The Historical Interpretation of Vowel Harmony in Bantu

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1. Introduction

Those of us who have assembled at this Table Ronde on Bantu Historical Linguistics share a number of interrelated historical and comparative concerns. First, we are concerned to define the Bantu group as a genetic unit and to determine the place of Narrow and Wide Bantu, Bantoid, etc. within the Benue-Congo branch of Niger-Congo. Second, as a related goal, we share an interest in refining Proto-Bantu (PB) reconstructions and therefore in establishing what was vs. was not present in the parent language. As part of this enterprise, language-internal and cross-linguistic examinations have been necessitated of the changes that have taken place in the ca. 500 Bantu languages. An oft expressed hope is that the variations characterizing Bantu languages can serve as reliable criteria for the internal sub-grouping of the family.

My paper shares all of this concerns. While those of us present (and others) have approached the above four issues in a number of ways, I would like to exemplify a particular strategy that has only occasionally been applied to Bantu, most notably in the work of Yvonne Bastin. This strategy is to focus on widespread phonological phenomena in Bantu that are conditioned in an unusual way by the morphology. Just as arbitrary features of a morphological system are cited as evidence for genetic relation, the idea

here is that phonological properties that have arbitrary—or at least unusual—morphological conditions may also serve this genetic marking function. The material for the kinds of studies I advocate here have been accessible for some time, mostly in dictionaries and lexicons, many of which we have acquired, created, or converted to electronic form as part of the Comparative Bantu On-Line Dictionary (CBOLD) project.[1] My purpose in this paper is twofold. First, I document the well-known process of vowel height harmony (VHH) throughout the (Narrow) Bantu domain. For this purpose I have created a Bantu vowel-harmony database which at the time of this writing contains information on 134 languages. Second, I attempt to show that a peculiarity of VHH, namely an asymmetry in how it operates in front vs. back vowels, is a useful criterion to subdivide Bantu into two groups, roughly approximating the Equitorial vs. Savanna Bantu split postulated by other researchers.[2] My tentative suggestion will be that this asymmetry was introduced into proto-Savanna Bantu after this split was effected.

2. Vowel height harmony

A process of vowel height harmony (VHH) has been documented in a wide range of languages from all parts of the Bantu zone. While widely occurring, VHH is subject to considerable variation. I refer to one pattern which occurs with significant frequency as "asymmetric" VHH in this paper. Assuming for the moment the Proto-Bantu (PB) seven-vowel system **i̯, *i, *e, *ʉ, *u, *o, *a* reconstructed by Meinhof and van Warmelo (1932), Guthrie (1967-71), Meeussen (1967) and others, the relevant asymmetry can be expressed diachronically as in (1).[3]

(1) Asymmetric vowel height har

a. front height harmony :

b. back height harmony :

As indicated, the degree 2 vowels *i degree 3 (mid) vowels, but with one both *e and *o, *u is lowered only VHH is observed directly in many original seven-vowel (7V) system F.22[4] in (2), where the applicative /- are illustrated after each of the se language:

(2) Nyamwezi F.22 (Maganga & S

a.	-βon-él-a	'see + appl'
b.	-zeeng-el-a	'build + ap
c.	-βis-ɪl-a	'hide + appl
	-pʊnd-ɪl-a	'bend + app
	-gub-ɪl-a	'put on lid -
	-shʊʊn-ɪl-a	'gnaw + ap
	-gaβ-ɪl-a	'divide + ap

In (2a) we see that both /ɪ/ and /ʊ/ however, only /ɪ/ is lowered after /e/. is no change after the vowels /i/, /ɪ/, occur in the vowel harmony databas Lega D.25, Holoholo D.28, Nande Rimi F.32, Kinga G.65, Nyakyusa N

In Bantu languages with five-v with *i̯ and *ʉ, respectively. The cor to show the same asymmetry as in se examples from Kisa E.32 in (3).

[1]Both CBOLD and lexical research on Bantu were supported in part by National Science Foundation grant no. SBR93-19415 and SBR96-16330. An earlier version of this paper was presented under the title "Reconstructing Bantu and its Evolution" at a workshop entitled "Pushing Back the Limits of Linguistic Prehistory: Methods, Tools and Results", which I co-organized with Jean-Marie Hombert at the University of California, Berkeley, June 22-23, 1995 under the sponsorship of the France-Berkeley Fund. I would like to thank John Lowe, the co-Principal Investigator of the CBOLD grant at Berkeley, for his considerable help and input to the present study. I would like also to thank the participants at both the Berkeley and the Lyon conferences for their helpful comments and suggestions—particularly Jean-Noël Mabiala for making his Kongo dialect database available to me.

[2]For discussion see Nurse's overview (this volume) as well as other papers in this volume (especially Ehret's).

[3]As we shall see below, this symbolization of the PB vowel system is equivalent to *i, *ɪ, *ɛ, *u, *ʊ, *ɔ, *a, as we find in Nyamwezi in (2), as well as in most seven vowel systems outside NW Bantu.

