The phonology–morphology interface

Consonant mutations in Bemba

Nancy Chongo Kula
Universiteit Leiden/HIL

1.   Introduction

The inception of Lexical Phonology (LP) (Kiparsky 1982; Mohanan 1982) was one of the initial instigators of debate on the phonology/morphology interface. LP, which assumes at least three levels of phonological representation, views the lexicon as consisting of ordered strata in which morphological rules may apply cyclically either stratum internal or across strata. Other theories following LP have retained the central idea of cyclicity in deriving phonological processes that are morphologically driven. Inkelas (1993), develops a model of morphology/phonology interface called Prosodic Lexical Phonology (PLP) from which it follows that every process of word formation triggers cyclic phonological rules. In PLP phonological rules do not access morphological structure directly but rather access phonological phrases (p-structure) that are created from morphological concantenations. Cyclicity is retained in the sense that phonological rules apply automatically upon the construction of a new p-structure. Benua (1997) in an Output-Output transderivational correspondence in Optimality Theory, dubbed O-O correspondence, proposes a theory that maps an obligatory relation between inflected words, where the output of the first member of a paradigm is mapped onto the second member.

Following a Government Phonology (GP) (Kaye, Lowenstamm and Vergnaud 1985, 1990; Harris 1990) perspective, I will argue for a non-cyclic derivation of morphologically conditioned phonological effects. I will pursue the idea that morphology is only visible to phonology in analytic contexts, while in non-analytic contexts phonology is blind to morphological boundaries. To achieve this objective, I will trace the mutation effects of the causative suffix in Bemba, a language of the Bantu group that is principally spoken in the Northern Province of Zambia.

The paper shall proceed as follows; Section 2 presents Bemba structure and phonology, Section 3 gives the data, Section 4 briefly looks at previous analyses of

Bantu causative triggered mutations, Section 5 presents my analysis following GP assumptions, and Section 6 offers some concluding remarks.

2.   Bemba structure and phonology

2.1 Bemba structure

Bemba, like many other Bantu languages has a robust agglutinative morphology that allows affixation of a variety of morphemes both to the left and the right of the verb stem. The Bantu verb therefore has the shape given in (1).

(1)   prefix + verb stem + (extensions) + final vowel

The prefix in the verb serves to indicate the infinitive or citation form of the verb. The verb stem, cannot be used independent of the final vowel (FV) even though it is the stem that is assumed to be stored in the lexicon. All phonological and morphological processes apply to the verb stem before the FV is added. All suffixes are as such attached to the verb stem, represented by 'extensions' in the illustration in (1) above. The final vowel thus does not take part in any morphological nor phonological processes. This behaviour of the FV implies that the output to morphological and phonological processes needs to conform to a consonant final domain so that the strict CV structure of Bemba can be retained once the FV is added post-lexically. This factor shall be crucial to my analysis of consonant mutations in Section 5.

2.2 Vowels

Bemba has a five vowel system, historically reduced from a seven vowel system by conflation of the high vowels as shown in (2).

(2)   Proto-Bantu vowel system: í   i   e   a   o   u   ú
       Bemba vowel system: i   e   a   o   u

Proto-Bantu reconstructions (cf. Meeussen 1967) have generally assumed that the trigger of consonant mutations in causativised stems, is the high vowel /-í-/ that has been lost in vowel reduction. This is in line with findings of Schadeberg (1995), who notes that spirantisation, one of the types of consonant mutation (CM), is more frequent in Bantu languages that have undergone vowel reduction as opposed to those that have not.

