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Bare Root Nodes in Basaa

Eugene Buckley
University of Pennsylvania, gene@ling.upenn.edu

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1. Introduction

Schmidt (1994) presents an analysis of phantom consonants in Basaa — consonants which never surface but which have various phonological effects — which requires three assumptions. First, each root in the language selects a particular template, chosen from the set of possible iambic feet. Second, the templates, although defined in terms of the prosodic categories of mora and syllable, project X-slots which serve as the docking sites of the root melody. Third, mapping is from left to right, with spreading only of vowels, and the unfilled X-slots at the right edge of the domain are the phantom consonants. She claims that an analysis in more orthodox moraic theory which makes use of bare root nodes instead of X-slots is not tenable for two reasons: it is formally unworkable, and overgenerates the distribution of phantom consonants. I argue here that, on the contrary, an analysis using bare root nodes is not only workable but considerably simpler than Schmidt's approach; and that her analysis is empirically inadequate because it cannot produce all the necessary contrasts between the presence and absence of phantom consonants. Perhaps most importantly, the reanalysis shows that X-slots remain unnecessary, so that a more constrained representation of timing can be maintained.

I begin in §2 by summarizing the evidence which motivates the phantom consonants. Schmidt's X-slot analysis is outlined in §3, followed in §4 by a reanalysis in strictly moraic terms. Also in §4 I discuss the formalization of the rule which derives long vowels from phantom consonants, and in §5 support the use of bare root nodes using evidence from metathesis. Finally, I discuss in §6 the cases of phantom consonants which do not occur at the right end of the root, and give a brief conclusion in §7.

2. Motivating Phantom Consonants

2.1 Elision

There are two major ways in which phantom consonants make their presence felt in Basaa. One relates to a rule of Elision (Schmidt's 'Vowel Coalescence'), which deletes the first of two adjacent vowels.

(1)	a.	ɓíni-ag	→	ɓínâk	'bend–NOM'
	b.	cé-ag	→	cêk	'destroy–NOM'
		lɔ-aha	→	lɔ̀hà	'arrive–IND.CAUS'

While it may appear in (1b) that the second vowel is deleted, this impression is due to the prior application of Vowel Assimilation, shown below in (2) independent of Elision.

(2)	lɛ́l-ag	→	lɛ́lɛ̂k	'cross–NOM'
	ɓón-ag	→	ɓónôk	'promise–NOM'

Thus the fuller derivation of the words in (1b) is as follows.

* This paper originated in discussions at the Delaware Valley Phonology Reading Group at the University of Pennsylvania, December 1994. I would like to thank the participants for their role in the development of the ideas presented here, especially Akin Akinlabi and Laura Downing.

(3)	cé-ag	→	cé-eg	→	cêk
	lɔ-aha	→	lɔ-ɔha	→	lɔ̀hà

There is no Assimilation of the suffixes in (1a) because the rule applies only when the trigger is singly linked. Some of these examples also show the effect of a rule which neutralizes laryngeal features in word-final position.[1]

As is typical in the literature on empty C slots (beginning with Clements and Keyser 1983), the phantom consonants of Basaa are posited in order to account for various exceptional vowel clusters. Specifically, we find the failure of Elision when two vowels are separated by a phantom consonant, represented here as •.

(4)	ní•-aha	→	nííhà	'shut up–IND.CAUS'
	o•-ag	→	òòk	'manufacture–NOM'

While Vowel Assimilation applies across the phantom consonants here, Elision does not, so we do not find **níhà* or **òk* with single (short) vowels analogous to *lɔ̀hà* and *cêk* in (1b). If we assume the existence of phantom consonants, this failure of application can easily be attributed to the fact that the two vowels are not phonologically adjacent.