[4]Throughout this study I shall provide each cited language, indicating also cha some zone D and E languages into a n referential designations given to langua

[5]We probably should include in this cat D.28, within which "l'opposition phon degré (j,ʉ) et celles du second (i,u) est d

(1) Asymmetric vowel height harmony

a. front height harmony : *i > e / {e, o} C __

b. back height harmony : *u > o / o C __

As indicated, the degree 2 vowels **i* and **u* are lowered to **e* and **o* after degree 3 (mid) vowels, but with one difference: Whereas *i is affected after both **e* and **o*, **u* is lowered only after **o*. This front-back asymmetry in VHH is observed directly in many languages which have preserved the original seven-vowel (7V) system of PB. Such is the case in Nyamwezi F.22[4] in (2), where the applicative /-ɪl-/ and reversive transitive suffix /-ʊl-/ are illustrated after each of the seven vowels /i, ɪ, e, u, ʊ, o, a/ of the language:

(2) Nyamwezi F.22 (Maganga & Schadeberg 1992)

a.	-βon-él-a	'see + appl'	-hong-ól-a	'break off'
b.	-zeeng-el-a	'build + appl'	-zeeng-ʊl-a	'build'
c.	-βis-ɪl-a	'hide + appl'	-βis-ʊ́l-a	'find out'
	-pɪɪnd-ɪl-a	'bend + appl'	-pɪɪnd-ʊl-a	'overturn'
	-gub-ɪl-a	'put on lid + appl'	-gub-ʊ́l-a	'take off lid'
	-shʊʊn-ɪl-a	'gnaw + appl'	-shʊʊn-ʊl-a	'show teeth'
	-gaβ-ɪl-a	'divide + appl'	-gaβ-ʊl-a	'divide'

In (2a) we see that both /ɪ/ and /ʊ/ are lowered after /o/. As seen in (2b), however, only /ɪ/ is lowered after /e/. The examples in (2c) show that there is no change after the vowels /i/, /ɪ/, /u/, /ʊ/ and /a/. Eleven 7V languages occur in the vowel harmony database which exhibit the above asymmetry: Lega D.25, Holoholo D.28, Nande DJ.42, Kikuyu E.51, Sukuma F.21, Rimi F.32, Kinga G.65, Nyakyusa M.31 and Matumbi P.13.[5]

In Bantu languages with five-vowel (5V) systems, **i* and **u* merge with **į* and **ų*, respectively. The corresponding suffixes typically continue to show the same asymmetry as in seven vowel systems. Thus consider the examples from Kisa E.32 in (3).

[4]Throughout this study I shall provide the Guthrie reference letter+number for each cited language, indicating also changes proposed by Tervuren (e.g. shift of some zone D and E languages into a new zone J) or, in a few cases, Tervuren referential designations given to languages not included in Guthrie (1967-71).

[5]We probably should include in this category one additional language, Holoholo D.28, within which "l'opposition phonologique entre les voyelles du premier degré (į,ų) et celles du second (i,u) est de portée restreinte" (Coupez 1955:12).

(3) Kisa E.32 (Sample 1976)

a.	-tsom-el-a	'pierce + appl'	-tsom-ol-a	'pull out'
b.	-rek-el-a	'set trap + appl'	-rek-ul-a	'spring trap'
c.	-βis-il-a	'hide + appl'	-βis-ul-a	'reveal'
	-fu:ng-il-a	'lock + appl'	-fu:ng-ul-a	'unlock'
	-βa:mb-il-a	'spread out + appl'	-βa:mb-ul-a	'spread apart'

The examples in (3a) show the lowering of /i/ and /u/ after /o/, while in (3b) only /i/ lowers after /e/. Finally, these suffixes are realized with /i/ and /u/ after /i/, /u/ and /a/ in (3c). Within the Bantu vowel harmony database 46 languages attest this pattern. These include, among others: Rwanda (DJ.61), Rundi (DJ.62), Nyankore E.13/J.21, Ganda EJ.15, Haya EJ.22, Jita E.25, Shambaa G.22, Swahili G.42, Shi DJ.53, Cokwe K.11, Lwena K.14, Songye L.23, Luba-Kasai L.31a, Bemba M.42, Tonga M.64, Cewa N.31b, Yao P.21, and Shona S.11.[6] It is safe to say that this asymmetry is quite the rule among 5V Bantu languages.[7]

The languages just cited exemplify what I refer to as the "canonical" VHH system in Bantu. Whether having a 7V or a 5V system, canonical VHH is characterized by the following five properties:

(i) Canonical VHH has the above asymmetry. In other words, within asymmetric VHH there is an independence of front height harmony and back height harmony, as indicated in (1).

(ii) Canonical VHH is not conditioned by the degree 4 vowel /a/. Thus, assuming that VHH is a lowering process, as virtually all scholars do, /a/ fails to pattern with degree 3 vowels in conditioning VHH. Instead, by this criterion, /a/ patterns with degree 1 and 2 vowels.

(iii) Canonical VHH does not apply to /a/. Just as /a/ does not trigger lowering in canonical VHH, it also is not targeted for vowel harmony.

(iv) Canonical VHH does not apply to the final vowel (FV) morpheme. By final vowel I mean to refer both to the inflectional final vowels that occur on verbs, e.g. *-i, -e, -a*, according to tense/aspect etc., as well as final vowels used in derivational morphology, e.g. verb-to-noun derivation.

(v) Canonical VHH does not apply to prefix vowels. Thus, both noun class prefixes and inflectional prefixes on verbs (marking subject, tense/aspect, object etc.), fail to harmonize in languages with canonical VHH.

Defined this way, canonical VHH characterizes 57 languages in the vowel harmony database. As seen in Map 1, these languages are located in the Central and Eastern parts of the Ba the Shona group.

