VOWEL HARMONY, SYLLABLE STRUCTURE, AND THE CAUSATIVE EXTENSION IN LOBALA
A GOVERNMENT PHONOLOGY ACCOUNT

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This article makes use of the theoretical framework of government phonology and applies it to Lobala, an undescribed Bantu language of Zaïre. After first presenting the framework, the article shows that, what looks like an ATR harmony process, is in fact a process of reduction taking place under the constraint of government. The article goes on to offer an account of the phonological changes triggered by the causative verbal extension. Finally, the article posits that the licensing domain be defined in terms of A^+ in order to account for segments that are, in traditional terms, opaque to harmony.

L'auteur se sert du modèle de phonologie dit *government phonology* qu'il applique au lobala, langue bantoue, non-étudiée, du Zaïre. Après avoir présenté le modèle en question, il montre que, ce qui paraît être un cas d'harmonie vocalique résultant de *A.T.R*,. correspond plutôt à un processus de réduction contraint par le segment régisseur. Cet article explique aussi, dans le cadre du modèle à l'étude, les changements phonologiques produits par l'extension verbale du causatif. Finalement, l'article propose la délimitation du domaine d'autorisation par l'élément A^+ afin de mieux expliquer les segments qui, selon les termes traditionnels, sont opaques à l'harmonie.

0. INTRODUCTION

This article[1] gives an account of what appears to be vowel harmony in Lobala[2] and in particular relates this to the consequently unexpected changes in the aspectual suffixes to the verb stem in the causative form of the verb.

It begins in §1 by outlining the theoretical framework of government phonology. In §2, after a brief introduction of the data, it discusses the harmony process in Lobala first from an SPE approach (*The Sound Pattern of English*, henceforth SPE, Chomsky and Halle 1968). Then, within a government phonology framework, it demonstrates that harmony is not so much a spreading process as a process of REDUCTION taking place under the constraint of government. In §3, this analysis is taken further in order to account for other data, specifically data in which the causative verbal extension is found. Finally, in §4, the article refers to the aspectual suffixes of the causative verb and seeks to account for segments that are apparently opaque to the harmony process.

1. GOVERNMENT PHONOLOGY

1.1 INTERNAL STRUCTURE OF PHONOLOGICAL ELEMENTS

This article follows the lines of government phonology such as put forward by Kaye, Lowenstamm, and Vergnaud (1985 and 1990) (henceforth KLV), in particular taking the ultimate phonological primitive to be the 'element' rather than the 'feature'

[1]This article was originally presented as an M.A. thesis at the School of Oriental and African Studies, University of London.

It has been my privilege to live in the Lobala speaking village of Imese since 1987. I gratefully acknowledge the help of my friends Mr. Enyanga Bavon, Mr. Botɔkɔ Mokpengbe and Mr. Makenza Nzobali who have shared with me not just their language but much else besides. I would like to thank Dr. Monik Charette both for her infectious enthusiasm for phonology and for her kindly taking time to direct some of my wandering thoughts towards a theoretical framework that does more than simply describe. I also thank Professor Jonathan Kaye for stimulating the mind in new and exciting directions. All inaccuracies, inelegancies, and illogicalities etc. are entirely my own.

[2]Guthrie (1971:39) classifies Lobala as C.16. Bastin (1978:140) retains the C.16 listing but also lists Lobala as C.31j. By doing so, she places Lobala in the Bangi-Ntomba group with the languages that are geographically closest to it. Guthrie's comments on C.16 Lobala undoubtedly apply to Bastin's C.31j Lobala. There is no evidence for there being two languages in Northern Zaïre both called Lobala, see Morgan and Fultz (1985). The language is spoken in Zaïre by around 50,000 people who live in the forest and swamplands on the eastern bank of the Ubangi River in the Kungu and Bomongo Zones of the Equateur Region. No previous study has been made of the phonology of the Lobala language.

of other phonological approaches. That is to say, rather as salt is broken down into sodium and chlorine, so segments can be broken down into their component elements. As in chemistry, so in phonology some elements attract each other, others repel each other. Within government phonology, this propensity to form relationships (to attract or to repel) is articulated in what is known as CHARM THEORY (KLV 1985). Elements are said to be charmed, either positively ($^+$) or negatively ($^-$) or else they may be charmless ($^\circ$), sometimes referred to as being neutrally charmed. Onset positions of the syllable are typically filled with a negatively charmed segment, the nuclear positions typically with a positively charmed segment. As far as vowels are concerned the relevant elements are in (1).

(1)
I°	(palatality)
U°	(labiality)
A^+	(openness)
$ɪ^+$	(Advanced Tongue Root (ATR))
N^+	(Nasality)
v°	(the cold or empty vowel)

Each of these elements is said to be individually pronounceable unlike abstract features. Each element can also be expressed as a fully specified feature matrix, consisting of a number of UNMARKED properties and one MARKED or SALIENT property. (The exception to this is the COLD VOWEL which has no marked property.) For example, the feature matrices for A^+ and I° are given in (2) where the salient property is marked with an asterisk.

(2)

$$A = \begin{bmatrix} -\text{ROUND} \\ +\text{BACK} \\ -\text{HIGH}^* \\ -\text{ATR} \\ +\text{LOW} \end{bmatrix} \qquad I = \begin{bmatrix} -\text{ROUND} \\ -\text{BACK}^* \\ +\text{HIGH} \\ -\text{ATR} \\ -\text{LOW} \end{bmatrix}$$

These elements may fuse or combine with one another but under strict constraints, chief amongst which are that (1) positively charmed elements may not directly combine with each other, and (2) that elements always combine under an OPERATOR-HEAD relationship. This means that a compound segment will have all the properties of its head except for the one salient property of the operator. By convention, the head is represented on the right and the operator on the left. The combination of two or more elements is consequently an asymmetric operation. $I^\circ.A^+$ is not the same as $A^+.I^\circ$.

$I^\circ.A^+$ is primarily A^+ with 'non-backness' added, phonetically realized as [æ];[3]

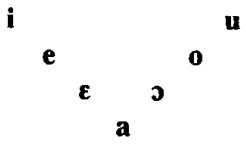
$A^+.I^\circ$ is primarily I° with 'non-highness' added, phonetically realized as [ɛ].

The charm value of the whole segment is normally assigned by the head and not the operator with the important exception that both $ɪ^+$ and N^+ have the distinctive property of always transmitting their positive charm.

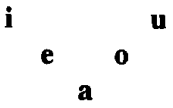
$ɪ^+$ cannot combine directly with another positively charmed element. However, since [ɛ] is neutrally charmed (assuming the same charm value as its head I°) $ɪ^+$ will be able to combine with this neutrally charmed compound: $ɪ^+.(A^+.I^\circ)$ which is represented phonetically as [e].

Lobala like many other languages of the area including the 'classical' form of Lingala can be said to have a seven vowel system shown in (3).

[3]Generally, I have used standard IPA symbols when referring to language data. However, it should be noted that I have used [j] to refer to a voiced palatal plosive and [c] as its voiceless counterpart.

(3)


It is worth noting that modern Lingala, as spoken in Kinshasa, has been reduced and, by implication, simplified to the five vowel system shown in (4), perhaps under the influence of languages such as Kikongo.

(4)


An elemental representation of the seven vowels is shown in (5); the head of the compound segment is underlined.

(5)

	ɪ$^+$	ɪ$^+$				ɪ$^+$	ɪ$^+$
BACK/ROUND	I°	I°	I°	v°	U°	U°	U°
HIGH	v°	A$^+$	A+	A$^+$	A+	A+	v°
	x	x	x	x	x	x	x
	[i]	[e]	[ɛ]	[a]	[ɔ]	[o]	[u]

Three things are worth noting about this representation. Firstly, the cold vowel never occurs as head in Lobala. Secondly, BACK and ROUND are represented on the same tier. This possibility is subject to parametric variation. In languages such as French and Turkish, I° and U° can combine to create [y] but this is not the case in Lobala. This fact may help us to understand the behaviour of I° in certain environments where I° is blocked from spreading to where U° is already in position.

