unit may then undergo nasal effacement (nt > nth > th), as in Swahili G.42, or de-stopping (nt > nth > nh), as in Rwanda DJ.61, Rundi DJ.62, and Shona S.10, where \*umu (j)ntu ‘person’ is realized as (u)mu nhu (cf. Nyamwezi F.22 m nhu). The resulting Nh may then simplify to N. This is presumably the chain of events that have characterized the southern Tanzanian languages Hehe G.62, Pangwa G.64 and Kingwa G.65, which have nt > n, as seen from closely related Wanji G.66, which has nt > nh.

**4.1.2. Nasal + voiceless fricative.** Three different strategies are also commonly seen when a nasal is followed by a voiceless fricative. First, the nasal may simply be effaced, even in languages such as Yao P.21, which voice post-nasal voiceless stops, e.g.

ku-n sóosa kuu sóosa ‘to look for me.’ The second strategy is seen in Nande DJ.42, which extends post-nasal voicing to include fricatives, e.g. o-lu sáŋgá ‘pearl’, pl. e-n záŋgá. A third strategy found in languages such as Kongo H.10, Yaka H.31 and Venda S.21 is affrication. As seen in the Kongo forms in (16), post-nasal affrication can also affect voiced fricatives:

(16) Post-nasal affrication in Kongo (Carter 1984)

a.	/ku-N fil-a/ /ku-N síb-a/	kú-m pfil-a kú-n tsib-a	‘to lead me’ ‘to curse me’
b.	/ku-N vun-á/ /ku-N zól-a/	kú-m bvun-á kú-n dzol-a	‘to deceive me’ ‘to love me’

In Tuki A.64, which has nasal effacement before voiceless consonants, /n+s/ becomes [ts], as expected, but /n+f/ becomes [p], e.g. /a-n seya-mí/ a tseya-mí ‘he abuses me’, /a-n fununa-mí/ a pununa-mí ‘he wakes me up’. This is presumably because [f] comes from earlier \*p. Thus, besides conditioning changes which can be characterized as “strengthening” or “fortition,” a nasal can block the opposite lenition processes (e.g. \*p > f).

**4.1.3. Nasal + voiced consonant.** As mentioned above and seen in (17a),

(17) a.	/ku-n búúcil-a/ /ku-n láp-á/ /ku-n jíím-a/ /ku-n gónék-a/	kuu múúcil-a kuu náp-a kuu jíím-a kuu ŋónék-a	‘to be angry with me’ ‘to admire me’ ‘to begrudge me’ ‘to make me sleep’
b.	/ku-n mál-a/ /ku-n ném-a/ /ku-n jál-a/ /ku-n ŋáádil-a/	kuu mál-a kuu náp-a kuu jál-a kuu ŋáádil-a	‘to finish me’ ‘for me to do incorrectly’ ‘to cut me in small pieces’ ‘to play around with me’

Yao P.21 deletes post-nasal voiced consonants—other than [d], e.g. ku-n dípa kuu-n dípa ‘to pay me’. This includes nasal consonants in (17b), since many Bantu



languages do not tolerate NN sequences. On the other hand, voiced continuants may alternate with stops (or affricates) after a nasal, e.g. Ganda EJ.15 /n láb-a/ n dáb-à ‘I see’, Tuki A.64 /a-n rama-mí/ a dama-mí ‘he pulls me’.

Post-nasal voiced consonants may also be nasalized, in which case a geminate nasal is produced. This is most readily observed in the case of Meinhof’s Law. Known also as the Ganda Law, and illustrated from that language in (18),

(18)	/n bomb-a/	m momb-a	‘I escape’
	/n limb-a/	n nimb-a	‘I lie’
	/n jung-a/	ɲ ɲung-a	‘I join’
	/n gend-a/	ŋ ɲend-a	‘I go’

a nasal+voiced consonant becomes a geminate nasal when the next syllable also begins with a nasal. The original motivation for this change is seen as the simplification of NCVNC sequences (cf. §4.5) However, many of the languages have extended the process to include forms where the second nasal is not an NC complex, e.g. Ganda EJ.15 /n lim-a/ n nim-a ‘I cultivate’. Interestingly, Yao P.21, which fails to delete [d] after a nasal in an oral context, will as a result of Meinhof’s Law do so if the following syllable is an NC complex, e.g. /ku-n díng-a/ ku-n níng-a kuu níng-a ‘to try me.’