Map 1. Bantu Vowe

Languages, most of which fall out the canonical system by providing e defining characteristics, as summarized

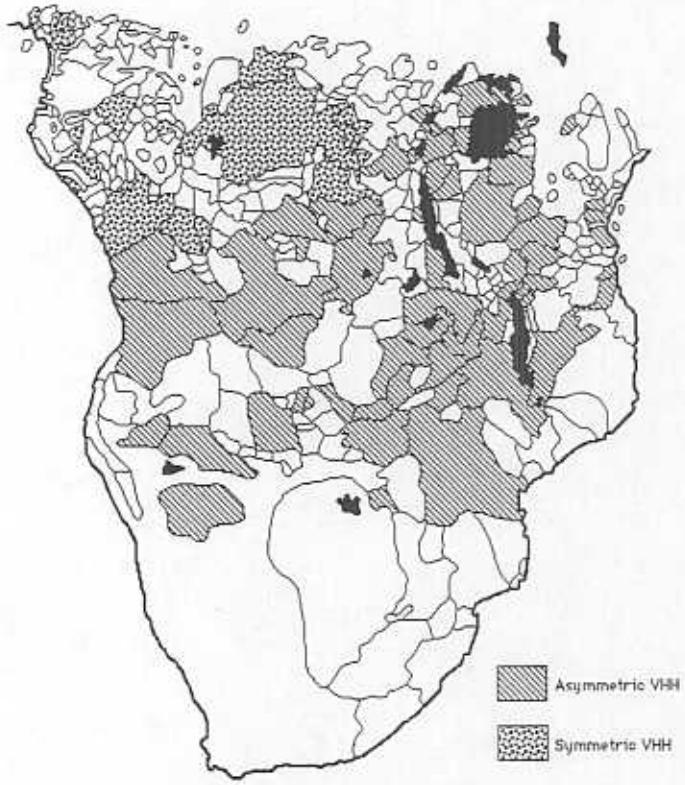
(i) Some languages have no VH Suku H.32, Mbala H.41, and Ruund I the distribution of mid vowels is sev

[6] As will be elaborated below, front-back differences in VHH are even more widespread than this list of languages would suggest.

[7] Quite strikingly, the only five-vowel Bantu languages that have *symmetric* VHH, i.e. with lowering of *u to [o] after *e as well as after *o, are to be found in zone H, e.g. certain Kongo H.10 dialects (see below).

[8] Enya D.14 (7V) and N. Binja D.26 (5 addition, Caga E.62 (5V) is generall productive suffixes such as applicative Philippson (personal communication) ha considerably more complex in po monomorphemic or which have tightly situations which obtain in zone S (exclus

the Central and Eastern parts of the Bantu region, extending as far South as the Shona group.



Map 1. Bantu Vowel Height Harmony

Languages, most of which fall outside this contiguous area, differ from the canonical system by providing exceptions to one or more of the five defining characteristics, as summarized below:

(i) Some languages have no VHH, e.g. Punu B.43, Lengola D.12,[8] Suku H.32, Mbala H.41, and Ruund L.53. In these languages, all with 5V, the distribution of mid vowels is severely restricted. Thus in Punu B.43,

[8]Enya D.14 (7V) and N. Binja D.26 (5V) may also belong to this group. In addition, Caga E.62 (5V) is generally believed to not have VHH, since productive suffixes such as applicative -i- do not harmonize. However, Gérard Philippson (personal communication) has pointed out to me that the situation is considerably more complex in polysyllabic forms which are either monomorphemic or which have tightly bound suffixes. Both Caga and similar situations which obtain in zone S (exclusive of Shona S.10) are discussed in §5.

"les phonèmes /e/ et /o/ ne se trouvent qu'en position initiale et radicale" (Kwenzi Mickala 1980:8). As a result, when not /a/, the vowel of a verb extension will always be [i] or [u], as seen in (4), from Blanchon (1995):[9]

(4) No VHH in Punu B.43

a.	-kil-il-a	'repasser'	b.	-kib-ul-a	'découvrir'
	-sub-il-a	'uriner sur'		-fung-ul-a	'révéler'
	-ded-il-a	'obéir à'		-tes-ul-a	'briser'
	-gol-il-a	'se frotter avec'		-dob-ul-a	'extraire, extirper'
	-gab-il-a	'distribuer à'		-gab-ul-a	'séparer'

(ii) Prefixes harmonize in Londo A.11, Bakweri A.22, Nen A.44, Gunu A.62, Koyo C.24, Bobangi C.32, Mongo C.61, Tetela C.71, Kela C.72, Ombo C.76, Budu D.35, Logooli E.41, and Gusii E.42. It is significant perhaps that all of these languages have 7V (except Budu, which has 9V). Harmony of the class 5 noun prefix /e-/ to [ɛ] and of the class 3 noun prefix /o-/ to [ɔ] are illustrated in (5) and (6), respectively, from Koyo C.24:[10]

(5) Harmony of class 5 /e-/ prefix in Koyo C.24

a.	e-símu	'scream'	b.	ɛ-bɛ	'thigh'
	e-túsi	'shoulder'		ɛ-sɛ́gɛ́	'hoe'
	e-bémbo	'debt'		ɛ-bɔ́gɔ́	'arm'
	e-kóró	'skin'		ɛ-sɔ́gɔ́	'hip'
	e-lagá	'promise'			

(6) Harmony of class 3 /o-/ prefix in Koyo C.24

a.	o-lingu	'love'	b.	ɔ-kɛsú	'stream'
	o-kulí	'hill'		ɔ-tɛrɔ	'basket'
	o-yélo	'morning'		ɔ-nɔgɔ	'mouth'
	o-kóro	'clothing'		ɔ-kɔ	'night'
	o-sanga	'rope'			

[9]Note that the only claim made about these languages is that they do not have vowel height harmony. They may in fact have other harmonies. Thus, Fontaney (1980) shows that postradical /a/ and /i/ assimilate to a following /u/, while /a/ also assimilates to a following /i/. She thus analyzes the suffix sequences -imin- and -umun- as /-am-il-/ and /-am-ul-/, respectively. Note in this context that postradical /a/ is actually realized as schwa in Punu, e.g. the FV in all of the examples in (4). Cf. below and Hyman (1998) for discussion of similar assimilations in Yaka.

[10]Based on Gazania (1972) and personal research conducted in Lyon with Mr. Yvon-André Ndzambo.