Thirdly and most importantly (5) also reveals that all but [ɛ] and [ɔ] are positively charmed. As KLV (1985) point out, positive charm in intuitive terms may be related to 'voweliness', and 'voweliness' in turn is related to 'the resonating cavity'—the oral cavity in the case of A$^+$ and the pharyngeal cavity in the case of ɪ$^+$. This in turn points us towards an account of why [ɛ] and [ɔ] (but not [a]) are the 'marked vowels' in a seven vowel system. The positively charmed segments 'more naturally' fit into nuclear positions of the syllable. One can predict that something is likely to give, some phonological process is likely to happen, when a charmless segment occurs in such a position.

Consonantal segments are not the major focus of this article but at some points five other elements are referred to, for which Harris (1990b:264) distinguishes the salient properties in (6).

(6)
R°	(coronality)
?°	(occlusion)
h°	(noise)
H$^-$	(stiff vocal chords)
L$^-$	(slack vocal chords)

1.2 SYLLABLE STRUCTURE

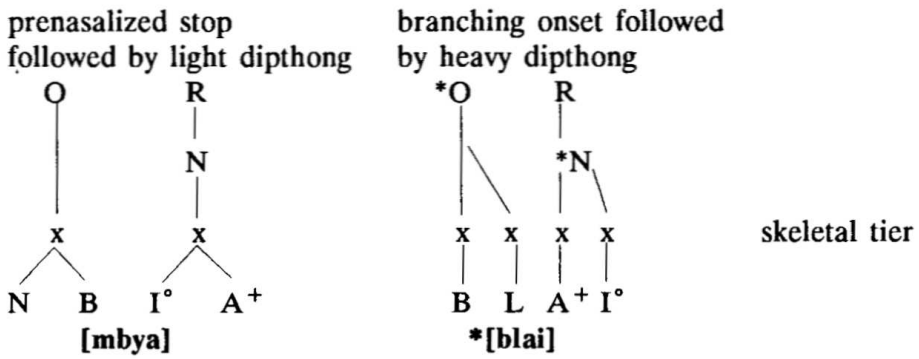
Government phonology goes beyond the internal representation of segments. It also provides a theory of syllable structure in which the syllabic constituents are limited to ONSET, RHYME, and NUCLEUS. An onset necessarily brings with it its head, a nucleus attached to a timing slot or skeletal point (see §1.3). A nucleus brings with it an onset (its complement) but not necessarily a skeletal point attached to that onset. The rhyme

may branch but only if the nucleus does not branch. These constituents branch on a binary basis only. The possibility of their branching at all is subject to parametric variation. In Lobala and related languages the general claim is that no constituent may branch. Syllable structure is illustrated in (7).

1.3 THE SKELETAL OR TIMING TIER

This article also assumes the existence of the skeletal tier in the representation of the phonology. This is well argued for by Kaye and Lowenstamm (1984), Kaye (1989) and Goldsmith (1990) who were following in the steps of Clements and Keyser (1983) who, in their turn, were building on the work in nonconcatenative morphology of McCarthy (1981). The significance of the skeletal tier is that it allows segmental constituents to no longer be represented as directly attached to syllabic constituents. It is rather the skeletal tier that holds everything together. Moreover, if a segment is not attached to a skeletal point it will have no (phonetic) realization. The skeletal tier also allows the representation of the distinction between a light and heavy dipthong. The light dipthong, two segments attached to one (nuclear) skeletal point is found in Lobala. The heavy dipthong, a branching nucleus, is not found. Similarly, a prenasalized stop in which two segments are said to be attached to one (non-nuclear) point, is found but a branching onset is never found. This is exemplified in (7) where an asterisk indicates a form that does not occur in the language.

(7)

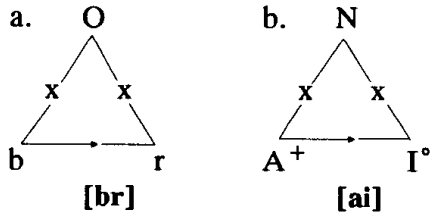


It is also possible to represent long vowels by a branching nucleus. Long vowels do occur in Lobala; however, there is good evidence to regard them as nuclear sequences rather than long vowels. (See, for instance, data given in (48)). It will not be discussed further in this article.

1.4 GOVERNMENT RELATIONS AND LICENSING

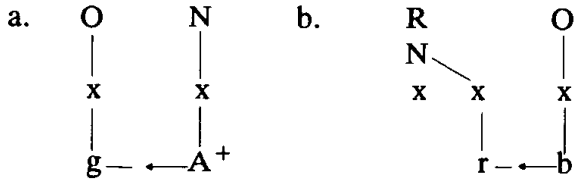
Government phonology claims that phonological processes are manifestations of governing relations that positions contract with one another. Parallel to developments in syntax, the argument is that, within a domain, every position has to be licensed apart from the head of that domain. Government is contracted by the head with its complement and is defined in terms of LOCALITY and DIRECTION. For instance, at the INTRA-CONSTITUENT LEVEL (i.e., within a given nucleus or onset) government is strictly local. That is to say, the head must be adjacent to the complement. Secondly, the direction of government at this level will always be from left to right. In (8a), the head (governor) is **[b]** and the complement (governee) is **[r]**. In the heavy dipthong shown in (8b), the governor is A^+ and the governee is I°.

(8)



At the inter-constituent level, government is again strictly local but from right to left. It is illustrated in (9).

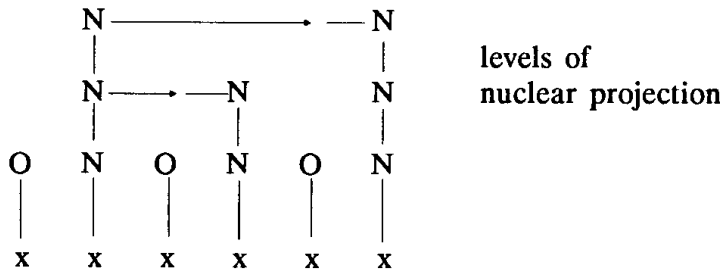
(9)



In (9a), a non-nuclear head (i.e., onset) is licensed by the nucleus governing it. In (9b), the non-nuclear head licenses a non-nuclear complement, in this case a rhymal complement.

Nuclei themselves are not strictly adjacent to one another. They are said to be licensed at the LEVEL OF NUCLEAR PROJECTION where they now become visible to one another. Directionality of government at this level is parametrically determined. In Lobala it is clearly set at head first; that is to say, directionality is from left to right. The head nucleus, (functioning as head of its domain) is then said to govern all other nuclear positions to the right within the domain. This is exemplified in (10).

(10)



In (10), the head nucleus is now represented as being adjacent to the other nuclear positions in its domain. Government phonology claims that phonological processes such as vowel harmony and stress assignment are among the manifestations of governing relations applying at the level of nuclear projection.

A government phonology framework aims not merely to describe a phonological process but to provide a principled account of a process. Processes are not arbitrary language specific happenings. They will either be processes of DECOMPOSITION, a segment losing an element for a reason, or COMPOSITION, a segment gaining an element for a reason. Government phonology seeks to provide the reason for the process. Before examining how the theory can apply to processes in Lobala, the basic data is presented together with a preliminary discussion of them within an SPE framework.

2. THE PHENOMENON OF VOWEL HARMONY

2.1 AN SPE ACCOUNT

The typical verb word in Lobala has, as its base component, a verb ROOT or radical that in traditional terms is referred to as being of a CVC form. The variations of this form need not concern us here. This root is optionally suffixed with verbal EXTENSIONS, such as causative, stative, applicative, etc., to create the verb STEM. This stem is, in turn, prefixed by a subject marker and suffixed by a final vowel. Tense reference is not in focus in this article. (11) summarizes the form of the verb word at least as we will be meeting with it here.

(11)

subject	- {	stem	} -	final
marker		{root-(extensions)}		vowel

Directional VOWEL HARMONY can be said to be triggered by the vowel of the verb root. Vowels in the pronominal prefix (or subject marker) have no influence on the rest of the word. Everything that occurs to the left of the root is regarded as being in a separate DOMAIN. (12) presents the basic (imperative) forms of a number of verbs that illustrate the form of the phonological process in question. In the imperative form, the subject marker is absent and in these examples the stem consists of the root only. The final vowel is referred to in the next paragraph.