**4.1.4. Other processes.** The above seems to indicate that Bantu languages prefer that post-nasal consonants be [+voice] rather than [-voice] and [-continuant] rather than [+continuant]. Voiceless stops tend to become aspirated, and voiced stops tend to become nasalized. While these generalizations reflect the common processes affecting post-nasal consonants, it is important to note that opposing “counter-processes,” though less common, are also found. For example, voiced stops are devoiced and variably pronounced as ejectives in Tswana S.31 and Sotho S.33: bón-a ‘see!’, m pón-á ‘see me!’, dís-á ‘watch’, n tís-á ‘watch me!’. Aspirated stops are deaspirated in Nguni languages, e.g. Ndebele S.45 ulu thi ‘stick’, pl. izin ti. Affricates become deaffricated in

a number of languages, e.g. Shona S.10 *bvum-a* ‘agree, admit’, vs. *m vum-o* ‘permission, agreement’. Finally, and perhaps most unusual, nasal consonants are denasalized after another nasal in Punu B.43, Lingala C.36d, Bushong C.83, Kongo H.10, Yaka H.31, e.g. Yaka *m bák-íní* ‘I carved’ (*mak-* ‘carve’), *n dúúk-íní* ‘I smelt’ (*nuuk-*).

**4.1.5. Moricity.** In most Bantu languages there is no vowel length opposition before an NC complex. Rather, as seen in many of the cited examples, the preceding vowel is frequently lengthened. The standard interpretation is that this nasal is “moraic,” i.e. it contributes a unit of length or “beat,” which is readily transfers to the preceding vowel. It also is potentially a tone-bearing unit. This is most transparently seen in languages which allow NN sequences, or when the nasal is syllabic and phrase initial, e.g. Haya E.22 *mí-bwa* ‘dog’. However, even when the nasal loses its syllabicity and compensatorily lengthens the preceding vowel, some languages still treat it as a tone-bearing unit, e.g. Ganda EJ.15, while others do not, e.g. Haya EJ.22, Bemba M.42 (see chapter XX on tone).

**4.1.6. New cases of NC.** While the preceding subsections characterize the phonology of NC complexes inherited from PB, many Bantu languages have introduced new sequences of N+C. The most common source is the loss of [u] in *mu-* prefixes, e.g. Swahili G.42 *m thu* ‘person’, *m toto* ‘child’. The resulting syllabic [m] may then undergo homorganic nasal assimilation, as it does in most dialects of Yao P.21, e.g. *ṅ kúlú* ‘elder sibling’ 1, *ṅ sééngó* ‘horn of antelope’ 3, *ṅ gólógolo* ‘in the weasel’ 18 (N’ = syllabic). The loss of the [u] of *mu-* prefixes also extends to the 2nd person plural SP and the class 1 OP, but will frequently not take place if followed by a vowel or NC, e.g. Yao *mu uso* ‘bow of boat’ 3, *muu ndo* ‘person’ 1, *mw-ii gaasa* ‘handful’ 18 (cf. *(d)i gaasa* ‘palm of hand’ 5). Vowel-deletion can also be blocked if the stem is monosyllabic, e.g. *mu si* ‘village’ 3. The resulting NC may contrast phonetically or phonologically with PB \*NC in several ways. First, as the Yao examples illustrate, the