2.3   Consonants

In GP, phonology is viewed as a purely cognitive function whose role is that of parsing; segmenting continuous input strings into phonological units that address lexical units. GP employs a system of elements as the smallest interpretable units that combine to form sound segments or phonological expressions. These phonological expressions (PEs) are the cognitive and melodic units that can be manipulated and which attach to the skeleton, which acts as a tier of timing units. This implies that melody and timing are separate in GP and therefore the smallest sound unit is not a phoneme specified for phonetic content and duration, but rather a monovalent element which may combine with other elements to form sound segments that are traditionally referred to as phonemes. The combination of elements to create PEs is regulated by Licensing Constraints (LCs) which define restrictions on the combinations of elements per language.[1] The representations for sound segments are motivated by the number of contrasts employed in a particular language according to the phonological processes operative in it. The set of LCs for Bemba is therefore based on the phonological processes operative in Bemba. Given in (3) is a GP representation of the consonants of Bemba both lexical and derived.[2]

> (3)   Representation of Bemba consonants in GP

stops	p (U̲.ʔ.h)	t (R̲.ʔ.h)	k (ʔ.h)
	b (U̲.ʔ.h.L)	d (R̲.ʔ.h.L)	g (ʔ.h.L)
fricatives	ß (h̲.U.L)	f (h̲.U)	s (h̲.R) ʃ (h̲.I)
affricates	ʧ (ʔ.I.h)	ʤ (ʔ.I.L)	
nasals	m (L̲.U.ʔ)	n (L̲.R.ʔ)	ɲ (L̲.I.ʔ) ŋ (L̲.ʔ)
laterals	l (R)		
glides	y (I)	w (U)	

3.   The Data

3.1   Two causative suffixes

There are two ways of forming the causative in Bemba; by suffixation with the regular causative suffix -ish- (4), or by mutation of the stem final consonant (5). The choice of either of the two processes depends on the transitivity of the verbal stem.[3] Transitive verb stems form the causative with the -ish- suffix, which I shall refer to as the long causative, whilst intransitive stems opt for mutation of the stem final consonant. I shall refer to the latter process as triggered by the short causative.

(4)   transitives *-ish*

a.	imb-a	*sing*	imb-ish-a	*cause to sing*
b.	sek-a	*laugh*	sek-esh-a	*cause to laugh*
c.	pet-a	*fold*	pet-esh-a	*cause to fold*
d.	beleng-a	*read*	beleng-esh-a	*cause to read*
e.	tem-a	*chop*	tem-esh-a	*cause to chop*

(5)   intransitives — CM: spirantisation & palatalisation

a.	lub-a	*lost*	lufy-a	*cause to be lost*
b.	tump-a	*stupid*	tumfy-a	*cause to become stupid*
c.	end-a	*walk*	ensh-a	*cause to walk/move*
d.	pit-a	*pass*	pish-a	*cause to pass*
e.	kul-a	*grow*	kush-a	*cause to grow*
f.	pook-a	*burst*	poosh-a	*cause to burst*
g.	lung-a	*hunt*	lunsh-a	*cause to hunt*
h.	kos-a	*hard*	kosh-a	*cause to become hard*
i.	pon-a	*fall*	pony-a	*cause to fall*
j.	kom-a	*be deaf*	komy-a	*cause to be deaf*

In (5), where the causative is expressed by mutation of the stem final consonant, the labials /p b/ in (5a–b) spirantise to *-fy-*, the stops /d t k g/, the fricative /s/, and the liquid /l/ in (5c–h) spirantise to *-sh-*, and the nasals in (5i–j) palatalise to *-ny-* and *-my-* respectively.

3.2 Morphologically complex stems

When stems that are already suffixed with one or more suffixes are causativised multiple mutations occur when only one causative is semantically interpretable. Consider the data in (6)–(10) where both the short and long causative interact with the applicative, reciprocal and reversive suffixes.

The data in (6) show that the causative triggers spirantisation of the suffix consonant both for the short (6a–b) and the long (6c–d) causative: the applicative suffix *-il-* becomes *-ish-*.