2.2 Lengthening

A second reason for positing these phantom consonants is that they have a surface realization when they occur in coda position; this is the only source of true (tautosyllabic) long vowels in Basaa. For this we need a rule of Lengthening, which is formulated below in §3. To take one example, if the roots in (4) occur unsuffixed, they have a long vowel.[2]

(5)	ní•	→	ní:	'shut up'
	o•	→	ò:	'manufacture'

Other roots, such as *cé* and *lɔ* (cf. (1)), surface without length, showing that the change in (5) is not due to word minimality. Further, lengthening also occurs in longer roots with a final phantom consonant.

(6)	búgu•	→	búgû:	'crack'
	sɛ́bɛ•	→	sɛ́bɛ̂:	'whittle'

If we posit abstract segments which induce lengthening, we have a means of distinguish–ing between roots such as [cé] and [ní:].

The examples seen so far have a phantom consonant in coda position by virtue of the underlying string of segments, and in that position it undergoes lengthening. A phantom can also occur in the coda due to the application of Syncope, which applies in the familiar context VC_CV. First, we can motivate the rule with the following simple roots.

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[1]Schmidt calls this 'devoicing', but since implosive [ɓ] becomes [p], rather than, for example, [p'], it should be considered loss of all laryngeal features. See Lombardi (1994) for similar examples and discussion. The two suffixes illustrated here are the Nominalising *-ag* and the Indirect Causative *-aha* (which often induces raising of the root vowel). Tone rules are not discussed in this paper; see Schmidt (1994) and Hyman (1988); likewise see Schmidt (1994) for more extensive data.

[2]Schmidt transcribes derived long vowels as geminates ([aa]), just like hetero syllabic identical vowels, but I use a length mark ([a:]) to facilitate interpretation of the transcriptions.

(7)	kóbol-aha	→	kóblàhà	'peel–IND.CAUS'
	pídiɓ-ag	→	pídɓàk	'hate–NOM'

Syncope applies adjacent to phantom consonants as well. When a phantom is the second consonant in the root, it will end up in the coda after Syncope, in which case it leads to the creation of a long vowel.

(8)	a. hɛ́•-aha	→	hɛ́•ha	→	hé:hà	'cost–IND.CAUS'
	b. só•o•-ag	→	só••ag	→	só:àk	'trim tree–NOM'
	tú•u•-ag	→	tú••ag	→	tú:àk	'pull–NOM'

Contrast *hé:hà* in (8a), where Syncope and Lengthening are found, with *lòhà* in (1b), where Elision applies. The difference between the roots is the presence of a phantom in /hɛ́•/.

Roots such as /só•o•/ are the only type with two phantom consonants. Evidence for both is present in (8b): the second phantom forces syllabification of the first in the coda ([so•.•ag]), and the first then causes lengthening. Further evidence for the final phantom is that it blocks Elision: thus we do not find **só:hà* or **sóàhà*. This final phantom is also expected to trigger Lengthening when no suffix is present, but Schmidt reports a late shortening rule that compresses the long vowel in the unsuffixed forms.

(9)	só•o•	→	sóô:	→	sóô	'trim tree'
	tú•u•	→	túû:	→	túû	'pull'

This shortening apparently happens only when the long vowel is phonetically preceded by an identical vowel; it does not apply in e.g. *búgû:*, where a (phonetically realized) consonant separates the two homorganic vowels.

In addition to the blocking of Elision, then, the creation of long vowels is the second major type of evidence for phantom consonants.

3. The Template Analysis

Schmidt's account of phantom consonants relies crucially on the use of templates. She classifies roots into four types according to their prosodic shape in isolation, each of which corresponds to some instantiation of an iambic foot.

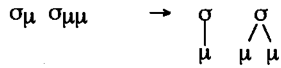
(10)	SURFACE FORM	TEMPLATE ANALYSIS
	cé	/cé/ + σ_{μ}
	lɛ́l	/lɛ́l/ + $\sigma_{\mu\mu}$
	ɓínî	/ɓín/ + σ_{μ} σ_{μ}
	kóbôl	/kóbl/ + σ_{μ} $\sigma_{\mu\mu}$

Mapping to the template is left to right, with vowels linked only to the first mora of a syllable (recall that all long vowels are derived by rule). The second vowel of the disyllabic roots is derived by application of Vowel Assimilation to an unfilled position in the template. To prevent the linking of suffixal material to this position, association to the template (and subsequent Assimilation) must occur **before** suffixation. In other words, the derivation must be cyclic.