nasal from \*mu- is typically syllabic, while the nasal from \*NC loses its syllabicity (Hyman & Ngunga 1997). Second, the nasal from \*mu- does not condition the same alternations on the following consonant (e.g. voiceless stops do not become voiced after N'- in Yao). In Tswana S.31, where m+b is normally realized [mp] (cf. §4.1.4), mu- loses its vowel when followed by stem-initial /b/, which in turn is realized [m], e.g. mu búsi m músi 'governor' (cf. búsi-á 'to govern'). Contrast this last example with Matuumbi P.13 (Odden 1996), where class 9/10 N- does not condition changes on voiced stops (l\O(u,) gó\O(i,)) 'braided rope', pl. η gó\O(i,)), but N'- from \*mu- does (e.g. mu gaála ~η ŋaála 'in the storage place' 18). A third difference is that N'- does not condition lengthening on the preceding vowel, cf. Haya EJ.22 /a-ka-ń-biNg-a/ a-káá-m-biŋg-a 'he chased me' vs. /a-ka-mú biNg-a/ a-ka-mí biŋg-a 'he chased him'. Finally, there can be a tonal difference, even in cases where there is no difference in syllabicity. Thus, in Basaa A.43, class 3 N- (< \*mu-) is a tone-bearing unit, while class 9 N- is not. Thus, the rule of high tone spreading applies in the phrase púbá m bǒndɔ 'white lion' (< m bǒndɔ 'lion' 9), but not in púbá m ɓomga 'white hammer' (< m ɓomga 'hammer' 3), since, although non-syllabic, the m- in this case "counts" as the tone-bearing unit to which the high tone spreads.

#### 4.2. Consonant + high vowel

Besides the post-nasal environment, consonants are frequently realized differently before high vs. non-high vowels. First and foremost is the process of frication which affects consonants when they are followed by \*i and \*u producing changes such as those schematized in (19).

(19) a.	*p <sub>i</sub>	>	p <sup>H</sup> <sub>i</sub>	>	pf <sub>i</sub>	>	f <sub>i</sub>	>	fi
	*b <sub>i</sub>	>	b <sup>H</sup> <sub>i</sub>	>	bv <sub>i</sub>	>	v <sub>i</sub>	>	vi
b.				>	ps <sub>i</sub>	>	(ts <sub>i</sub> )	>	s <sub>i</sub>
				>	bz <sub>i</sub>	>	(dz <sub>i</sub> )	>	z <sub>i</sub>
c.	*t <sub>i</sub>	>	t <sup>H</sup> <sub>i</sub>	>	ts <sub>i</sub>	>	s <sub>i</sub>	>	si
	*d <sub>i</sub>	>	d <sup>H</sup> <sub>i</sub>	>	dz <sub>i</sub>	>	z <sub>i</sub>	>	zi
d.	*c <sub>i</sub>	>	c <sup>H</sup> <sub>i</sub>			>	s <sub>i</sub>	>	si
	*j <sub>i</sub>	>	j <sup>H</sup> <sub>i</sub>			>	z <sub>i</sub>	>	zi
e.	*k <sub>i</sub>	>	k <sup>H</sup> <sub>i</sub>	>	ks <sub>i</sub>	>	(ts <sub>i</sub> )	>	s <sub>i</sub>
	*g <sub>i</sub>	>	g <sup>H</sup> <sub>i</sub>	>	gz <sub>i</sub>	>	(dz <sub>i</sub> )	>	z <sub>i</sub>

As indicated, these changes are first triggered by the development of “noise” in the release of a consonant before the tense high vowels \*<sub>i</sub> and \*<sub>u</sub>. Indicated as “H” in (19), the present-day reflex can, in fact, be aspiration, as in Makua P.31—cf. Kalanga S.16 *thúm-á* ‘sew’ (\**túm-*) vs. *túm-á* ‘send’ (\**-túm-*). Similarly, /t, d/ are aspirated before /i/ in Doko C.31 (7V): /ká tísá/, /í-dínó/ [ká t<sup>h</sup>ísá] ‘traverse’, [í d<sup>h</sup>íno] ‘tooth’. In most languages, however, CH is further modified either to an affricate or fricative, as indicated, e.g. Ngom B.22b *kfu<sub>ba</sub>* ‘chicken’ (\**k<sub>u</sub>ba*). Such modifications are found in all 5V languages except Lengola D.12, as well as in many 7V systems (Schadeberg 1994-5).