(6)   applicative   *-il-*

	stem		applicative	causativised applicative	
a.	lil-a	*cry*	lil-il-a	lish-ish-a	*lil-ish-a
b.	lub-a	*lost*	lub-il-a	luf-ish-a	*lub-ish-a
c.	imb-a	*sing*	imb-il-a	imb-ish-ish-a	*imb-il-ish-a
d.	shit-a	*buy*	shit-il-a	shit-ish-ish-a	*shit-il-ish-a

The data in (7) illustrate a case of double CM's of the suffixes *-an-* and *-il-* that become *-any-* and *-ish-* respectively. (7a) with the short causative also spirantises the stem final consonant while (7b) with the long causative does not.

(7) reciprocal + applicative *-an-* + *-il-*

	stem		appl/recip	caus/recip	caus/appl/recip
a.	pit-a	*pass*	pit-il-an-a	pish-any-a	pish-ish-any-a
b.	sek	*laugh*	sek-el-an-a	sek-esh-any-a	sek-esh-esh-any-a

The intransitive suffix in (8) that alternates between *-uk-* and *-uluk-* makes all stems it attaches to intransitive, implying that they can only take the short causative. (8) illustrates that /u/ blocks CM across it as stem final /l/ in (8a) and suffix internal /l/ in (8b) both fail to mutate. The data in (9) with the transitive reversive suffix are complements to (8), illustrating the same point.[4]

(8) reversive *-uk-*/*-uluk-* (intrans.)

	stem		intrans. rev	caus/rev
a.	sel-a	*move*	sel-uk-a	sel-ush-a
b.	pet-a	*fold*	pet-uluk-a	pet-ulush-a

(9) reversive *-ul-*/*-ulul-* (trans.)

	stem		trans. rev	caus/rev
a′.	sel-a		sel-ul-a	sel-w-ish-a
b′.	pet-a		pet-ulul-a	pet-ululw-ish-a

(10) illustrates a case of multiple mutations where three suffix final consonants mutate. Mutation is once again blocked by /u/.

(10) reversive + applicative +reciprocal *-uluk-* + *-il-* + *-an-* (example (7b))

	stem		rev/appl/recip	caus/rev/appl/recip
a.	pet-a	*fold*	pet-uluk-il-an-a	pet-ulush-ish-any-a

3.3 The causative in Runyankore and Kirundi

Whilst languages like Bemba and parallels of it such as Luganda, display multiple CM's with the causative in morphologically complex stems another group of Bantu languages such as Runyankore and Kirundi do not. Although these languages do form the causative by mutating the stem final consonant as (11) shows, they do not exhibit multiple CM effects.

(11)

	stem		caus.	perf.	perf/caus
Runyankore	gul-	*close*	guz-	gul-il-e	gul-iz-e	*guz-iz-e
Kirundi	og-	*wash*	oz-	og-il-e	og-iz-e	*oz-iz-e

Whatever we assume the causative to be, in Runyankore and Kirundi it only triggers CM once in both simplex and complex stems. An analysis aiming towards giving a uniform account of the effects of the causative across Bantu would therefore have to take these data into consideration.

4. Previous analyses

4.1 Hyman (1995), Katamba (1999)

Hyman (1995), and along the same lines Katamba (1999) for Luganda, follow a Lexical Phonology perspective with the assumption that the Bantu mutation triggering causative suffix is the high /-í-/ that was lost in vowel reduction from Proto-Bantu. Hyman opts for a cyclic application of the causative, whilst Katamba following Meeussen's (1959: 58) observation that monophone suffixes such as the causative -*í*- and passive -*w*- have a tendency to follow longer suffixes in Bantu, opts for reduplication or *suffix doubling* of the causative suffix in morphologically complex stems. Both analyses can be captured in the derivation outlined in (12).

(12)   UR →   morphology → phonology → morphology → phonology → output
       lek- *'stop'* lek-í-   lesh-í-   lesh-êl-í-   lesh-êsh-   lesh-êsh-a

What (12) represents is not only the cyclic application of a phonological rule, but an interpretation that crucially relies on the interleaving of morphology and phonology to produce cyclicity. This basic assumption of LP is brought to question in GP which assumes phonology to be a function that applies at a single level and in addition assumes that all derivations are subject to the minimalist hypothesis given in (13) below.