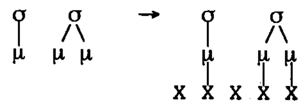
The following derivation illustrates one form. Following Schmidt, I represent consonant features schematically under a Root node, and vowel features under a lower V-Place tier.

(11) TEMPLATE ANALYSIS OF [kóblàk]

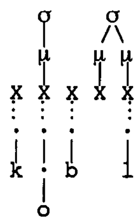
instantiation of template



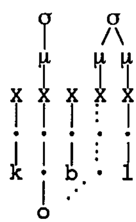
'expansion' of template



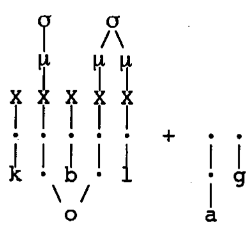
mapping of melody to template



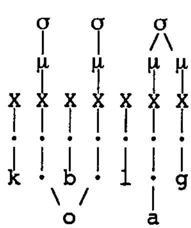
Vowel Assimilation



suffixation



(re)syllabification



Subsequent application of Syncope and Laryngeal Neutralization yields *kɓblàk.* Note that upon resyllabification, the mora over /l/ is simply lost; its only purpose was to force projection of an X-slot in the template.

For roots with apparent phantom consonants, there is a mismatch in the number of consonants present underlyingly in the root and the number of consonant positions provided by the template.

(12)

SURFACE FORM	TEMPLATE ANALYSIS
wá:	/wá/ + $\sigma_{\mu\mu}$
téê	/té/ + σ_{μ} σ_{μ}
ɓúgû:	/ɓúg/ + σ_{μ} $\sigma_{\mu\mu}$
sóô: (→ sóô)	/só/ + σ_{μ} $\sigma_{\mu\mu}$

Recall that association of the melody to the template is left to right, without spreading of consonants; when an X-slot at the right edge remains empty, it behaves as a phantom consonant.

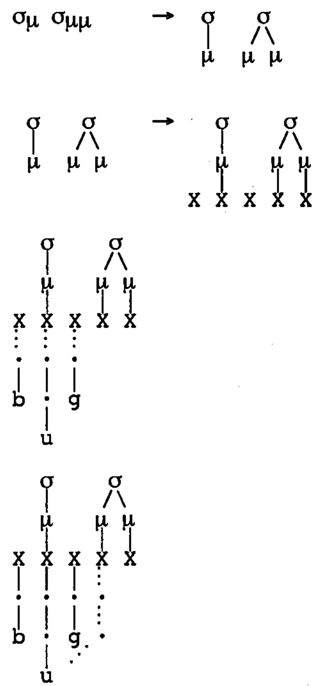
(13) TEMPLATE ANALYSIS OF [búgû:]

instantiation of template

'expansion' of template

mapping of melody to template

Vowel Assimilation



The final X here is eventually filled by Lengthening, yielding surface *búgû:*. Similarly, Elision will not apply to vowels separated by an X. It is in this way that the empty X-slot is used to account for the phantom consonant phenomenon.

4. Eliminating Templates

The use of templates in Basaa is poorly motivated for several reasons. In many cases the template does not predict anything beyond what the simple syllabification of the underlying string of segments would yield, so that the additional stipulation of template size is a needless complication. Basaa also lacks the variation in template choice which is found in classic examples of templatic languages, such as the Classical Arabic root *ktb* 'write' in e.g. *kutib*, *katbab*, etc. (cf. McCarthy and Prince 1986).[3] Further, the generalization that all the templates are instances of iambs is dubious since one of these, the CV, is degenerate. The only apparent function of the templates in Basaa is to project the correct number of X-slots.