As seen above in (6), \*<sub>u</sub> was almost entirely restricted to the first and last stem syllables in PB, although it also occurs in stem-internal position in the PB root \**-tákun-*, which has reflexes such as Cewa N.31b *tafun-a*, Pende L.11/K.52 *táfun-a*, Venda S.21 *tafun-a*, Yao P.21 *táwún-a*, and (with metathesis), Nkore-Kiga EJ.13/14 and Nyambo EJ.21 *fútan-a*. Synchronic alternations are found in languages which use the \*<sub>u</sub> suffix to derive adjectives or nouns from verbs, e.g. Ganda EJ.15 *nyee-* ‘become fat’ *nyééf-ù* ‘fat’; *lebel-* ‘be loose’ *lebév-ù* ‘loose’; *tamiir-* ‘become drunk’ *mu tamíiv-ù* ‘drunkard’.

\*<sub>i</sub> also most frequently occurred in the first and last stem syllables in PB, but also in noun class prefixes, e.g. class 8 \**b<sub>i</sub>-* > Shona S.10 class 8 *zvi-* (with a “whistled” labioalveolar [ʒ]). In many Bantu languages, synchronic alternations are conditioned by

one or more of the three suffixes reconstructed with \**j*. The first of these is the causative suffix \**-j-* (which must in turn be followed by a FV). As seen in the Bemba M.42 forms in (20),

(20) a.	-leep-	'be long'	-leef-i-	'lengthen'	[leef-y-a]
	-lub-	'be lost'	-luf-i-	'lose'	[luf-y-a]
b.	-fiit-	'be dark'	-fiis-i-	'darken'	[fiiš-a]
	-cind-	'dance'	-cins-i-	'make dance'	[cinš-a]
	-lil-	'cry'	-lis-i-	'make cry'	[liš-a]
	-buuk-	'get up (intr)'	-buus-i-	'get [s.o.] up'	[buuš-a]
	-lúng-	'hunt'	-lúns-i-	'make hunt'	[lúnš-á]

when followed by causative \**-j-*, labial /p, b/ become [f] and lingual consonants become [s] (subsequently modified to [š] by palatalization, e.g. /sit-/ [šit-] 'buy'). The second suffix is \**-j-*, which derives nouns, often agentives, from verbs, as in Ganda EJ.15 o-mú ddus-i 'fugitive' (< -'dduk- 'run (away)'), o-mu lez-i 'guardian' (< -ler- 'raise (child)'). Finally, the bimorphemic "perfective" suffix \**-j-d-e* also frequently conditions frication (Bastin 1983), e.g. Nkore E.13 -réet- 'bring', perfective -réets-ir-e; Rundi DJ.62 rir- 'cry', perfective riz-e (< rir-y-e < \*did-*j-d-e*).

While such frications occur frequently throughout the Bantu zone, there is considerable variation. Not only can the exact reflexes differ, but so can the environments in which they occur. In Bemba M.42, for instance, only causative \**-j-* regularly conditions frication. In Yao P.21, frication before causative \**-j-* is more widespread than before perfective \**-j-d-e*, but will almost always occur before the latter if the preceding consonant is either [l] or [k], i.e. the two consonants which occur most frequently in extensions (Ngunga 2000). What this indicates is that frication, although originally an across-the-board phonological process, has acquired morphological restrictions and, in some cases, has been levelled out completely. Thus, the [i] of Bemba M.42 -il-e not only fails to condition frication, but has been restructured, on analogy

with suffixes such as applicative *-il-/-el-*, to undergo vowel height harmony, e.g. *fik-il-e* ‘arrive+perfective’ vs. *bep-el-e* ‘lie+perfective’. The perfective suffix *-il-e* continues to differ from the applicative *-il-* in its ability to fuse or “imbricate” with verb bases that end in a range of consonants, e.g. *kúngub-* ‘gather’ perfective *kúngwiib-e* vs. applicative *kúngub-il-a* (Bastin 1983, Hyman 1995a).