(12)

bín-a	'dance'
tén-a	'cut in two'
wànd-a	'hit'
bómb-a	'hide'
túb-a	'sing'
bɛ̀l-ɛ	'circumcize'
ɲɔ̀l-ɔ	'enter'

Let us assume, along with most bantuists, that the final vowel is morphologically determined. That is to say, it is not the manifestation of an empty position which has picked up an ambient or archetypical **-a**. (We will see in §2.3 what the manifestation of such an empty position is.) Rather, this so-called 'final vowel' is mapped from the lexicon as **-a** to mark the indicative or neutral aspectual reference. Imperfective and perfective are alternative aspectual markings. Aspectual marking is an obligatory component of the verb word. What is clear from (12) is that when the root vowel is [ɛ] or [ɔ], the final vowel, which in this case must have the underlying form [**-a**], appears to harmonize with the root vowel.

In an SPE system, assuming that [ɛ] and [ɔ] both have the feature [–ATR], one could say something on the lines of where the root vowel is [–ATR] the following vowel will have ALPHA FEATURES where 'alpha' is the feature matrix of the root vowel. This might be expressed as in (13).

(13)

$$\begin{Bmatrix} V \\ \{+\ low\} \end{Bmatrix} \rightarrow \{\alpha\ features\} \,/\, \begin{Bmatrix} -ATR \\ \{\alpha\ features\} \end{Bmatrix}\ C \text{ ——}$$

There are several reasons why this analysis is not satisfactory. Firstly, there is more data which show that it does not capture the entirety of the process. Consider (14) where the extension suffix **-el-** 'APPLICATIVE' is added.

(14)

bín-el-a	'dance for someone'
tén-el-a	'cut in two for someone'
wànd-el-a	'hit for someone'
bómb-el-a	'hide for someone'
túb-el-a	'sing for someone'
bɛ̀l-ɛl-ɛ	'circumcize for someone'
ɲɔ̀l-ɛl-ɛ	'enter for someone'

The last example in (14) reveals that it is not accurate to suggest that the following vowel harmonizes all its features to the root vowel. When the vowel is other than [**a**], such as is found in the applicative **-el-**, the feature associated with the vowel, [–back] in this case, will remain and there will be harmony, apparently along [–ATR] lines. It is only in the case of the final vowel [**a**] that complete harmonizing takes place. So we will have to come up with probably three, ordered rules, the first of which shown as (15) would suggest that [–ATR] harmony of some sort is taking place. Indeed, we would

be suggesting that the [+ATR] form of the extension **-el-** loses its 'ATR-ness' and becomes **-ɛl-**.

(15) $\{+\text{ATR}\} \rightarrow \{-\text{ATR}\} \; / \; \{-\text{ATR}\}\ \text{C} \_\_$

In fairness, it should be mentioned that linguists such as Katamba (1984) suggested that verbal extension suffixes are not marked for 'tenseness' (i.e., have no ATR value) rather on the lines of their not being marked for tone at the lexical level. This approach is, however, not compatible with the government phonology approach taken here, but more pertinently, it appears to run aground when faced with such data as **wànd-el-a** in (14). If the **-el-** is unmarked for ATR, where does the ATR come from in the form of the applicative in **wànd-el-a**? The root vowel **a** is also a non-ATR vowel. It is data such as the above that demonstrate that the underlying form of the applicative must be **-el-** and cannot be **-ɛl-**. (Some, such as Mtenje (1985), get round this by claiming that [a] is in fact [+tense] but this seems to be a denial of reality at least as far as the Lobala data are concerned.)

Furthermore, from the government phonology theoretical viewpoint one has to say that (15) is a most unhappy description of vowel harmony. How is it that the absence of something (in this case ATR) causes something else to harmonize with it? That which is not present, cannot spread. This reflects KLV's notion of PRIVATIVENESS. They state (1990:194) that "phonological oppositions that are privative at the level of lexical representation remain privative at all level". So one might have reasonably expected that [+ATR] would spread but never [–ATR]. In short, (15) will not only lead into deeper and deeper water, it posits arbitrary processes lacking motivation. (15) is observationally accurate but explanatorily void.

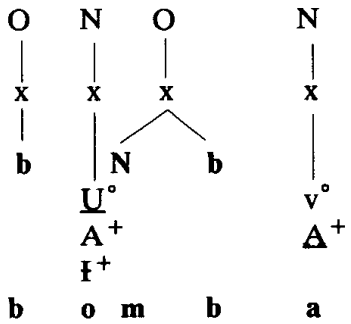
We must also consider the fact that ATR harmony is a very rare phenomenon in Bantu languages. Mous (1986) describes the occurrence of ATR harmony in a Cameroonian language, Tunen (A 44 in Guthrie's classification), but apart from that, it does not appear that this predominantly West African phenomenon occurs widely in Bantu languages. A further argument that we are not concerned here with ATR harmony comes from the fact that Lobala does not have a full set of ATR vowels, typical of the languages of West Africa that do display ATR harmony processes. The [–ATR] forms of **i** and **u** do not occur in Lobala, nor is there an ATR counterpart of **a**.

A final argument against ATR harmony is that in modern Lingala it is, what in an ATR system would be the unmarked [–ATR] forms that have been dropped from the language (see (4)). This means that rather than the classical form **mɔ́nɔ** 'see' it is the simplified form **móna** 'see' which is found in modern Lingala. It is, however, the marked and not the unmarked forms in the language that are likely to disappear. This does not mean to say that we can leave ATR out of the picture altogether, but we can reach the significant conclusion that we are not dealing with the spreading of [+/– ATR]. Indeed, we are not dealing with an ATR harmony process at all.

2.2 A GOVERNMENT PHONOLOGY ACCOUNT OF VOWEL HARMONY

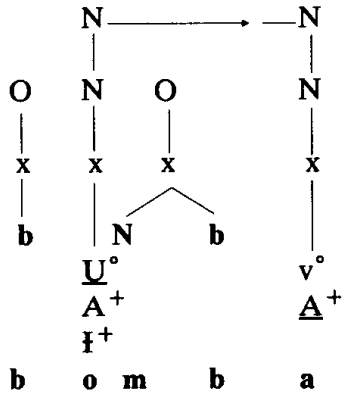
Let us now return to our original, simple data and this time try to account for it with an autosegmental approach using a government phonology framework represented by one of the forms from (12).

(16) **bómb-a** 'hide'



We can predict that this is a stable configuration. The root vowel is complex and positively charmed and as such is an ideal governor. The governee is simplex (consisting of one element) and is positively charmed. (17) illustrates the government relation that is said to exist between the head (root vowel) and its complement (final vowel). It will be recalled that the direction of government at nuclear projection level is parametrically set at 'left to right' in Lobala.

(17)



nuclear projection

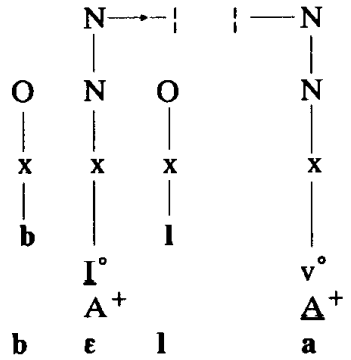
syllabic tier

skeletal tier

segmental tiers

Charette (1990:235) points out that it is in fact the "manifestation of the governing relation which a nuclear head contracts with its (nuclear) complements that is observed in processes such as vowel harmony." So let us now see what happens in an example where the 'harmony process' takes place.

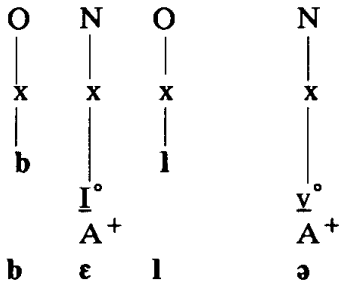
(18) **bɛ̀l-ɛ** 'circumcize'



We now have a configuration where a neutrally charmed segment is in the governing position. Neutral segments may indeed act as governors but under strict constraints, chief amongst which is that no neutrally charmed segment may govern a positively charmed segment. Thus charm theory predicts that it is precisely [ɛ] and [ɔ], the neutrally charmed segments, that are marked and therefore precipitate a phonological event.

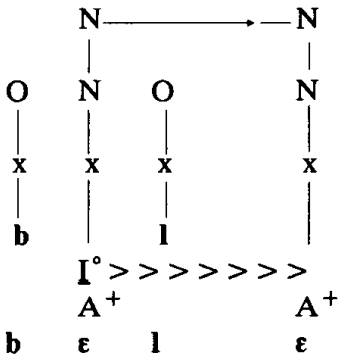
Consequently, something in (18) has to give. Let us assume, for the time being, that the positive charm is removed from the governed segment by reversing the head and operator position as shown in (19).