In a related vein, the moras in Schmidt's templates do not show the behavior typical of moras. In particular, they exhibit no stability effects whatsoever: whenever an X-slot is deleted, the dominating mora also deletes. Instead, it is the X-slots which exhibit stability. Clearly much of the structure is extraneous. While there have been criticisms of standard moraic theory (e.g. Tranel 1991), the weight of evidence favors the mora over a skeletal tier (e.g. Hyman 1985, McCarthy and Prince 1986, Hayes 1989). I argue that in Basaa the X tier can be eliminated and replaced with a purely moraic representation. And since templates are required only to project X-slots, these can be eliminated as well.

I propose that the regular roots have underlying forms corresponding closely to their isolation pronunciations. This step is easy to take since, as noted, in many cases (*cé, lɛ́l, kɓ́bɔ̂l*) the number of consonants alone is sufficient to determine the number of surface syllables: for them, the template is redundant.

(14)

SURFACE FORM	TEMPLATE ANALYSIS	NO-TEMPLATE ANALYSIS
cé	/cé/ + σ_μ	/cé/
lɛ́l	/lɛ́l/ + $\sigma_{\mu\mu}$	/lɛ́l/
ɓíní	/ɓín/ + σ_μ σ_μ	/ɓíni/
kɔ́bɔ̂l	/kɔ́bl/ + σ_μ $\sigma_{\mu\mu}$	/kɔ́bol/

The fact that the vowels of a root are always identical continues to follow from Vowel Assimilation; in principle, the second vowel in a root like /ɓini/ could be underlyingly placeless (with features provided by spreading), or the multiple linking of vowel features could be underlyingly present. I adopt the latter solution here (see (15)). So far the crucial difference between the two approaches is that, in the No-Template analysis, an underlying vowel replaces the function of the template.

Compare the following derivation of *kɔ́blàhà* without templates to that in (11). Not only does the No-Template analysis require fewer steps and less apparatus, but cyclicity is not necessary; yet as I will show, it captures the facts more exhaustively. The 'template' follows from simple prosodification after suffixation.[4]

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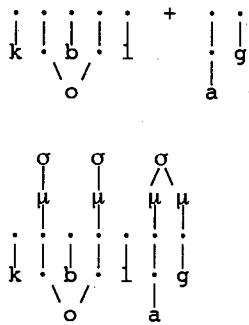
[3]The Basaa case fails also to meet the criteria that define less vigorous examples of templates. For example, in Sierra Miwok (e.g. Smith 1985) every root has a particular template affiliated with it — e.g. but crucially can also surface with other, morphologically determined templates (which we do not find in Basaa). Further, while in the Mayan languages (e.g. McCarthy 1989) the canonical root can be defined templatically as CVC, the crucial point is that this template is uniform (again, unlike in Basaa, where the iambic template has four different shapes).

[4]A further necessary assumption of Schmidt's approach is that when the rule of Vowel Assimilation spreads the V-Place features of a vowel to an empty X-slot, an intermediate node must be created by NODE GENERATION (e.g. Archangeli and Pulleyblank 1986). While this sort of operation is accepted by many, there are also dissenting voices (e.g. Avery and Rice 1989). The No-Template analysis does not require node generation, since the second

(15) NO-TEMPLATE ANALYSIS OF [kɓ́blàk]

suffixation

prosodification



Without templates, the size of the root on the surface is simply a consequence of the number of underlying segments.

In the No-Template analysis, the underlying representations of the roots with phantom consonants are exactly parallel to those of the regular roots, except that in certain of the consonant positions they contain root nodes that dominate no further features. We will see below cause to believe that the node is simply the feature [+son].[5] The earlier notation • is thus interpreted directly as a bare root node.