The vowels *\*i* and *\*u* may have effects on preceding consonants other than frication. While nasals are usually exempt from the effects of degree 1 high vowels, Ganda EJ.15, *\*i* palatalizes /n/, e.g. *o-mu-son-i* ‘tailor’ (< *-son-* ‘sew’). A much more frequent phenomenon concerns the realization of PB *\*d*, which may be preserved as [d] before [i], but realized as [l] or [r] before other vowels. This occurs both in 7V languages, e.g. Duala A.24, Tiene B.81, Bobangi C.24, as well as in 5V languages, e.g. Kongo H.16, Lwena K.14, Kwezo K.53, Dciriku K.62, Kete L.21 and certain dialects of Yao P.21. In the 5V languages *\*di* is typically realized as [dzi] or [zi], and *\*di* is realized [di]. (Unless preceded by a nasal, *\*d* is realized as [l] or [r] before other vowels.) The synchronic situation is considerably obscured in Ruwund L.53, where *\*di* is realized [di] and *\*de* is realized as [li] (cf. §3.2 above). In other languages the effect is extended to the high back vowel *\*u*, e.g. Tswana S.31 (7V). In Kalanga S.16 (5V), *\*du* is realized [du], while *\*du* is realized [lu] (Mathangwane 1999). Finally, Cewa N.31b exhibits the “hardening” of /l/ to [d] only before glides, e.g. *dy-a* ‘eat’, *bad-w-a* ‘be born’ (cf. *bal-a* ‘bear (child)’). Occurring in both eastern and western Bantu—indeed, throughout the zone—there is dialectal evidence in both the Kongo H.10 and Sotho-Tswana S.30 groups that the [d] was originally pronounced as retroflex [ɽ] before high vowels (cf. also much of Caga E.60, where *\*d* is realized [r] before *\*i*, *\*u* elsewhere as [l] or Ø).

### 4.3. Consonant + glide

The post-consonant glides [y] and [w] are typically derived from underlying vowels. As a result, consonants often show the same alternations before the glides [y] and [w] as before the corresponding high vowel. Thus, [y, w] from *\*i*, *\*u* produce

frications, while [y, w] from \*i, \*u or \*e, \*o typically do not. An exception to this is found in the Mongo C.60 group (7V). In some dialects of Mongo, /t/ is realized [ts] before the high tense vowels /i, u/, while /l/ (< \*d) is realized as j [dʒ]. However, all dialects appear to produce the affricate realizations before [y, w]—even if they derive from /e, o/: tó kamb-a ‘we work’, ló kamb-a ‘you pl. work’ vs. tsw-án-a ‘we see’, jw-án-a ‘you pl. see’.

In many Bantu languages, ky/gy develop into alveo-palatal affricates. This is seen especially in the different realizations of the class 7 \*ki- prefix before consonants vs. vowels, e.g. Nyamwezi F.22 (7V) k̄i j̄ükò ‘spoon’ vs. c èyèò ‘broom’; Swahili G.42 (5V) ki kapu ‘basket’ vs. c ama ‘society’; Ha DJ.66 class 7 íki ‘this’ vs. ic-o ‘that (near you)’. Other languages front velars with a noticeable offglide, i.e. k<sup>y</sup>, g<sup>y</sup>, first before high front vowels, then before mid front vowels as well. Thus, Ganda EJ.15 èk<sup>y</sup>i kópò ‘cup’, ultimately èci kópò. While different patterns of velar palatalization are found throughout the Bantu zone (Hyman & Moxley 1992), some languages in the Congo basin show analogous developments with respect to alveolar consonants. While /li/ is realized [di] in both Luba Kasai L.31a and Pende L.11/K.52, /ti/ is realized ci [tʃi]: Luba mac-il- ‘plaster+appl’ (mat-), Pende shíc-il- (~ shít-il-) ‘close+appl’ (shít-).