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(B.74b?), Leke C.14, and, in the perfe
H.31. Although we shall return to co
Yaka in §4, we illustrate VHH of the p

(7) Final vowel harmonizing in
Ruttenberg 1971)

a.	tsúb-idi	'vagabonder'
	kúd-idi	'chasser qqn'
	kík-idi	'barrer'
	kás-idi	'lier'

In addition, most languages that ha
harmonize the final vowel, e.g. Mongo

(iv) The asymmetry is not found
Gusii E.42, Kuria E.43, Beembe H
Mbundu H.21a (see Map 1). Whereas
obtain in one of the four relevant comb
environments in these languages (**eC*
symmetric VHH in Mongo-Nkundo C.
(5V) in (9):

(8) Symmetric VHH in Mongo-Nku

a.	-kɔt-ɛl-	'couper + appl
	-kɛnd-ɛl-	'aller + appl'
	-ét-el-	'appeler + app
	-tóm-el-	'envoyer + apı
	-íy-el-	'voler [steal] +
	-lúk-el-	'pagayer + apı
	-kamb-el-	'travailler + ap

(9) Symmetric VHH in S. Kongo

a.	-somp-el-a	's'attacher à'
	-leng-el-a	'dépérir, languir
	-sik-il-a	'soutenir, fortifie
	-vur-il-a	'surpasser, l'empo
	-land-il-a	'suivre'

Besides being found only among certain 7V languages, prefix harmony involves only degree 2 and 3 vowels. That is, /a/ is not involved, as it may be in progressive harmony (see below).

(iii) Among languages that restrict VHH to the stem, the final vowel harmonizes in the B.30 languages (Bobe, Bia, Pinzi etc.), Boma B.82 (B.74b?), Leke C.14, and, in the perfective only, in Kongo H.10 and Yaka H.31. Although we shall return to consider what is "really" going on in Yaka in §4, we illustrate VHH of the perfective final vowel in (7).

(7) Final vowel harmonizing in Yaka H.31 (van den Eynde 1968, Ruttenberg 1971)

a.	tsúb-idi	'vagabonder'	b.	kéb-ele	'faire attention'
	kúd-idi	'chasser qqn'		ték-ele	'vendre'
	kík-idi	'barrer'		sód-ele	'déboiser'
	kás-idi	'lier'		sób-ele	'changer'

In addition, most languages that have extended VHH to prefixes also harmonize the final vowel, e.g. Mongo C.61, Tetela C.71, Gusii E.42.

(iv) The asymmetry is not found in zones A-B-C and Mituku D.13, Gusii E.42, Kuria E.43, Beembe H.11, Vili H.16d, Laadi H.16f, and Mbundu H.21a (see Map 1). Whereas in asymmetric systems VHH fails to obtain in one of the four relevant combinations (**eCu*), it applies in all four environments in these languages (**eCi*, **eCu*, **oCi* and **oCu*). I illustrate symmetric VHH in Mongo-Nkundo C.61 (7V) in (8) and in S. Kongo H.10 (5V) in (9):

(8) Symmetric VHH in Mongo-Nkundo (7V) (Hulstaert 1965)

a.	-kɔt-ɛl-	'couper + appl'	b.	-mɔm-ɔl-	'décoller'
	-kɛnd-ɛl-	'aller + appl'		-mɔ́m-ɔl-	'déshonorer'
	-ét-el-	'appeler + appl'		-bét-ol-	'éveiller'
	-tóm-el-	'envoyer + appl'		-komb-ol-	'ouvrir'
	-íy-el-	'voler [steal] + appl'		-is-ol-	'découvrir'
	-lúk-el-	'pagayer + appl'		-kund-ol-	'déterrer'
	-kamb-el-	'travailler + appl'		-bák-ol-	'détacher'

(9) Symmetric VHH in S. Kongo (5V) (de Gheel 1652)

a.	-somp-el-a	's'attacher à'	b.	-tomb-ol-a	'faire monter'
	-leng-el-a	'dépérir, languir'		-lemb-ol-a	'barrer, effacer'
	-sik-il-a	'soutenir, fortifier'		-vil-ul-a	'mouvoir, remuer'
	-vur-il-a	'surpasser, l'emporter'		-bub-ul-a	'corrompre'
	-land-il-a	'suivre'		-bang-ul-a	'faire violence'

As before, the forms in (8a) and (9a) involve the applicative extension (**-id-*), while those in (8b) and (9b) contain the reversive transitive extension (**-ud-*). It is perhaps worth noting that the data in (9) are taken from de Gheel's (1652) dictionary of a southerly dialect of Kongo H.10 (cf. Laman 1936:lviii). Such dialects of Kongo appear to constitute the only 5V languages with symmetric VHH. This dictionary shows that they have had such harmony for at least three and a half centuries.

(v) Whereas in symmetric languages /a/ does not lower a following vowel, /a/ conditions VHH in Mbundu H.21a, Mbunda K.15, Kwangali K.33, Kwezo K.35, Dciriku K.62, Pende L.11/K.52, Mbundu R.11, Kwanyama R.21, Ndongo R.22, and Herero R.31, all 5V languages.[11] As seen in Map 2, these languages are roughly contiguous, belonging to zones K and R. The illustration in (10) comes from Pende:

(10) Front height harmony (front height harmony) in Pende L.11/K.52 (Niyonkuru 1978)

a.	-lomb-	'demander'	→	gu-lómb-él-a	'demander pour'
	-bemb-	'abandonner'	→	gu-bemb-el-a	'abandonner pour'
	-sas-	'hacher'	→	gu-sas-el-a	'hacher pour'
b.	-díg-	'vendre'	→	gu-díg-íl-a	'vendre pour'
	-túng-	'bâtir'	→	gu-túng-íl-a	'bâtir pour'