(19)



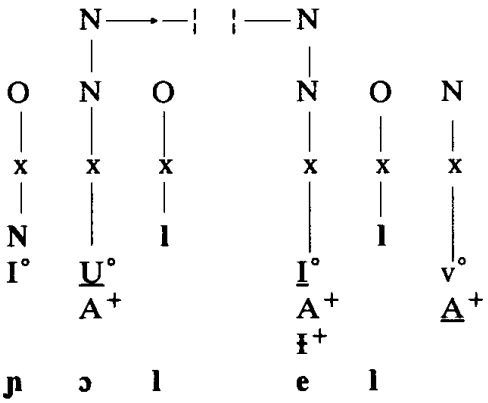
This results in a schwa. However, this is not a happy solution because the cold vowel is not tolerated as head in Lobala. In order to solve this problem, the neighbouring I° element from the adjacent nucleus spreads and becomes the neutrally charmed head of the segment. Government can then take place satisfactorily as shown in (20).

(20)



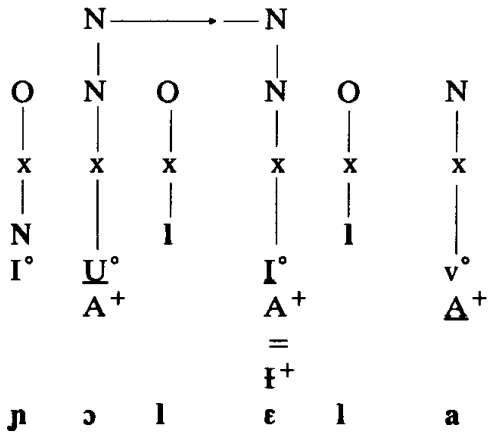
We should now review the process assumed in (19) in the light of what happens in the case of the applicative. Referring back to data in (14), consider the derivation in (21).

(21) **ɲɔ̀l-ɛl-ɛ** 'enter for someone'



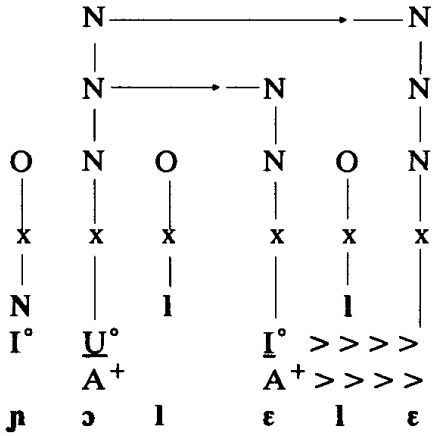
The head, the root vowel, seeks to govern its adjacent nuclear projection but cannot. The neutrally charmed [ɔ] cannot govern the positively charmed [e]. Just as in (18)–(20), this is the motivation for a phonological process. What happens now is that the ATR element becomes delinked. A process of DECOMPOSITION has taken place, shown in (22).

(22)



Having concluded that the process under discussion in (22) is one of decomposition, that is to say delinking the positively charmed element, we are in a position to tentatively revise our account of what happens next. Rather than claiming that the final vowel ($v^{\circ}.A^{+}$) reverses its operator-head relationship, as we earlier assumed, a complete delinking of the positively charmed A^{+} is proposed. Just as positively charmed $ɪ^{+}$ delinked when governed by the neutral [ɛ], so positively charmed A^{+} delinks in the same circumstances. This would then allow us to account for the data with one type rather than two types of process, motivated by the same circumstances. If A^{+} delinks, the result would be zero, that is to say, the cold vowel. It has already been stated that it is not acceptable in Lobala for the cold vowel to be the head of a segment. Consequently, what happens is that the adjacent nuclear segment spreads across in its entirety, as shown in (23). Further evidence for this particular process taking place, whereby an adjacent nuclear segment spreads to fill an empty nuclear position, will be provided below in §2.3 and a more developed account of the process will be proposed by way of a conclusion in §4.2.

(23)



Two general points can be extracted from the foregoing discussion. Firstly, we are here talking about positive charm being licensed by the head. This is the key issue. When the head is positively charmed, it licenses positive charm throughout its domain. That is to say, once positive charm is licensed, anything else can follow that is positively charmed. There is no constraint on the complexity of the governee apart from its charm. The word **bínela** is well-formed even though **e** is more complex than **i**. However when positive charm is not licensed by the governor, then the governee cannot be positively charmed.

Secondly, and following from this fact about licensing positive charm, a process of decomposition is required. This has been commented on by Harris (1990a) who outlines the possible effects at nuclear projection level. Amongst these he identifies REDUCTION HARMONY, by which he means an element becoming delinked in governed position when it is not licensed by the governing position or head. He gives examples from Pasiego

Spanish in which A^+ becomes delinked. He also gives examples from Chichewa (a Bantu language spoken in Malawi, classified by Guthrie as N.31b) shown in (24).

(24)

	CAUSATIVE	APPLICATIVE	
pìnd-a	**pìnd-its-a**	**pìnd-il-a**	'bend'
pùt-a	**pùt-its-a**	**pùt-il-a**	'provoke'
bál-a	**bál-its-a**	**bál-il-a**	'give birth'
lémb-a	**lémb-ets-a**	**lémb-el-a**	'write'
kònz-a	**kònz-ets-a**	**kònz-el-a**	'correct'

When the governing position licenses A^+ as operator, the extension forms **-ets-**, **-el-** are licensed. (They have A^+ as operator.) But when it is not licensed by the governor, that element must delink from the governed segment. This, then, is an alternative account of height harmony. It is mentioned in order to show that the processes involved are, arguably, remarkably similar to that proposed above.

2.3 THE EMPTY NUCLEUS IN LOBALA

This section seeks to justify the claim in (23) that A^+ delinked with further evidence from the language. It demonstrates what happens when a nucleus is underlyingly empty. Consider first the data in (25) where a stative verbal extension is suffixed to the root.

(25)

	STATIVE	
a.	**búl-uŋgan-a**	'be mixed up'
b.	**cíl-iŋgan-a**	'hurry'
c.	**zòl-oŋgan-a**	'be stirred'
d.	**wàl-aŋgan-a**	'fall from a height'
e.	**wɔ̀l-ɔŋgɔn-ɔ**	'be squashed'
f.	**cɛ́l-ɛɲjɛn-ɛ**	'crumble'

The final vowel is exactly as we would predict, but what of the first vowel of the stative extension? This vowel is consistently a copy of the root vowel. To claim that this is a harmony process would be to allow every vowel to spread where it wanted! This would be completely unacceptable. What is more likely is that this is a case of the genuine empty nucleus, of which the lexical representation would be along the lines of (26).

(26) 'stative [Root -v°ŋgan-]' where v° is the cold vowel

Further evidence for this comes from consonant final words loaned from European languages. Phonetically, words may not end in a consonant in Lobala. In the terms of government phonology, a domain final empty nucleus is not licensed. So we will want to know what vowel stands in at this point: an ambient A^+ or some other vowel. Consider the examples in (27).

(27)

a.	**búkù**	'book'
b.	**bɔ̀lɔ̀kɔ̀**	'block' 'prison'
c.	**bùlàɲjítì**	'blanket'
d.	**fàláŋgà**	'franc, money'
e.	**mèlèsí**	'merci, thanks'
f.	**tɔ̀lɔ́sì**	'torch'

The apparent irregularity of (27f) is accounted for by [i] compensating for the depalatalization of the sibilant. In (27e), an empty nucleus is inserted between **r** and **c**; in the other cases the empty nucleus is at the end of the word. It is the adjacent vowel

that spreads, in each instance, from the left into the empty nucleus position and not an ambient A^+.

There is, then, good evidence that suggests that when a nuclear point is empty, that is to say, it has no segmental content other than the cold vowel, the adjacent nuclear segment spreads in its entirety into the empty position.

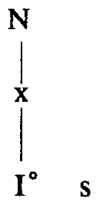
This is precisely what was happening in (20). A^+ delinked leaving an empty nucleus (the cold vowel), requiring the segment of the adjacent nucleus to spread across and 'fill the gap'.