While a [y] glide (or offglide) can trigger palatalization, [w] is responsible for velarization, e.g. in the Rundi-Rwanda DJ.60 and Shona S.10 groups. Meeussen (1959) summarizes the reflexes of labial+glide and coronal+glide complexes in Rundi as in (21).

- |         |  |    |  |
|---------|--|----|--|
| (21) a. | bw [bg]<br>fw [fk]<br><br>mw [mŋ]<br><br>tw [tkw]<br>rw [rgw (gw)]<br>sw [skw, s <sup>k</sup> w]<br>zw [d <sup>z</sup> gw]<br>tsw [tskw, ts <sup>k</sup> w]<br>cw [t kw, t <sup>k</sup> w] | b. | fy [f <sup>s</sup> y]<br>vy [v <sup>z</sup> y]<br>my [mɲ]<br><br>ty [rtky, r <sup>t</sup> ky]<br>rg [rgy]<br>sy [s <sup>k</sup> y] |
|---------|--|----|--|

jw [d<sub>3</sub>g<sup>h</sup>w]  
 shw [kw, k<sup>h</sup>w]

nny [ny, n<sup>h</sup>y]

As seen in (21a), Cw hardens to Ck/Cg/C<sub>ŋ</sub>, and the labial offglide is lost (“absorbed”) when the C is labial. (22a) shows that Cy undergoes a comparable hardening process. When the C is velar, one obtains the expected Cw sequence. Similar processes occur in the Shona S.10 complex. In Kalanga S.16, /l/ becomes [g] before [w], e.g. tól-a ‘take’, tóg-w-a ‘be taken’. Compare also Basaa A.43, where the class 4 mi- and class 8 bi- prefixes are realized ηw- and gw- when directly followed by a vowel, e.g. bi tónj ‘horns’ vs. gw ǒm ‘things’ (y ǒm ‘thing’ 7)—cf. the object pronouns ηw-ó (cl. 4) and gw-ó (cl. 8). Finally, geminate w+w and y+y become, respectively, [ggw] and [ggy] in Ganda EJ.15:

- |         |        |      |       |          |                    |
|---------|--------|------|-------|----------|--------------------|
| (22) a. | /pó-a/ | wo-a | ww-aa | ggwaa... | ‘become exhausted’ |
| b.      | /pí-a/ | wi-a | yy-aa | ggyaa... | ‘get burnt’        |

As seen, both glides derive from \*p —cf. m pw-êdd-è ‘I have become exhausted’ and m pî-dd-è ‘I have gotten burnt’ (~ n jî-dd-è).

#### 4.4. \*j + Consonant

Consonants may harden not only after nasals or before glides, but also after PB \*j, particularly when this vowel is either word-initial or preceded by a vowel. Thus, Tswana S.31 devoices stops not only after N-, but also after reflexive i-: i pón-é ‘see yourself!’, i tís-é ‘watch yourself!’ (bón-, dis-). In Lega D.25, PB \*t normally becomes [r], but is preserved as [t] after the class 5 prefix \*j, e.g. i-táma ‘cheek, pl. ma-ráma. Ganda EJ.15, on the other hand, develops geminates from \*jC. Thus, compare o-mu sâjjà ‘man’ and bajj-a ‘carve’ with Haya EJ.21 o-mu šâjja and bajj-a. This process also produces root-initial geminates, e.g. ‘tt-à ‘kill’ and ‘bb-à ‘steal’, and singular/plural alternations in classes 5/6 such as e-g gulu ‘sky’, pl. a-ma gulu (cf. Haya EJ.21 ít-a, íb-



a, e-i gulu). While class 5 \*i- typically “strengthens” following consonants, it is known also to condition voicing (and implosion), e.g. Zezuru S.12 báŋgá ‘knife’ (pl. ma páŋgá), daŋgá ‘cattle enclosure’ (pl. ma taŋgá), gáŋgá ‘large helmeted guinea-fowl’ (pl. ma káŋgá)

#### 4.5. Long distance consonant phonology

In all of the processes discussed thus far, the trigger of the phonological process is adjacent to the targeted consonant. Bantu languages also are known for the ability of a consonant to affect another consonant across a vowel (and beyond). There are several such cases.