(13)   *Minimalist hypothesis* (Kaye 1995: 290)
       Processes apply whenever the conditions that trigger them are satisfied.

The minimalist hypothesis implies that derivations are blind to the history or future of any derivation in which they are involved. For Hyman's analysis this implies that the disparity between the first and second application of phonology, with the causative -*í*- only absorbed in the second application of phonology and not in the first, should not exist. In fact, the resulting form of the initial phonological application (i.e. the causative of *lek-a*) does not contain an /-í-/ but is simply *lesha* 'cause to stop'. This being the case, there is no position between a spirantised stem and the causative to infix the applicative as Hyman and Katamba postulate.

   Hyman's analysis also crucially relies on the assumption that the vocalic segment /-í-/ still exists in Bemba even though it never surfaces. Note that this /-í-/ cannot be construed as the /-i-/ resulting from the merger in (2) as the present day Bemba /-i-/ does not cause spirantisations as the applicative suffix -*il*- illustrates.

   A final problem for Hyman and Katamba's analysis is the data of the causativised reversives given in (11). As long as this analysis assumes that the causative originates in a position adjacent to the stem and as such triggers spirantisation of the stem final consonant, followed by infixing of additional suffixes, then the incorrect causativised forms in (14), which contain two instances of spirantisations, are predicted. Languages like Runyankore and Kirundi do not fit into the analysis

at all. In addition, the spirantisations triggered by the long suffix -*ish*- in (6c–d) are not accounted for. Consider the examples in (14) taken from (8a, b) where Hyman and Katamba would predict the incorrect forms.

(14)		stem		reversive	caus/rev	
	a.	sel-a	*move*	sel-uk-a	sel-ush-a	*sesh-ush-a
	b.	pet-a	*fold*	pet-uluk-a	pet-ulush-a	*pesh-ushush-a

An analysis that integrates and gives a uniform account of all the phenomena related to the CM process, as well as moves towards a charaterisation of other Bantu languages, is certainly preferable. It will be my aim, following Government Phonology (GP) assumptions to provide such an account.

5.   GP and Morphology

5.1   Morphological versus phonological domains

According to the description of GP given in 2.3, phonology is seen as a function that is applied to an input string for the purpose of parsing and to act as a lexical addressing system. Viewing phonology as a function implies that there is only one phonological level and as such there cannot be cyclic applications of phonology. Morphological structure is regarded as consisting of units relevant to phonology in its function as an addressing device. Therefore the interaction of phonology with morphology is restricted to the ability of phonology to access the internal domains of morphology. In GP this is subsumed under either of the two types of morphology (Kaye 1995):

(15)   (i)   Analytic morphology:
   -φ (concat (φ (A), B)) e.g. English past tense suffix as in *peeped*
   -φ (concat (φ (A), φ (B))) e.g. English compounds as in *blackboard*
   (ii)   Non-analytic morphology:
   -φ (concat (A, B)) e.g. English negative prefix *in*- as in *irrational*

In analytic morphology, morphology is either partially or fully visible to phonology. Using φ as the phonological function the derivation of the past tense form of English *peep* proceeds as follows: apply phonology to the verb, then affix the past tense suffix -*ed* and apply phonology to the resulting form. Compounds such as *blackboard* provide a case where morphology is fully visible to phonology and each string in the morphology corresponds to a phonological domain, where a phonological domain is understood as a string to which phonology applies. In non-analytic morphology on the other hand, phonology is blind to morphology, showing no recognition of morphological complexity but treating the concatenated

form as one phonological domain. Words that are derived from this type of morphology are indistinguishable from lexical words.

With this in mind I will claim that in Bemba, the long causative suffix that only attaches to transitive stems constitutes analytic morphology where the stem forms a phonological domain to which suffixes attach and then phonology applies to the resulting string (16a). The short causative on the other hand, that triggers mutation of the stem final consonant shall be treated as constituting non-analytic morphology which implies one phonological domain between the stem and its suffixes (16b). The square brackets in (16) indicate phonological domains.