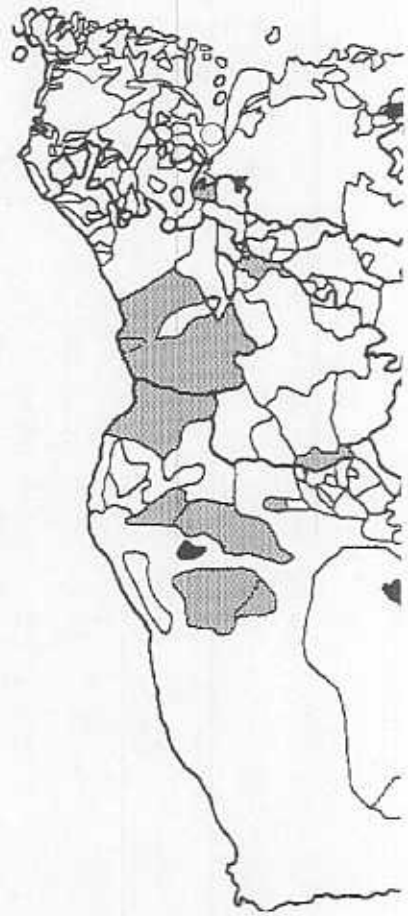
While these languages appear to have extended front height harmony, so that the change of /i/ to [e] also occurs after /a/, it should be noted that back height harmony is still restricted to occurring only after /o/:

(11) Back height harmony (back height harmony) of u/o only after /o/ in Pende (Gusimana 1972)

a.	gu-bóg-ól-a	'briser'	b.	gu-seng-ul-a	'absoudre'
	gu-nyóng-ólól-a	'tordre'		gu-shit-ul-a	'défaire (noeud)'
	gu-sómb-ól-óg-a	'sauter'		gu-vumb-ul-a	'déterrer'
				gu-kál-úg-a	'gémir'

[11] Boma B.74b (B.82?), a 7V language, may also fall in this category, though I have not been able to confirm this. Interestingly, Leitch (1996), in fact, shows that the stem sequences [aCɔ] and [aCɛ] are disallowed in favor of [aCe] and [aCo] in a number of zone C languages. Since we independently know that /a/ may become a trigger of retracted tongue root (RTR) harmony outside Bantu, e.g. in Akan (Clements 1985), Yoruba (Archangeli & Pulleyblank 1989) and Gokana (Hyman 1985), we expect that this might also be the case in some of the 7V languages, particularly in zone A. The fact that it is better attested in 5V languages in the Bantu vowel harmony database may only reflect the areal nature of the feature, i.e. characterizing languages in the Southwest part of the Bantu region.

This then provides another argument
harmony and back height harmony.



Map 2. Languages Lowe

(vi) /a/ undergoes vowel harmony
A.44, Gunu A.62, Kota B.25, Nzebi B.
Leke C.14, Koyo C.24, Mboshi C.
Ngombe C.41, Leku C.60, Bembe H.1
languages /a/ becomes [ɛ] after /ɛ/ and
with respect to the final vowel /-a/ in E
and (13), respectively:

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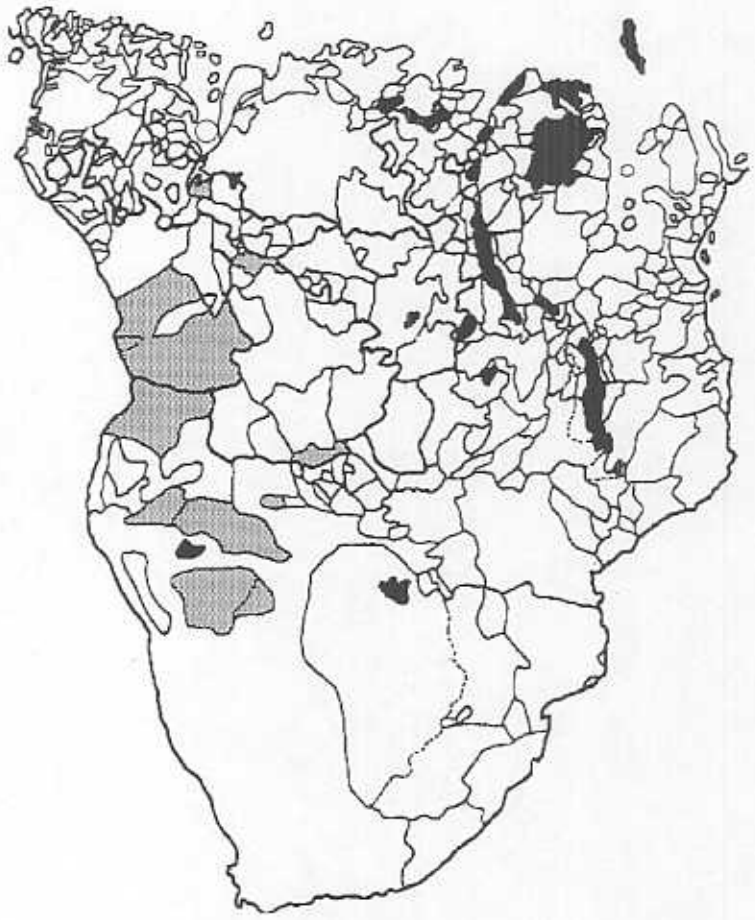

Map 2. Languages Lowering /i/ to [e] after /a/

(vi) /a/ undergoes vowel harmony in Londo A.11, Bakweri A.22, Nen A.44, Gunu A.62, Kota B.25, Nzebi B.52, Tiene B.81, Boma B.74b (B.82), Leke C.14, Koyo C.24, Mboshi C.25, Doko C.31, Lingala C.36d, Ngombe C.41, Leku C.60, Bembe H.11, and Lwalwa L.00. In all of these languages /a/ becomes [ɛ] after /ɛ/ and/or [ɔ] after /ɔ/. This is illustrated with respect to the final vowel /-a/ in Bakweri A.22 and Koyo C.24 in (12) and (13), respectively:

(12) Harmonizing of /a/ in Bakweri A.22 (Hawkinson 1985)

a.	li-sík-a	'to groan/groaning'	b.	i-lɛmb-ɛ́	'to laugh'
	li-túṭ-a	'to sweep'		i-kɔ́m-ɔ	'to beat'
	i-kot-á	'to light'			
	i-vend-á	'to plait'			
	i-fáf-a	'to hit'			

(13) Harmonizing of /a/ in Koyo C.24 (Gazania 1972)

a.	i-yís-a	'to hide'	b.	i-dzɛg-ɛ	'to laugh'
	i-kund-a	'to plant'		i-lɔg-ɔ	'to bewitch'
	i-wóg-a	'to hear'			
	i-yég-a	'to learn'			
	i-lámb-a	'to cook'			

Of course, by definition, such harmonizing of /a/ is absent in languages that I have characterized as having "canonical" VHH.[12]

With so many parameters, one might ask what is not found? Or, which combinations of features are found only rarely. First, three departures from canonical VHH are restricted to languages with 7V:

(i) All languages having prefixal VHH have 7V. None has 5V.

(ii) All languages having final-VHH have 7V. None has 5V.

(iii) Among the 19 languages in the database that harmonize /a/, all have 7V except Bembe H.11 and Lwalwa L.00.

On the other hand, all of the languages where /a/ conditions vowel lowering have 5V. In addition, of the 18 languages lacking VHH, only 3 have 7V: Duala A.24, Wongo C.85, Enya D.14.

Our focus here is on the front-back asymmetry in VHH. All languages that lack the asymmetry have in fact 7V except for dialectal Kongo H.10.[13] It is interesting that no language has been found with asymmetric VHH and either prefixal harmony or final-vowel harmony. It seems that the asymmetric pattern is limited to languages where VHH affects only the base—i.e. the stem minus the final vowel (Meeussen 1967). As we shall further justify below, the specific asymmetric pattern is a property only of stem-internal VHH. That is, height harmony of the final vowel and prefixes,

[12]It is not clear whether we should view the harmonizing of /a/ as VHH, with which it frequently, though not necessarily, co-occurs. One argument from Koyo for distinguishing the two is that whereas /ɛ, ɔ/ harmonize to [ɔ,ɛ] in prefixes (as well as in suffixes), as we saw in (5), /a/ harmonizes only in suffixes. Thus we obtain the class 6 plural nouns a-bɛ́ɛ 'breasts' (not *ɛ-bɛ́ɛ), and a-lɔ́ɔ 'thorns' (not *ɔ-lɔ́ɔ).

[13]For discussion of Yaka, see Hyman (1998) and below.

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[15]In §5 I shall propose an alternative,

ri A.22 (Hawkinson 1985)

ining' b. i-lɛmb-é 'to laugh'
i-kɔ́m-ɔ 'to beat'

2.24 (Gazania 1972)

b. i-dzɛg-ɛ 'to laugh'
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;1998) and below.

when occurring, is strictly symmetric—and, as we have said, typically requires a 7V system.

Before turning to that issue, let us provide further evidence of the independence of front height harmony and back height harmony. First, a group of Southern Bantu languages that includes Lozi K.21/S.34, Luyana K.31, Mbukushu K.33, Makua P.31 and all of zone S except Shona S.10 (e.g. Venda S.21, Tswana S.31, Nguni S.40) lack front height harmony . In these languages the applicative suffix contains an invariant mid vowel /ɛ/, while the causative suffix contains a non-alternating high vowel /i/. In each case, however, *u/o* harmony after [o] is either fully productive, as in asymmetric languages, or is statistically prevalent. For example, in Lozi (5V), "the allodesinence /-ol-/ [and its doubled realization /-olol-/—LMH] occurs with most radicals having radical vowel /o/" (Gowlett 1967:64). Elsewhere one obtains /-ul-/ and /-ulul-/. Hence: *-bóf-a* 'tie' → *-bof-ólol-a* 'untie, release' vs. *-fung-a* 'tie a beast' → *-fung-ulul-a* 'untie a beast'. On the other hand, the applicative is always *-el-*, while the causative is always *-is-*, i.e. neither undergoing VHH. In Mbukushu K.33b (5V), the applicative again has a mid vowel, *-er-* (→ *-en-* after a nasal) and the causative a high vowel -ith- (Fisch 1977:123). However, while these front vowels are exempt from VHH, /u/ is realized [o] after /o/, [u] after /i, e, u, a/. Thus, the reversive suffix and its double alternate between *-or-* (~ *-on-*) and *-ur-* (~ *-un-*): *-ter-a* 'einfüllen', *-ter-ur-a* 'Topf vom Feuer entfernen' vs. *-tong-a* 'stöhnen', *-tong-onon-a* 'beichten'.

It is striking that no Bantu language has front height harmony without back height harmony.[14] We thus see that front height harmony can either be extended to applying after /a/, as in zones K and R, or can be absent, as in Southern Bantu, without any necessary effect on back height harmony. Assuming, following Meeussen (1967), that these harmony systems were once "canonical" in the sense of (1), these examples show that Bantu languages can and do separate front height harmony and back height harmony in their histories.[15] The important observation is that even when a language restructures the inherited situation, a front-back asymmetry typically survives. As another example, consider the possible vowel combinations in Matuumbi P.13 (7V) shown in the table in (14).