The first, Meinhof’s Law, was seen already in §4.1.3, whereby a nasal+voiced stop is realized NN or N when followed by a second nasal complex (sometimes just N) in the next syllable. Another version of this simplification occurs in Kwanyama R.21, where the second nasal+voiced stop loses its prenasalization (Schadeberg 1987): \*ŋ gombe > oŋ gobe ‘cattle’, \*ŋ-gandu > oŋ gadu ‘crocodile’. These dissimilatory changes have the effect of minimizing the number of NC complexes in a (prefix+) stem. Another well-known dissimilatory process is Dahl’s Law, whereby a voiceless stop becomes voiced if the consonant in the next syllable is also voiceless. This accounts for the initial voiced reflexes in Nyamwezi F.22 roots such as -dakún- ‘chew’ (\*-tákun-), -guhí ‘short’ (\*-kúpi). Dahl’s Law is also responsible for the /t/ or /k/ of prefixes to become voiced (and sometimes continuant), e.g. Kuria E.43 /ko tɛma/ [yo tɛm-a] ‘to beat’. While there is considerable variation (Davy & Nurse 1982), multiple prefixes may be affected, e.g. Southern Kikuyu E.51 /ke-ke-ko eta/ [ye-ye-ɣw eet-a] ‘he (cl. 7) called you’. Alternations are also sometimes found stem-internally, as in Rundi DJ.62 -bád-ik- ‘transplanter’, -bád-uk- ‘pousser bien’ vs. -bát-ur- ‘arracher (plantes) pour repiquer’.

Other long-distance consonant processes are assimilatory in nature. In Bukusu EJ.31c, an /l/ will assimilate to a preceding [r] across a vowel, e.g. -fúk-il- ‘stir + appl’ vs. -bír-ir- ‘pass + appl’. The process is optional when the trigger [r] is separated by an

additional syllable, e.g. -rám- ‘remain’, -rám-il- ~ -rám-ir- ‘remain + appl’. Several languages in the western Lacustrine area show a process of sibilant harmony which disallows or limits the co-occurrence of alveolar and alveo-palatal sibilants, e.g. [s] and [š]. In Rwanda DJ.61 and Rundi DJ.62, /s/ becomes alveopalatal across a vowel, when the following consonant becomes (alveo-) palatal as the result of a y-initial suffix, e.g. soonz- ‘be hungry’ vs. a-ra shoonj-e ‘he was hungry’ (< soonz-ye). In Nkore-Kiga EJ.13/14, the process produces alternations in the opposite (depalatalizing) direction, e.g. shígish- ‘stir’, o-mu sígis-i ‘stirrer’. Finally, a third long-distance assimilation involves nasality. A wide range of Bantu languages nasalize [l] or [d] to [n] after an NV(V) syllable (Greenberg 1951), e.g. Bemba M.42 cít-il- ‘do + appl’ vs. lim-in- ‘cultivate + appl’. While Suku H.32 optionally extends this process across additional syllables, creating extension variations such as -am-ik-il- ~ -am-ik-in-, such long-distance assimilation is obligatory in Kongo H.10—and in nearby Yaka H.31, e.g. ziik-il- ‘bury + appl’ vs. mak-in- ‘climb + appl’, miituk-in- ‘sulk + appl’, nutuk-in- ‘lean + appl’.