(16)   stem+caus   stem+appl+caus
        a.   long causative: [[lemb] esh-]   [[lemb] esh-esh-]   *write*
        b.   short causative: [lish-]   [lish-ish-]   *cry*

This distinction stems from the fact that all morphological and phonological domains in Bemba must end in a consonant. In the unmarked case I assume that the stem forms an independent phonological domain, which once created, is retained throughout a derivation. This implies that suffixation with the long causative that has a -VC- shape, does not result in a violation of the requirement for a final consonant and therefore allows the stem to retain its integrity. The short causative, which marks all causative forms by spirantisation of the stem final consonant is represented in the same domain as the stem, from which position a consonant final domain is retained. Note that in this instance, the stem having not retained its integrity at the start of the derivation cannot do so in later derivations and thus remains accessible in morphologically complex stems.

## 5.2 Consonant Mutations — a GP Account

To motivate my preferred analysis I present two possible approaches within GP. First I reject the idea that the short causative is the /-í-/ from Proto Bantu, as this vowel is no longer available in the language. However, following the palatalisation effects of the causative on nasals; /$n, m \rightarrow ny, my$/ respectively, I will indeed agree that the short causative consists an /-i-/ but rather pursue the idea that it can only be the /-i-/ that is presently available in the vowel system of the language. An initial problem with this is the representation of the short causative. If it is regularly represented in a skeletal position dominated by a nucleus then we have to assume that its effects are not triggered from this position since other *i*-initial suffixes do not trigger CM. The assumption is then that it delinks from its skeletal position as (17) shows and attaches to the preceding onset that it licenses, thereby resulting in mutation of the segment dominated by the onset. Furthermore it will be necessary to say that this /-i-/ in N_1 has a relation with the following nucleus N_2, that charges N_2 with the mutating effect so that the double and multiple mutation effects are

accounted for. Formally this can be represented by the notion of h(ead)-licensing in GP.[5] Following h-licensing N_1 h-licenses the nucleus in N_2 causing it to spirantise the onset to its left by spreading an (I) element. This accounts for why the reversive suffix -*uk*- that lacks an (I) element to act as host of the h-licensing process, blocks CM. The -*a*- of the reciprocal suffix -*an*- would have to be treated as empty following its distribution in word final position. (Square brackets in the phonological structure mark phonological domains. Only relevant domains are illustrated).

(17) (6a) lil-il-a → lish-ish-a *cry*
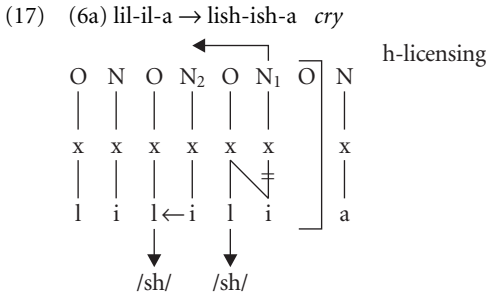
Extending this analysis to the long causative is problematic and the only possible solution is to assume that the -i- in the long causative -*ish*- spreads into the preceding onset causing it to mutate, which considerably weakens the argument.

Another possibility is to view the short causative as a floating segment that has no representation in constituent structure. This would account for why it forms a joint domain with the stem. Mutations in morphologically complex stems would be explained by (I) spreading through the whole domain, as in (18).