(16)

SURFACE FORM	TEMPLATE ANALYSIS	NO-TEMPLATE ANALYSIS
wá:	/wá/ + $\sigma_{\mu\mu}$	/wá•/
téê	/té/ + σ_{μ} σ_{μ}	/té•e/
ɓúgû:	/ɓúg/ + σ_{μ} $\sigma_{\mu\mu}$	/ɓúgu•/
sóô: (→ sóô)	/só/ + σ_{μ} $\sigma_{\mu\mu}$	/só•ó•/

This approach differs crucially from Schmidt's analysis in that no reference to an X skeletal tier is necessary: the phantom consonants exist on the root tier, which is a standard element of autosegmental theory, while the X tier is widely rejected as unnecessary in moraic theory. Her brief discussion of an alternative analysis using bare root nodes is unworkable because it maintains the cumbersome use of templates, with bare root nodes projected just like X-slots. I assume no projection of positions; rather, the phantom consonants are an underlying part of the root.

The second vowel of a root is here assumed to consist of a Root node dominating a bare V-Place node, distinct from a bare Root node.

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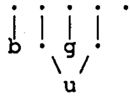
vowel of the root is present underlyingly.

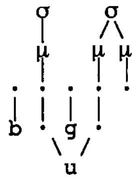
[5]This basic approach to empty segments was proposed by Hayes (1989); see Downing (1991) and Roberts-Kohno (1994) for similar applications within Bantu. McCarthy (1988) and others have argued that the Root node is contentful, and contains the features [sonorant, consonantal]; I follow Hume and Odden (1994) in assuming that [consonantal] is not a true phonological feature, and therefore that the Root tier contains only the feature [sonorant].

(17) NO-TEMPLATE ANALYSIS OF [búgû:]

root



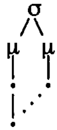
prosodification



Subsequent application of Lengthening yields surface *búgû:*, much as in Schmidt's approach. Similarly, the presence of the bare root blocks application of Elision, which requires adjacent syllable nuclei.

A note on the formulation of Lengthening is in order. For Schmidt, the spreading of vowel features is to an empty X-slot. Since I assume that there is no such slot, but rather a bare root node, the spreading must be to that node. If the bare root node contains the feature [+son], as suggested above, all we need to spread is the V-Place node.[6]

(18) *Lengthening*



Root tier

V-Place tier

This rule could be thought to result in a geminate representation of the sort proposed by Selkirk (1990), or (in other theories of geminates) simply a vowel cluster with shared features. Since no long vowels exist underlyingly, it is not possible to test whether the output of this rule needs to be a true geminate. At any rate, the two [+son] root nodes could easily be merged by an operation such as the Shared Features Convention (Steriade 1982).

[6]Vowel Spreading is not identical to Vowel Assimilation, since it spreads to a weak rather than strong mora. It is also not subject to the restriction on binary association (as seen in *búgu•* → *búgû:*); this is not unexpected given the formulation in (18), which spreads a higher tier than Vowel Assimilation.

5. Metathesis

By a rule of Metathesis, whenever /h/ follows a consonant, the order of the cluster is reversed.

(19)	*Suffixation*	lɛ́l-aha	ad-aha	ɓíni-aha
	Elision	—	—	ɓínaha
	Syncope	lɛ́lha	adha	ɓínha
	Metathesis	lɛ́hla	ahda	ɓíhna
	Surface	lɛ́hlà 'cross'	àhdà 'unite'	ɓíhnà 'bend'

This rule also provides an explanation for the root alternation CvCv: ~ Cv:C, illustrated below.

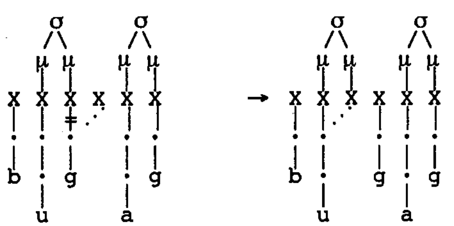
(20)	ɓúgû:	'crack'
	ɓú:g-àhà	'crack–IND.CAUS'
	ɓú:g-àk	'crack–NOM'

As Schmidt notes, Metathesis does not literally target /h/, but instead a placeless consonant. This category naturally includes the bare root node, and it should be no surprise that Metathesis applies in these cases as well. My derivation of the forms in (20) has the following steps, which are all independently necessary in the language.