[14]The one counterexample I once believed to exist is Sukuma F.21 (7V). In this langauge the applicative varies as expected between -el- and -ɛl- (Batibo 1985:167) as does the neuter/stative -ek-/-ɛk- (p.168). The causative also shows VHH but with a slightly more complex pattern: -is-y- after /i, u, a/, -ɛs-y- after /e, o/ and -ɛs-y- after /ɛ, ɔ/. Although the same source appears to report that the reversive /-ol-/ is used as such after all vowels, Batibo (personal communication) has clarified that indeed it lowers to -ɔl- after /ɔ/.

[15]In §5 I shall propose an alternative, namely that PB lacked FHH entirely.

(14) V + XV (postradical vowel) in Matuumbi P.13 (Odden 1996)

V/XV	i̱	i	e	ʉ̱	u	o	a
i̱	x	—	—	x	—	—	x
ʉ̱	x	—	—	x	—	—	x
i	—	x	—	—	x	—	x
u	—	x	—	—	x	—	x
e	—	—	x	x	—	—	x
o	—	—	x	—	—	x	x
a	x	—	—	x	—	—	x

As seen, any of the seven vowels can be followed by postradical /a/, which we can set aside. The restrictions in force are as follows: First, degree 1 high vowels /i̱, ʉ̱/ are followed by another degree 1 high vowel, while the degree 2 high vowels /i, u/ are followed by another degree 2 high vowel. This much is symmetric. On the other hand the degree 3 vowels /e/ and /o/ have asymmetric properties: /e/ can only be followed by /e, ʉ̱/, while /o/ can only be followed by /e, o/. Finally, degree 4 /a/ can only be followed by /i̱, ʉ̱/. Whereas in other 7V languages the default high vowels are degree 2 (cf. Nyamwezi in (2) above), in Matuumbi the default high vowels are degree 1, or [+ATR].[16]

This completes the initial survey of VHH. We now turn to questions of reconstruction.

3. Reconstruction of the Proto-Bantu vowel system

The question that arises in the face of the variations outlined in §2 is: What should we reconstruct and for whom? All Bantu? Some subgroup? The problem of whether to reconstruct VHH for PB, and if so, which kind (e.g. symmetric? asymmetric?) is compounded by questions concerning the nature of the vowels themselves in Proto- and pre-Proto-Bantu. We take up these two issues in this and the following section.

While most scholars agree that PB had a system with seven vowels, occasional suggestions of more vowels, either nine or ten, have been heard:

> ...it seems most likely that proto-Bantu had a classic system of CHVH [cross-height vowel harmony—LMH] with nine (or possibly ten) vowels, and that it inherited this system largely unchanged from proto-Volta-Congo. (Stewart and van Leynseele 1979:51)[17]

> La forme à neuf voyelles est notamment attestée dans le groupe Akan de Greenberg, 1963. Stewart 1970, qui désigne ce groupe sous le nom de Volta-Comoe, a émis l'hypothèse qu… en sont issues. Une hypothèse anal… proprement bantous, à savoir l'altern… bantoues contemporaines par rapp… reflétant le premier degré avec de… (Coupez 1980:67)

Even sticking with the traditional vie… systems in (15) should be reconstructed…

(15) a. i̱ ʉ̱ b. i
i u ɪ
e o ɛ
a

I assume that the standard Bantu recon… 1980[1969]) and Guthrie (1967-71) i… phonetically transcribed vowels in (15… was an opposition between tense and la… degree 2 vowels are interpreted to be la… lax, although there is no opposition. In… opposition in tense-laxness (or [ATR… vowels: In this system degree 2 vowels… vowels are lax mid vowels. The qu… reconstruct, (15b) or (15c)?

Part of the difficulty in deciding b… be seen in the inconsistencies that appe… of different Bantu languages. First, the… analysis uses (15b), while pointing o… system is (15c). Thus, Kuperus (1985:… u, ʊ, o, a/, rather than orthographic /i… vowels written *e,o* in Londo *sound* like… *e,o*, but they function like the [-ATR… Therefore ATR is used, rather than, say… analyzes Mituku D.13 with /i̱, i, e, ʉ̱, ɪ… vowels are phonetically [i, e, ɛ, u, o, ɔ…

In other cases authors are upfront… & Schadeberg (1992:26) symbolize the… /i, ɪ, e, u, ʊ, o, a/, but add: "We have… whether the difference between i and ɪ… other is to be analyzed as an [Advance… of various degrees of vowel height."

What seems to be part of the diffi… often more close, i.e. more similar to d… author's preferred transcription in (15c)… following three languages symbolized … the following observations:

[16]For the same reason noun prefixes contain the vowels /i̱/ and /ʉ̱/, not /i/ and /u/. This interpretation differs from that given by Odden (1996), who assumes that the [+ATR] is prespecified.

[17]Stewart (1983) has since come back to his original position (Stewart 1970) that Bantu had 7 vowels, specifically those in (15a,b).

> Volta-Comoe, a émis l'hypothèse que les sept voyelles du protobantou en sont issues. Une hypothèse analogue semble se dégager de faits proprement bantous, à savoir l'alternance, dans les réflexes des langues bantoues contemporaines par rappart au protobantou, de voyelles reflétant le premier degré avec des voyelles reflétant le troisième. (Coupez 1980:67)

Even sticking with the traditional view, as I shall do, which of the 7V systems in (15) should be reconstructed?

(15)

a.			b.			c.		
ɪ	ʊ		i	u		i	u	
i	u		ɪ	ʊ		e	o	
e	o		ɛ	ɔ		ɛ	ɔ	
a			a			a		

I assume that the standard Bantu reconstructed system of Meeussen (1967, 1980[1969]) and Guthrie (1967-71) in (15a) is meant to symbolize the phonetically transcribed vowels in (15b). As seen, it is assumed that there was an opposition between tense and lax (or [±ATR]) high vowels. That is, degree 2 vowels are interpreted to be lax high vowels. Mid vowels are also lax, although there is no opposition. In (15c), on the other hand, the proto opposition in tense-laxness (or [ATR]) is assumed to be among the mid vowels: In this system degree 2 vowels are tense mid vowels, while degree 3 vowels are lax mid vowels. The question, then, is which system to reconstruct, (15b) or (15c)?