(18) short causative as floating -*i*-
(10a) pet-uluk-il-an-a → pet-ulush-ish-any-a *fold*
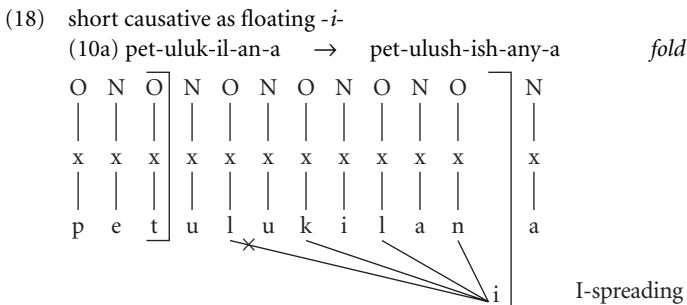
Since the floating suffix is not part of constituent structure, the reversive -*u*- should not block its spread through the domain. In addition, there is no obvious way of connecting the mutations caused by the floating -*i*- to those of the long causative. This brings me to my preferred analysis.

I retain the idea that the short causative is represented by a floating -*i*- which attaches to the onset to its left in the domain in which it appears. The floating causative suffix in (19a) spreads its (I) element into the onset it attaches to,

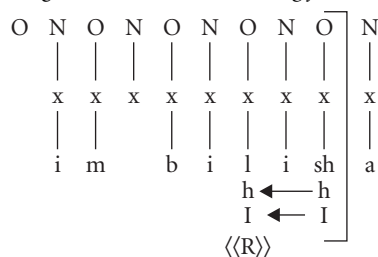disturbing the interpretability of the phonological expression so that (R) gets supressed and (h) spreads rightwards from the stem final consonant /t/, producing mutation of /l/. Multiple mutation is attained by (I) spreading further to the following onset where (ʔ) and (R) get supressed yielding /sh/. This characterisation of CM is easily extendable to the long causative as the phonological expression of /sh/ in Bemba, given in (3) above, contains an (I) and (h) element which as illustrated in (19b), spread leftwards through the vowel to the preceding consonant. I therefore claim that the process involves a form of consonant harmony where mutated consonants trigger mutation in consonants that occur in their domain.[6]

(19) a. short suffix: pit-il-a *pass for* → pish-ish-a

$$
\begin{array}{cccccc}
\text{O} & \text{N}_1 & \text{O} & \text{N} & \text{O} & \text{N} \\
| & | & | & | & | & | \\
\text{x} & \text{x} & \text{x} & \text{x} & \text{x} & \text{x} \\
| & | & | & | & \diagdown & | \\
\text{p} & \text{i} & \text{t} & \text{i} & \text{l} \quad \text{i} & \text{a} \\
& & \text{h} & \longrightarrow & \text{h} & \\
& & \text{I} & \longleftarrow & \text{I} & \\
& & \langle\langle ʔ \rangle\rangle & & \langle\langle \text{R} \rangle\rangle & \\
& & \langle\langle \text{R} \rangle\rangle & & &
\end{array}
$$
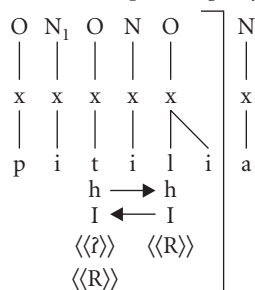
b. long suffix: imb-il-a   *sing for* → imb-ish-a

$$
\begin{array}{cccccccccc}
\text{O} & \text{N} & \text{O} & \text{N} & \text{O} & \text{N} & \text{O} & \text{N} & \text{O} & \text{N} \\
| & | & | & | & | & | & | & | & | & | \\
\text{x} & \text{x} & & \text{x} & \text{x} & \text{x} & \text{x} & \text{x} & \text{x} & \text{x} \\
| & | & & | & | & | & | & | & | & | \\
\text{i} & \text{m} & & \text{b} & \text{i} & \text{l} & \text{i} & \text{sh} & \text{a} \\
& & & & & \text{h} & \longleftarrow & \text{h} & & \\
& & & & & \text{I} & \longleftarrow & \text{I} & & \\
& & & & & & \langle\langle \text{R} \rangle\rangle & & &
\end{array}
$$

Having two causatives in morphologically complex stems by cyclic application (Hyman 1995) or reduplication (Katamba 1999) is a misrepresentation of the facts as there is only one causative in the resulting string. The fact that the harmony that takes place, for a fraction of the segments involved, patterns with the causative by producing a sibilant consonant is quite another matter. The consonant harmony process described here can be treated as parallel to a process in Kinyarwanda (Kimenyi 1980) where the fricatives /s, z/ are palatalised before syllables containing palatal fricative consonants.