(21)	*Suffixation*	ɓúgu•	ɓúgu•aha	ɓúgu•ag
	Syncope	—	ɓúg•aha	ɓúg•ag
	Metathesis	—	ɓú•gaha	ɓú•gag
	Lengthening	ɓugu:	ɓú:gaha	ɓú:gag
	Surface	ɓúgû:	ɓú:gàhà	ɓú:gàk

Schmidt notes the similarity between metathesis of /h/ and the 'rightward shift' of the /g/ in her derivation of *ɓu:gak*, which takes the following form.

(22)



If this change is to be made identical to metathesis of /h/, an additional process moving the supralaryngeal features of /h/ is required. The parallel is more directly captured in the present framework since the phantom consonant is, in fact, a consonant, rather than just an X-slot, and moving the /g/ or other consonant after an /h/ is the same formal operation as moving it after an empty root node. I take this rule to be true metathesis, which literally reorders the two segments — any consonant followed by a placeless consonant — rather than, say, a flop rule with complex spreading of features.

6. Initial Phantom Consonants

Up to this point we have examined only phantom consonants which follow all the normal consonants in the root. A criticism leveled against bare root nodes by Schmidt is that an analysis using them predicts free occurrence of phantom consonants in any position within the root, including before normal consonants. In fact there **are** phantom consonants in root-initial position, as she briefly discusses.

(23) /•áŋal/ 'tell'
/•ad/ 'unite'
/•én/ 'palm oil'

These roots contrast with true vowel-initial roots.

(24) /am/ 'thing'
/iba/ 'wild mango'
/ɛ́m/ 'crime'

The evidence for this distinction is that the Class 5 nominal prefix *li-* becomes [ǰ] before a true vowel-initial stem (25), but not before stems with a phantom consonant (26).

(25) li-am → ǰàm
li-iba → ǰìbà
li-ɛ́m → ǰɛ́m

(26) li-•aŋal-ag → lìáŋlàk
li-•én → lìén

Schmidt's analysis predicts that every vowel-initial root will acquire an initial phantom consonant, since every template projects a word-initial onset X. But her account cannot distinguish the two types of phonetically vowel-initial roots (which apparently contrast only for noun roots). The alternative is to distinguish templatic roots (23) from non-templatic roots (24), which further weakens the motivation for templates at all in the language. My analysis, of course, predicts that the presence or absence of a bare root node should be a possible contrast in initial position (/am/ vs. /•ad/) just as in final position (/cé/ vs. /wá•/).

A weakness of the present account lies in the apparent lack of the root types •V•VC and CV•VC (e.g. **kóôl*), which Schmidt says are nonexistent. In the templatic approach, this prediction follows from left-to-right association: empty X-slots — functioning as a phantom consonant — will occur only at the right edge, never to the left of a true consonant, except for the word-initial case just discussed. The No-Template approach has the opposite problem. It accounts easily for the contrast between (23) and (24), but represents with equal ease the non-existent forms •V•VC and CV•VC. I can offer no synchronic account of this gap in simple representational terms; the explanation for this absence is perhaps diachronic. Far more important, however, is that the formal analysis capture the **attested** distinctions, and on this count bare root nodes are superior to empty X-slots.

7. Conclusion

The analysis of Basaa presented here confirms the position against which Schmidt argues: namely, that 'the X-slot tier [is] redundant in phonological representations and, for that reason, undesirable' (p. 173). In fact, the overall analysis using bare root nodes is simpler: the shape of lexical roots is determined by simple prosodification rather than (generally redundant) stipulation of a template. The learner needs to posit bare root nodes only in positions where full consonants also occur. The bare nodes are motivated in the analysis, and equally in the learner's grammar, primarily by two exceptional properties: resistance to Elision, and surface realization as derived vowel length. Thus bare root nodes permit a straightforward interpretation of rather complex alternations, while better capturing the empirical facts and maintaining a more constrained version of moraic theory.

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