Other forms of apparent long-distance phonology are highly morpheme-specific. Thus, the passive suffix -w- (\*-u-) causes the palatalization of a preceding labial consonant in the Sotho-Tswana S.30 and Nguni S.40 groups, e.g. Ndebele S.45 dal-w- ‘be created’ (dal-) vs. bunj-w- ‘be moulded’ (-bumb-). In Ndebele and other Nguni languages, this process can actually skip syllables, e.g. funjath-w- ‘be clenched’ (-fumbath-), vunjulul-w- ‘be uncovered’ (-vumbulul-). In a number of languages, where causative \*-i- conditions frication, the effect is sometimes seen on non-adjacent consonants. In Bemba M.42, the roots lub- ‘be lost’ and lil- ‘cry’ form the causatives luf-y- and lis-y- (> liš-) and the applicatives lub-il- and lil-il-. However, their applicativized causative forms are -luf-is-y- and -lis-is-y-, with frication applying twice. As seen in (23), this is the result of a “cyclic” application of the frication process (Hyman 1994):

(23)	UR	MORPHOLOGY	PHONOLOGY	MORPHOLOGY	PHONOLOGY
a.	-lub-	-lub-ɨ- 'be lost'	-luf-ɨ- 'lose'	-luf-il-ɨ-	-luf-is-ɨ- 'lose for/at'
b.	-lil- 'cry'	-lil-ɨ- 'make cry'	-lis-ɨ-	-lis-il-ɨ- 'make cry for/at'	-lis-is-ɨ-

In the second morphology stage, applicative -il- is “interfixed” between the fricated root and the causative suffix \*-ɨ- (> y before a vowel). Bemba and certain other Bantu languages show the same multiple frications when the \*-ɨd- of perfective \*-ɨd-e is interfixed, e.g. *luf-is-ɨ-e* [lufiʃe] ‘lose + perfective’. In other languages, frication appears to apply non-cyclically, affecting only the applicative consonant, e.g. Mongo C.61 /kál-/ ‘dry’, /kál-ɨ-/ ( [káj-a] with FV -a) ‘make dry’, /kál-el-ɨ-/ kál-ej-ɨ- ‘make dry + applicative’ ( [kál-ej-a] with FV -a). Still others show evidence of cyclicity by “undoing” frication in a fixed (often non-etymological) manner. In Nyamwezi F.22, the verb /gul-/ ‘buy’ is causativized to /gul-ɨ-/ ‘sell’, which undergoes frication to become *guj-ɨ-* (> surface [guj-a] by gliding of ɨ to [y] and absorption of [y] into the preceding alveopalatal affricate). However when *guj-ɨ-* is applicativized, yielding intermediate *guj-el-ɨ-*, the result is *gug-ej-ɨ-* ( [gug-ej-a]). The [j] is “undone” as velar [g], on analogy with -og- ‘bathe intr.’, -oj-ɨ- ‘bathe (s.o.)’, -og-ej-ɨ- ‘bathe + appl’, not as the [l] one would expect if the process were non-cyclic. The most extreme version of this process is seen in languages such as Nyakyusa M.31, which uses a “replacive” [k] no matter what the input consonant of an applicativized causative. Thus, -kees-ɨ- ‘make go by’ (the causative of -keend- ‘go by’) is applicativized first to -kees-el-ɨ-, which then undergoes frication and de-frication of the s to k: -keek-es-ɨ- ‘make go by + appl’ ( [keek-es-y-a]).

#### 4. Conclusion

The above gives a sketch of some of the phonological properties of syllables, consonants, and vowels in Bantu languages. It emphasizes languages which have preserved the basic morphological and phonological structure inherited from Proto-

Bantu. In order to be complete, it is necessary to point out that quite a few languages in zones A and B have modified this structure significantly, e.g. by allowing closed syllables, developing back unrounded vowels etc. The tendency to break down the inherited structure is even more pronounced in groups just outside “Narrow Bantu”, e.g. Grassfields Bantu.

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