The vowels in the path of the consonant harmony process can either be transparent or opaque to the process; {i, e, a} are transparent, whilst {o, u} are not. This distribution can be explained by the fact that {i & e} both already containing an (I) element remain unaffected by (I) as representations with identical elements are

barred in GP. /a/ which is the harmonising vowel in height harmony is itself not subject to height harmony, hence it is not surprising that (I) spread leaves it unaffected. {o & u} on the other hand can be harmonised (*shok-uluk-a* → *shok-olok-a* 'turn back'), hence (I) cannot spread through them and leave them unaffected, and so it is blocked.

6.   Conclusion

I have accounted for the CM's in Bemba as the spread of the (I) and (h) elements and shown that there are at least two processes involved; a floating causative suffix and a process of consonant harmony. On a par with Kirundi and Runyankore the floating causative suffix in Bemba triggers spirantisation or palatalisation of the consonant that precedes it but in addition, as in Kinyarwanda, there is a consonant harmony process that mutates segments preceding either the voiceless fricative /sh/ or other mutated segments, in specified domains, by the spread of (h). The mutation process is blocked by (U) and does not affect more than the stem final consonant; stem initial and internal consonants remain intact. Although I have hinted at the possiblity of Licensing Inheritance as the motivation for the resistance of initial and internal positions to Consonant Mutation, it still raises the question of the limit on the possible modification or corruption of the phonological representation of the base before the word becomes unrecognizable; how far can we go? I will have to settle with regarding this as a language dependent factor and assume that for Bemba we can only go as far as the stem final consonant.

Notes

1. The set of elements (ʔ I U h L R) are used here to derive the consonantal sounds of Bemba. Up to ten elements (A I U R H L N h v ʔ) can be utilised for this purpose depending on the version of GP being used. The characteristics attributed to the elements in consonants are; U-labiality, ʔ-stop or edge, h-noise or aperiodic energy on release, R-coronality, v-velarity (Harris 1994, 1995 uses @ as the resonance element for velars), L-slack vocal chords, voicing (here L is coupled with nasality so that an underlined L represents nasality and voicing whilst a non-underlined L represents only voicing), I-palatality, A-present in uvulars and pharyngeals and H-stiff vocal chords, aspiration, voicelessness. I use the lack of a place element to represent velarity but cf. Kula (to appear) for a slightly modified version of this.

2. For a discussion of the general notion of Licensing Constraints cf. Charette and Göksel (1998). Underlined elements represent the head of the phonological expression and identifies the most salient element in the expression.

3. I use verb object agreement and passivisation as the test for transitivity (Bresnan and Mchombo 1987).

4. There is a slight complication here with the transitive reversive as suffixation involves deletion of the final /l/ of the suffix resulting in gliding of the preceding vowel before the long causative is added. For the purpose of the present discussion it is clear that no spirantisation is triggered in the stem.

5. H(ead)-licensing was initially used in GP (Kaye 1982) to account for ATR harmony effects: ATR vowels are represented by headed PE's whilst their non-ATR counterparts by unheaded PE's. The shift of non-ATR vowels to ATR in suffixation processes that involve an ATR vowel containing suffix, is accounted for by h-licensing. Namely that the previously unheaded segments become headed and hence ATR.

6. The lack of CM in initial positons and in word internal positions in longer stems, can be accounted for by Licensing Inheritance (cf. Harris 1994, 1997). Since onsets get their licensing power from following nuclei that license them, which in turn get their licensing potential from the head of the domain (N_1 in 19a), the licensing power of onsets diminishes rightwards. This makes the initial position in Bemba the strongest, explaining its resistance to CM. The angled brackets on elements in (19) represent supression of particular elements when they come into contact with other elements following the co-occurrence restrictions in Bemba. For detailed discussion cf. Harris (1997).