3. THE CAUSATIVE EXTENSION

3.1 THE CAUSATIVE AND PALATALIZATION

The causative, unlike the stative, is a very productive extension. It also seems to trigger what might at first sight appear to be another harmony process. In most languages in Guthrie's group C and indeed many other Bantu languages, the underyling and surface form of the causative is **-is-** (Bastin 1986). For reasons that will become clear, it is suggested that the underlying representation of the causative in Lobala is that shown in (28).

(28)



That is to say, the **s** has become delinked from its skeletal point and is thus, in most circumstances, not phonetically realized. It has become a so-called 'floating' **s**.

But consider first, data again from the imperative form of the verb, given in (29). In this instance, the causative is added to the stative form on the left in (29a-f) and to the reciprocal form in (29g-h).

(29)

	STATIVE	+CAUSATIVE	GLOSS OF CAUSATIVE FORM
a.	**búl-uŋgan-a**	**búl-uɲjiɲ-a**	'mix something up'
b.	**cíl-iŋgan-a**	**cíl-iɲjiɲ-a**	'hurry someone up'
c.	**zòl-oŋgan-a**	**zòl-iɲjiɲ-a**	'stir something up'
d.	**wàl-aŋgan-a**	**wàl-iɲjiɲ-a**	'drop something from a height'
e.	**wɔ̀l-ɔŋgɔn-ɔ**	**wɔ̀l-iɲjiɲ-a**	'squash something'
f.	**cél-ɛɲjɛn-ɛ**	**cél-iɲjiɲ-a**	'crumble something'
	RECIPROCAL	+CAUSATIVE	
g.	**ók-an-a**	**óc-iɲ-a**	'make each other understand'
h.	**wén-ɛn-ɛ**	**wén-iɲ-a**	'make each other see'

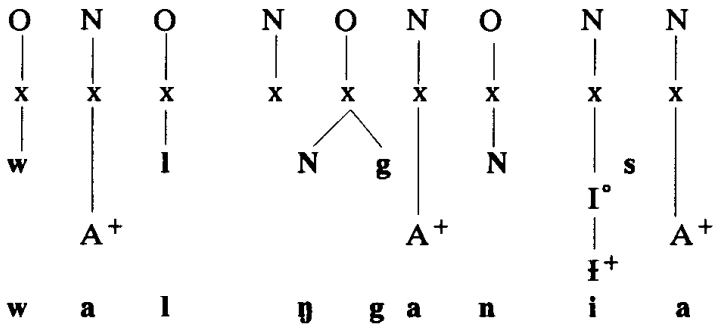
The underlying order of the extensions which is clear from other data in the language (see below) is given in (30).

(30) stative/reciprocal - causative - applicative

What appears to be happening in (29) is that the causative manifests itself by way of a palatalizing effect restricted to the domain of the verbal extension. In (29g), the root final **k** also palatalizes under a local palatalizing effect found throughout the language, seen also in the stative form of (29f). This is discussed later and represented below in (43).

The derivation for (29d) is now represented in (31).

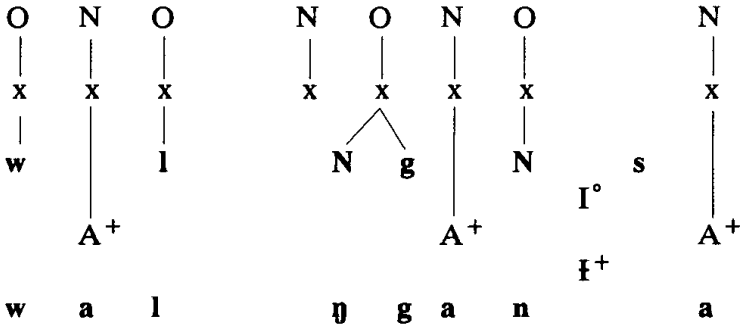
(31) **wàlɲjiɲa** 'drop something (from a height)'



If we were to argue that the aspect 'slot' in fact constituted a separate domain from the stem, we could then explain why the floating **s** of the causative fails to link to an onset via a skeletal point. It cannot cross a domain boundary. However, to introduce a new domain at the end of the word is in direct contradiction to our earlier account of government. The root vowel, as head of the domain, was seen to be governing the aspect slot, as in the example of **bɛ̀lɛ**. The aspect slot was part of the governing domain. We shall come back to this point later. For the time being, we must settle for there being some kind of 'weak' boundary which intervenes and prevents the causative **s** from associating with the onset. Since the segment is not attached to a skeletal point, it will have no phonetic realization.

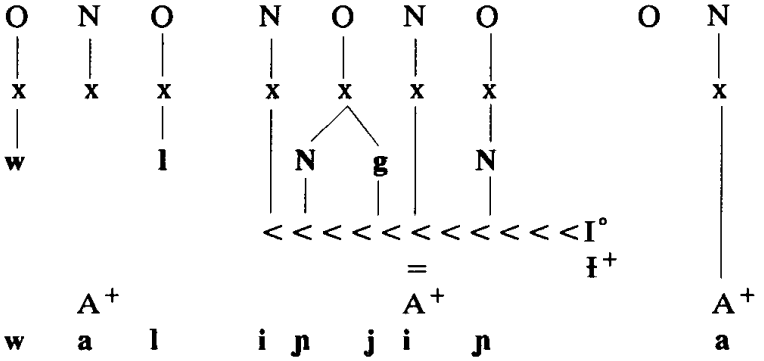
(31) still has one fundamentally unstable configuration. The two final nuclear positions are adjacent to one another at the skeletal level. The OBLIGATORY CONTOUR PRINCIPLE (Leben 1973) (henceforth OCP) does not allow identical categories to be adjacent to one another. The nucleus together with its skeletal point must delete as shown in (32).

(32)



Now the causative **i** is left stranded; it is not attached to anything. There appear to be two possible solutions. Either **i** will form a light dipthong with the final vowel or it will spread leftwards and affect its 'fellow' extension. As we shall see, both solutions may occur. We might expect the preferred solution to be for it to 'remain amongst friends' and spread leftwards. This involves suggesting that there is another weak boundary this time dividing the extensions from the verbal root. What happens is shown in (33).

(33)

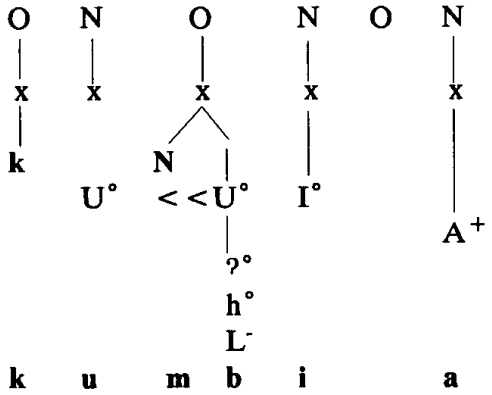


This leftwards spreading is of course a very different kind of process from what was described in (20) where the 'movement' was rightwards. Harmony processes cannot occur in both directions! The circumstances of (33) are very different. (20) was accounted for in terms of positive charm being licensed by the governor. In this case, there is a leftwards spreading of an element that has lost its skeletal point but nonetheless has to be realized phonetically.

In the case of (31)–(33), there is a complete take-over of everything by I°. It must also be noted that, in (29e) and (29f), **wɔ̀liŋjiŋa** and **cɛ́liŋjiŋa**, the governing relation that was said to be established by the root vowel with all other nuclei of the verb word to its right, seems to break down. It is as if I° has 'carved out its own empire' and created its own domain, in which I° and nothing but I° is licensed. The suggestion of an A^+ domain which is broken by I° will be raised in the final section. Whether this suggestion can help to explain why the A^+ becomes delinked (perhaps because A^+ is no longer licensed in an 'I° domain') goes beyond the scope of this article.

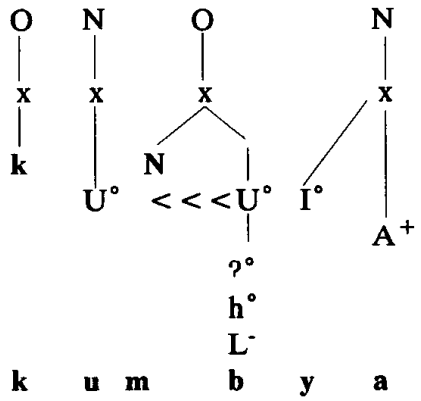
The causative **i** will go so far as to palatalize the final root consonant. **bíka** 'be healed' becomes **bíca** 'heal someone'. However, there will be some cases when the causative **i** cannot spread leftwards. Consider the example of the verb **kùmba** 'be thrown down'. The causative form of this verb is represented in (34) and (35).