References

Benua, L. (1997) *Transderivational Identity: Phonological relations between words.* Doctoral dissertation, University of Massachusetts, Amherst.

Bresnan, J. and S. A. Mchombo (1987) 'Topic, pronoun, and agreement in Chichewa'. In *Language* 63, 741–782.

Charette, M. and A. Göksel (1998) 'Licensing constraints and vowel harmony in Turkic languages'. In C. Eugenuisz, ed., *Structure and interpretation. Studies in phonology.* Wydawnictwo Folium, Lublin, 65–88.

Harris, J. (1990) 'Segmental complexity and phonological government'. In *Phonology* 7, 255–300.

Harris, J. (1994) *English Sound Structure.* Blackwell, Oxford.

Harris, J. (1997) 'Licensing Inheritance: an integrated theory of neutralisation. In *Phonology* 14, 315–370.

Hyman, L. (1995) 'Cyclic phonology and morphology in Bemba'. In J. Cole and C. Kisseberth, eds., *Perspectives in Phonology.* CSLI Publications Stanford, California, 81–112.

Inkelas, S. (1993) 'Deriving Cyclicity'. In E. M. Kaisse and S. Hargus, eds., *Phonetics and Phonology* 4: *Studies in Lexical Phonology.* Academic Press, New York, 75–110.

Katamba, F. (1999) 'Spirantisation and correspondence in Luganda'. Paper presented at the Colloquium for African Languages and Linguistics 1999, Leiden.

Kaye, J. (1982) 'Harmony processes in Vata'. In H. van der Hulst and N. Smith, eds., *The structure of phonological representations,* vol. 2. Foris Publications, Dordrecht, 385–452.

Kaye, J. (1995) 'Derivations and Interfaces'. In F. Katamba, and J. Durand, eds., *Frontiers of Phonology.* Longmans, London, 289–332.

Kaye, J., Lowenstamm, J. and J-R. Vergnaud (1985) 'The internal structure of phonological elements: a theory of charm and government'. *Phonology Yearbook* 2, 305–328.

Kaye, J., Lowenstamm, J. and J-R. Vergnaud (1990) 'Constituent structure and government in phonology'. In *Phonology* 7, 193–231.

Kimenyi, A. (1980) *A relational grammar of Kinyarwanda.* University of California Press, California.

Kiparsky, P. (1982) *Explanation in phonology.* Foris Publications, Dordrecht.

Kula, N.C. (to appear) 'Spirantization in morphologically triggered phonology'. In *Proceedings of ConSOLE VIII.*

Kula, N.C. and L. Marten (1998) 'Aspects of Nasality in Bemba'. *SOAS Working Papers in Linguistics and Phonetics* 8, 191–208.

Meeussen, A.E. (1959) *Essai de Grammaire Rundi.* Musée Royal de l'Afrique Centrale, Tervuren.

Meeussen, A.E. (1967) 'Bantu grammatical reconstructions'. *Africana Linguistica* 3, 81–121.

Meinhof, C. (1932) *Introduction to the phonology of Bantu languages.* Reimer, Vohsen, Berlin.

Mohanan, K.P. (1986) *The theory of Lexical Phonology.* R. Reidel Publishing, Dordrecht.

Morris, H.F. and B.E.R. Kirwan (1957) *A Runyankore Grammar.* Eagle Press, East African Literature Bureau, Kampala.

Sambeek, J. van (1972) *A Bemba Grammar.* Longmans, Green and Co., London.

Schadeberg, T. (1995) 'Spirantization and the 7-to-5 vowel merger in Bantu'. *Belgian Journal of Linguistics* 9, 73–84.

The White Fathers (1954) *Bemba – English Dictionary.* Northern Rhodesia & Nyasaland Joint Publications Bureau, Chilubula.