(34) **kùmbya** 'throw something down'



mb is represented as containing the U° element (labiality). I° cannot spread to where U° is already present. So, when it loses its skeletal point in accordance with OCP, it associates rightwards to form a light dipthong with the final nucleus. This was the second of the two options mentioned above.

(35)



A general observation can be made about the causative **i**. It will always be absorbed by non-labial segments to its left. In other cases it will form a light dipthong with the final vowel.

3.2 THE CAUSATIVE WITH THE APPLICATIVE

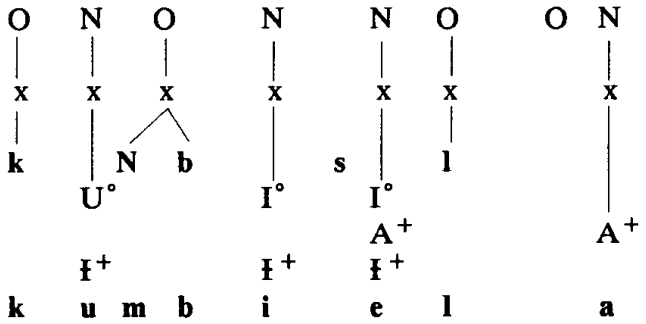
Let us now look at a case where the causative does not occupy the final position in the extension 'slot'. We have already noted, in (30), that the applicative extension will come to the right of the causative. Given the causative forms in (36), one might have expected simply to add the applicative **-el-** before the 'final vowel' to give the forms in (37), but armed with a theory of how the word and syllable are structured, we can in fact predict that this time the **s** of the causative that had lost its skeletal point would be able to attach itself to the onset that necessarily comes with the applicative as found in (38) and shown in (39) and (40).

(36) **tɛ́y-a** 'stand something up'
ùnj-a 'sell something'
kùmby-a 'throw something down'

(37) ***tɛ́y-el-a**
***ùnj-el-a**
***kùmby-el-a**

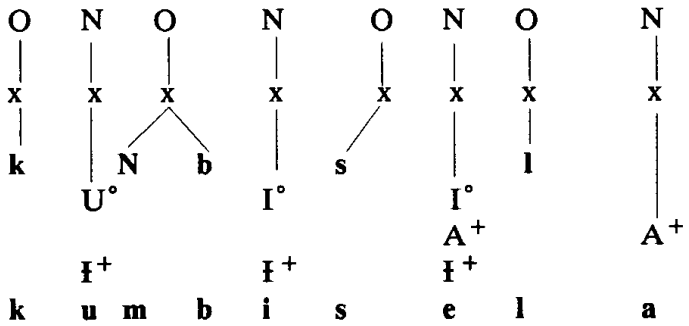
(38) **tɛ́y-is-el-a** 'stand something up for someone'
ùnj-is-el-a 'sell something for someone'
kùmb-is-el-a 'throw something down for someone'

(39) **kùmb-is-el-a** 'throw something down for someone'



The floating **s** does indeed attach itself to the onset position, as shown in (40), by way of creating a new skeletal point. It can apparently do this on this occasion because there is no kind of boundary, weak or otherwise, that prevents it from doing so.

(40)



This happens on all occasions that the causative is followed by the applicative but never when the causative is followed by one of the aspectual endings. This again provides some support for the positing of 'weak boundaries' as shown in (41) where + signifies a weak boundary.

(41) root + extensions + aspect

4. CAUSATIVES AND THE INTERRUPTION OF THE HARMONY SYSTEM

4.1 PALATALIZATION PROCESSES

Consider now the data given in (42) where the perfective aspect **-i** and the imperfective aspect **-e** are suffixed to the root. A pronominal prefix (subject marker) is required with these forms of the verb. Remember that material to the left of the verb root is regarded as being in a different domain.

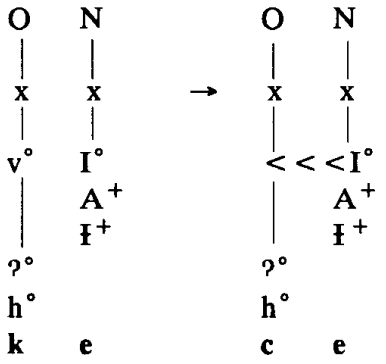
(42)

	IMPERATIVE		PERFECTIVE 3rd pers sg	IMPERFECTIVE 3rd pers sg
a.	**bík-a**	'be healed'	**à-bíc-í**	**kà-bíc-è**
b.	**bèk-a**	'borrow'	**à-bèc-í**	**kà-bèc-è**
c.	**màn-a**	'be removed'	**à-màn-í**	**kà-màn-è**
d.	**lól-a**	'be alight'	**à-lós-í**	**kà-lól-è**
e.	**túm-a**	'be blunt'	**à-túm-í**	**kà-túm-è**
f.	**bɛ̀l-ɛ**	'circumcize'	**à-bɛ̀s-í**	**kà-bɛ̀l-ɛ̀**
g.	**ɲɔ̀l-ɔ**	'enter'	**à-ɲɔ̀s-í**	**kà-ɲɔ̀l-ɔ̀**

It is particularly striking that the perfective aspect shows no change; it always has the form **-i**. On the other hand the imperfective **-e** undergoes the kind of harmony changes we might have expected from our experience earlier with the major exception that (42g) has the form **kaɲɔ̀lɔ** and not ***kaɲɔ̀lɛ.** This is the kind of behaviour we associated with an empty nucleus. When the nucleus was empty, the adjacent vowel spread from the left.

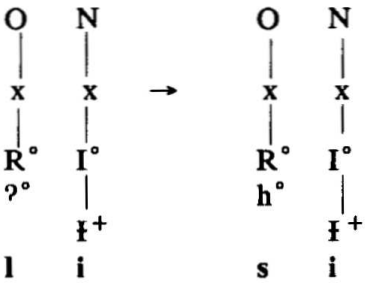
In (42a) and (42b), a process of palatalization, already remarked upon in (29), occurs when a segment containing the I° element governs **k** (or **ng**). This is a case of inter-constituent government and is represented in (43). Recall that directionality of inter-constituent government is always from right to left. It should come as no great surprise then that the I° element spreads to where the cold vowel is head:

(43)



A more limited event occurs when **l** is followed by **i**. **li** → **si** in most but not all instances in the language. Two such exceptional instances are **-lí** forms of the verb 'be' and **-kùlí** an auxiliary indicating a repeated action. These are two of the most common words in the language. Interestingly, in (29b), **li** also failed to undergo any change. Arguably in this case, the underlying form was **lv°**. The process whereby I° spread was a surface level event only. That is to say, the process whereby **ki** → **ci** is purely phonological and has no exceptions at all, but **li** → **si** is more constrained. It is represented in (44).

(44)



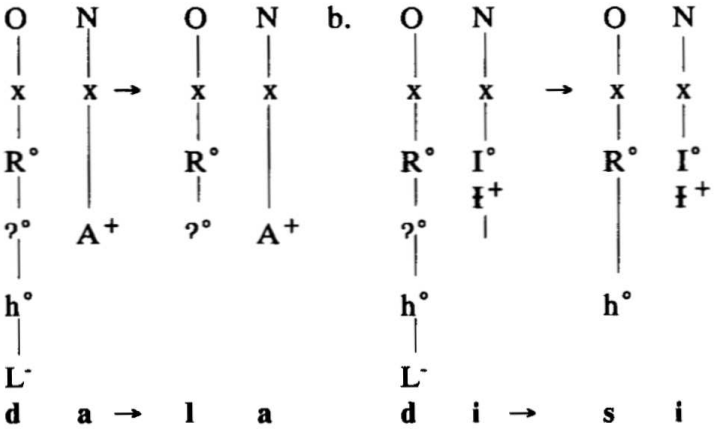
(44) does not explain anything. There is no motivation for ?° to become h°. It is precisely this sort of arbitrary happening that government phonology does not accept as a valid phonological process. Phonological processes, it will be remembered, are either processes of decomposition such as we have seen when the positive element delinked or composition such as illustrated in (43) where the I° element spreads into an empty space. (44) cannot be presented as either sort of process. There must be other factors involved. Happily, there is some good evidence to suggest an historical shift not between **l** and **s** but from **d** to either **l** or **s** or **z** (or even **h** and **r** in other languages). (45) lists the word for 'eye' in a number of languages from the C 31 cluster, that is to say, in languages neighboring the Lobala speaking area. The data is from Morgan and Fultz (1985).

(45)

lísò	Lingala
dísò	Nguma
díyò	Libinza
líhò	Dzando
lírò	Libobi
zíyò	Lobala

If the starting point for the process referred to in (44) had been **d** (represented as consisting of R°, ?°, h°, and L⁻), one can then posit a process of decomposition in order to arrive at either **l** or **s**. Possibly, something on the lines shown in (46a) and (46b).

(46) a.



b.

The instability of **d** is motivated by the absence of pre-nasalization. Evidence for this comes from the fact that when **l** is preceded by **N**, **l** reverts to **d** as in (47).

(47)

mò-làɲjì	'bottle'
n-dàɲjì	'bottles'
o-làmbos-í	'you ignored'
o-n-dàmbos-í	'you ignored me'

In other words, the underlying representation of **l** is **d**. It is **d** that has undergone a process of decomposition. However, when an underlying **d** is followed by **i**, as in (46b), the decomposition process is altered slightly and the outcome is **si**. Compare the following data from Lingala and the same word in Lobala.

	LINGALA	LOBALA	
(48)	**lì-tóí**	**ì-tóó**	'ear'
	lì-bùmù	**ì-bùù**	'stomach'
(49)	**l-ínò**	**z-ínò**	'tooth'
	lìŋga	**zìŋga**	'like'
	lía	**zá**	'eat'
(50)	**mò-kílí**	**mò-císí**	'world'
	à-lál-í	**à-lás-í**	'he's layed down'

One can make the safe observation that the sequence **li** is not easily tolerated in Lobala at lexical level.

There seem to be three ways of dealing with the sequence. In (48), the root of the nominal **-tóó** begins with a consonant and the prefix or class marker appears only as **i**. **l** seems to have been deleted altogether. On the other hand, in (49), the nominal root **ínò** has a vowel root initial. In this case the **li** prefix of Lingala appears as **z**. There seems to be some constraint that keeps the word or root initial occurrences voiced. In the case of (50), we find that it is in fact only root final **l** that becomes **s** before **i**.

When one also realizes that no verb that occurs naturally in Lobala appears in the lexicon with a root final **s** (or for that matter **c**), one is able to claim some support for the contention that a verb root, that on the surface ends in **s**, must underlyingly end in **l** and that an **i**, either underlying or apparent on the surface, has brought about that change.

4.2 NEUTRAL SEGMENTS OR AN A$^+$ DOMAIN

Now consider what happens in (51) when the causative is added.

(51)		CAUSATIVE		CAUSATIVE PERFECTIVE	CAUSATIVE IMPERFECTIVE
	ROOT	IMPERATIVE		3RD SG	3RD SG
a.	**bík-**	**bíc-a**	'heal'	**à-bíc-é**	**kà-bíc-à**
b.	**bèk-**	**bèc-a**	'lend to'	**à-bèc-é**	**kà-bèc-à**
c.	**màn-**	**màɲ-a**	'remove'	**à-màɲ-é**	**kà-màɲ-à**
d.	**lól-**	**lós-a**	'light something'	**à-lós-é**	**kà-lós-è**
e.	**túm-**	**túm-ya**	'blunten'	**à-túm-yé**	**kà-túm-yà**
f.	**bɛ̀l-**	**bès-a**	'have circumcized'	**à-bès-é**	**kà-bès-à**
g.	**ɲɔ̀l-**	**ɲɔs-a**	'put in'	**à-ɲɔs-é**	**kà-ɲɔs-à**

In the first column, the verb root alone is given without the causative extension. In the second column, the base or imperative form of the causative verb is shown. The final consonant of the root of the verb has changed much as might have been expected: recall what happened in the case of (31)–(33) **wàliŋjiŋa** where the **i** of the causative spread leftwards if it could. Not only has it spread, it has also been absorbed, as it was in (31)–(33), apart from the one case in (51e) where it cannot do so and thus forms a light dipthong with the final vowel parallel to the example of **kùmbya** given in (34) and (35).

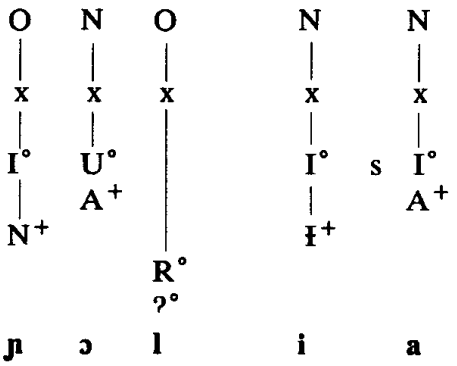
In the two right hand columns, there are also two surprising things to observe. Firstly, the perfective aspect now has a surface form **-e** and the imperfective **-a**. This

contrasts with what must be their underlying forms given in (42). Secondly, the expected harmony of the suffix with the root vowel is not realized at all. In (51g), where we would have expected *ɲɔ̀sɔ, we have instead the form **ɲɔ̀sa** which we would have predicted to be ill-formed when dealing with the original data in (12).

This article does not try to account for the change in the aspectual ending form **i** to **e**. Since the process is only triggered by the causative extension occurring immediately prior to the final vowel, one can surmize that it has something to do with the underlying form of the causative. Perhaps, to take the logic of earlier observations about **s** to their limit, one could argue that an underlying form **idi** was present. However, such speculation is not the aim of this article.

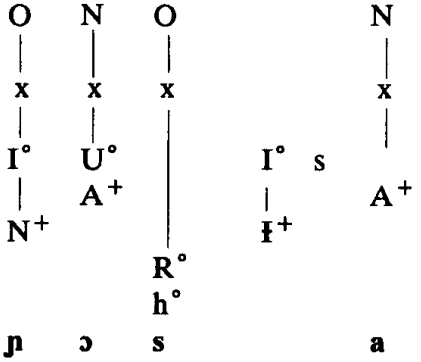
It is rather the second point that is worth pursuing. It appears that the governing relationship between root vowel and suffix is no longer manifested in terms of 'harmony'. Recall though that government phonology claimed that"within a DOMAIN every position has to be licensed apart from the head of that domain" (see §1.4). Crucially, the definition talks of domains and not words. Recall too that a vital condition for government is that the governor has to be adjacent to its governee on its respective level. Bearing in mind that we have just observed that **s** is always a manifestation of an underlying **l** or **li**, we are now in a position to suggest that a word like (51g) **ɲɔ̀sa** is not what it seems on the surface. It could be represented as in (52) and (53).

(52) **ɲɔ̀sa** 'cause to enter'



Some reasons why **li** → **si** have already been offered. These apply in this case. Moreover, the two final nuclei are also adjoining and so OCP applies. The left hand nuclear point deletes. The causative's need to be manifest has already been satisfied by the change in the final root consonant. The result is shown in (53).

(53)



The crucial point to account for is why there is no longer a governing relationship between **ɔ** and the final **a**. It would be observationally accurate to say that there was an intervening **i**. Indeed, if we refer back to the basic data in (51), repeated here, for convenience, as (54), it would be quite possible to argue that there was an underlying I° in each of the causative forms and even a surface one in the last one. Each root final consonant has been either palatalized or undergone a change due to its absorption of I°.

(54)

'BASE' FORM	CAUSATIVE
bík-a	**bíc-a**
bèk-a	**bèc-a**
màn-a	**màɲ-a**
lól-a	**lós-a**
bèl-ɛ	**bès-a**
ɲɔ̀l-ɔ	**ɲɔ̀s-a**
túm-a	**túm-ya**

But to claim that it is the causative itself that interrupts the harmony process is an arbitrary conclusion. As we noted when examining (42), the perfective aspect **-i** behaves in exactly the same way. It does not appear to undergo harmony. This suggests that we must focus attention on the segment itself and especially on the element the causative and perfective share in common, I°. It seems to be observationally accurate to claim that I°, when it occurs as head (and has no operator apart from ɪ^+) is not only not subject to government, it blocks government. This observation is backed up by evidence from nominal forms given in (55).

(55)

mò-kpètí	*'area around the village'*
è-bècè	*'evil spirit'*
mà-lɛ̀kù	'wine'
è-bɛ̀lɔ̀	'thigh'
***e-kɔla**	
è-nzɔ̀mbì	'darkness'
bɔ̀ɔ́lɛ́	'untruth'
phɔ̀ndú	*'pounded manioc leaves'*
bò-bɔ̀tɔ̀	'type of tree'
***bo-lɔnda**	

After a neutrally charmed root vowel, the subsequent vowel may be taken from the set {**ɛ,ɔ,i,u,**} but never {**e,o,a**}. This takes us a little further down the road because we can say that it is not only I° that blocks government but also U°. U° is not present in any of the verbal extensions but there is one rather exceptional verb that appears to have a compound root, **cétùba** 'cough', which supports the observation that U° behaves in the same way as I°. This is not an altogether unhappy find because it has already been made clear, in §1.1, that I° and U° occur on the same segmental tier and can be expected to behave in a similar fashion to one another. However, the major question that this still throws up is *why* I° and U° should block government.

Opaqueness in vowel harmony is a well documented phenomenon. Clements' (1981) analysis of Akan shows how **a** blocks ATR harmony. Van der Hulst and Smith (1986) have written on the subject of opaqueness. KLV (1985) have also shown that the positive charm of A^+ repels government by the positively charmed ɪ^+. This can be seen to apply at the level of nuclear projection just as much as at the segmental level. In the case of ATR harmony, one can indeed assert that, if anything is going to be opaque to the harmony process, then it will be A^+. A^+ is sometimes referred to in this context as the NEUTRAL ELEMENT. In so-called 'frontness harmony', the neutral element is I°.

Harris (1990a) shows how **a** also blocks height harmony in Chichewa. Data from this language have already been discussed (see (24)). When A^+ occurs as operator in the governing position, A^+ is licensed in the governee. However, when A^+ occurs as head, (as in the case of the reciprocal extension), this process is blocked, as is shown in (56).

(56)

a.	**kònz-an-its-a**	'have correct one another'
b.	**lémb-an-its-a**	'have write to one another'
c.	**kwèz-ets-an-il-a**	?
d.	**pélekez-an-il-a**	'escort one another for someone'

There is a certain logic in proposing that it is positively charmed A^+ occurring as head that repels the licence contract by A^+ acting as operator in the head of the domain.

In a somewhat parallel account in Lobala, it might be proposed that I° and U°, when acting as head and WITHOUT A^+ AS OPERATOR block the manifestations of I° and U° harmony. However, we would then be saying that government relations no longer hold and this would be a most unsatisfactory conclusion. After all, what properties of **i** or **u** can be said to block government? They always occur with ATR and are thus positively charmed and, by our earlier definitions, cannot be governed by a neutral head. Consider (57).

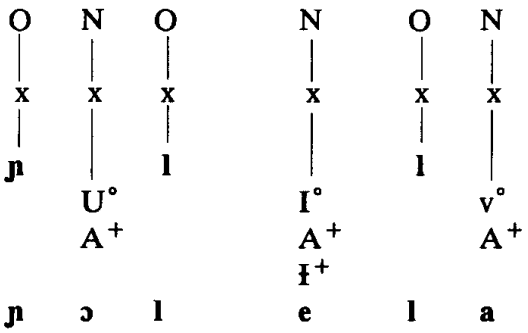
(57) **ɲɔ̀s-is-el-a** 'cause to enter something for someone'
(as in 'put the shoes in the bag for your father')

It is quite obvious that the root vowel cannot be said to be governing the other nuclear positions in the word. The neutrally charmed [ɔ] cannot govern any of the other positively charmed nuclear segments. We must talk in terms of distinct domains. The governing domain of [ɔ] is restricted to itself. It simply does not govern anything else.

We now latch onto the one property that the so-called 'high vowels' actually do have in common and that sets them apart from all the other five vowels, namely the absence of the element A^+. This article claims that A^+ can be said to create its own domain and that this domain is broken by the high vowels because they do not contain A^+. When A^+ occurs as either head or operator in the governing position, it forms an A^+ domain, and within that domain, nuclear segments must agree. Specifically, they must agree in their charm value as we have already seen. High vowels, **i** and **u** obviously do not belong to this A^+ domain. What is proposed is the same sort of thing as an ATR domain in West African languages. In a way similar to ATR spreading across the whole of its domain, so here this article proposes that A^+ spreads across its own domain. The difference in this case is that A^+ was already there in the first place. How then can we talk of A^+ spreading?

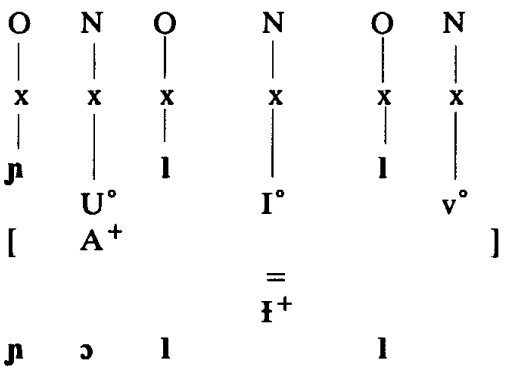
By way of example, consider **ɲɔlɛlɛ**, the underlying form of which is represented in (58).

(58) **ɲɔ̀l-ɛl-ɛ** 'enter for someone'



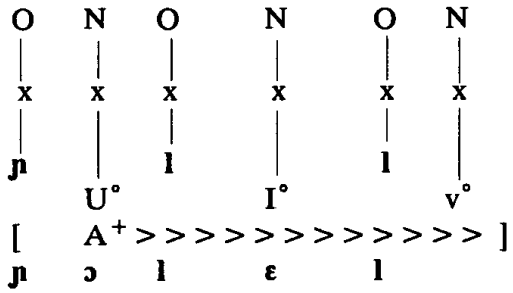
OCP does not allow identical categories to be adjacent to one another. As a result, all the A^+ elements are simply wiped out.

(59)



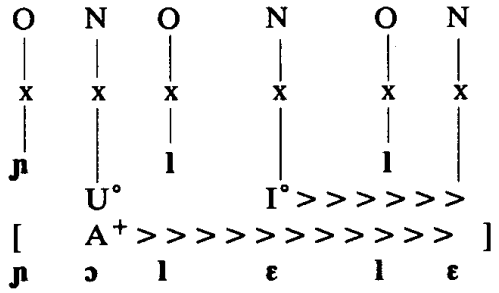
The point of this is that it now allows A^+ to spread across the domain that it has carved out for itself. Positive charm is licensed by the head. In this case, it is not licensed, so the I^+ delinks:

(60)



But as it spreads it takes with it associated elements from the back/round tier. This is what has elsewhere been called 'parasitic harmony' (see van der Hulst 1989:264). A^+ has been said to create a bridge along which other elements may spread. This account suggests not so much that A^+ is a bridge, but rather that there is a tidal flow; that A^+ is what is really spreading and taking with it all agreeing elements. U° cannot spread to where I° is present, but I° can happily spread to where nothing is present.

(61)



In the case of **ɲɔsisela**, A^+ will cause no OCP effect and cannot therefore spread and so no A^+ domain can be created to the right. This article proposes that, within a government phonology framework, this is a more convincing account of the consistently opaque effects of the high vowels.

5. CONCLUDING REMARKS

This article has sought to show, firstly, that vowel harmony in Lobala is elegantly described following a government phonology framework. It has demonstrated that it is untenable to maintain that there is an ATR harmony process involved. It would be equally inelegant to maintain that there were both front (I) and round (U) spreading. This would necessitate the ordering of the processes which would be a most undesirable outcome.

But much more than this, using charm theory (which isolates [ɛ] and [ɔ] as the marked vowels) this article has attempted to show that charm is licensed by the head of the domain. At nuclear projection level, when the head of the domain is positively charmed, positive charm is then licensed throughout the rest of the domain. When the head is neutrally charmed, positively charmed elements are not licensed in the domain and a process of decomposition must take place. The use of this theory takes us beyond mere description and into the realms of explanation.

Finally, it has been suggested that by defining the domain in terms of A^+, (so that in an 'A^+ domain', A^+ is licensed, but elsewhere it is not licensed) the opaque effects of the high vowels, in the traditional terms of vowel harmony, can also be accounted for.

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