Part of the difficulty in deciding between these two interpretations can be seen in the inconsistencies that appear in present-day synchronic analysis of different Bantu languages. First, there are studies where the phonological analysis uses (15b), while pointing out that the corresponding phonetic system is (15c). Thus, Kuperus (1985:58) analyzes Londo A.11 with /i, ɪ, e, u, ʊ, o, a/, rather than orthographic /i, e, ɛ, u, o, ɔ, a/, explaining: "The vowels written *e,o* in Londo *sound* like the [+ATR] vowels usually written *e,o*, but they function like the [-ATR] vowels usually written ɪ,ʊ or ɛ,ɔ. Therefore ATR is used, rather than, say, mid." Similarly, Stappers (1973:3) analyzes Mituku D.13 with /ị, i, e, ụ, u, o, a/, though pointing out that the vowels are phonetically [i, e, ɛ, u, o, ɔ, a].

In other cases authors are upfront about the difficulty. Thus, Maganga & Schadeberg (1992:26) symbolize the vowel system of Nyamwezi F.22 as /i, ɪ, e, u, ʊ, o, a/, but add: "We have no phonetic evidence for deciding whether the difference between i and u on the one hand and ɪ and ʊ on the other is to be analyzed as an [Advanced Tongue Root] distinction or as one of various degrees of vowel height."

What seems to be part of the difficulty is that the degree 2 vowels are often more close, i.e. more similar to degree 1 vowels, phonetically, than an author's preferred transcription in (15c) would suggest. Thus, concerning the following three languages symbolized with /i, e, ɛ, u, o, ɔ, a/, authors make the following observations:

(i) Bobe B.30: "Les voyelles du second degré d'aperture sont très fermées... et tendent pour cette raison à être confondues avec les voyelles correspondantes du premier degré" (van der Veen 1991:60).

(ii) Doko C.31: "Les voyelles du second degré sont phonétiquement plus proches de celles du premier degré que celles du troisième degré" (Twilingiyimana 1984:3).

(iii) Kela C.75: u/o are "très proches phonétiquement" (Forges 1977:27).

The literature thus shows not only possible disagreement, but also confusion over the phonetics and phonology of the above cited and other Bantu vowel systems. In fact, all three of the systems in (15) have been used to describe individual Bantu languages. A sample of 46 7V systems in the vowel harmony database can be summarized as follows:

(i) 6 languages are symbolized with /ị, i, e, ụ, u, o, a/: Ombo C.76, Mituku D.13, Holoholo D.28 (6V), Bira D.32, Nande D.42 (7V → 9V phonetically), Matuumbi P.13.

(ii) 6 languages are symbolized with /i, ɪ, e, u, ʊ, o, a/: Londo A.11, Logoli E.41, Kikuyu E.51, Nyamwezi F.22, Rimi F.32, Kinga G.65.

(iii) 33 languages are symbolized with /i, e, ɛ, u, o, ɔ, a/: Bakweri A.22, Duala A.24, Basaa A.43, Gunu A.62, Seki B.22, Kota B.25, Bobe B.30, Pinzi B.30, Himba B.30, Bia B.30, Tsogo B.31, Kande B.32, Nzebi B.52, Tiene B.81, Boma B.82, Leke C.14(6?), Koyo C.24, Mboshi C.25, Doko C.31, Bobangi C.32, Lingala C.36d, Ngombe C.41 (6), Bango C.44, Leku C.60, Mongo C.61, Tetela C.71, Kela C.75, Wongo C.85, Lega D.25, Gusii E.42, Kuria E.43, Sukuma F.21, Nilamba F.31.

(iv) One language, Enya D.14, is transcribed as /ị i e ụ u o a/ by Koloni (1971) but as /i e ɛ u o ɔ a/ by Spa (1973).

(v) In addition to the above, there are 4 9V languages described with [±ATR] in both high and mid vowels: Budu D.35, Konzo D.41, Tswana S.31, Sotho S.33. In the last two languages, the 8th and 9th vowels /e/ and /o/ can in many cases be interpreted as a tensing of /ɛ/ and /ɔ/ before higher vowels, or before /ʦ/ and /ʤ/ in a fairly transparent way. Konzo D.41, on the other hand, most likely derives these vowels by spreading of [+ATR] from /i, u/, as in mutually intelligible Nande D.42, which I placed in the first group with 7 underlying vowels.

Since the transcriptions in (15a) and (15b) have been said to be equivalent, the first two groups above can be combined to provide 12 7V systems (out of 46) that have been symbolized with a tense-lax opposition in the high vowels (i.e. orthographically, not necessarily "phonologically"). That leaves 34 7V systems for which a tense-lax opposition is instead posited among mid vowels. It would appear that (15c) is more frequently used to transcribe NW Bantu languages (zones A-D), while (15b) is more restricted to Eastern Bantu. However, it is hard to make reliable generalizations from this small sample, particularly as the first group, utilizing (15a), consists largely of a Matuumbi P.13).[18]

Of course one question we should of the vowel arrays in (15) represents relevant opposition is one between h above citations indicate, many researche the proper analysis of individual langua on vowel features even attempt a unif ATR. Clements' (1991), for instance, p the single feature [open] as a uniform height [including ATR]. However, l distinguishing (15b) and (15c).

While some Bantuists have se transcriptions of seven proto-vowel question. Perhaps the most thoughtful who argues that (15b) is the more likel

> The situation in Volta-Comoe langua the plausibility of the possible post-I for the plausibility of the possible (p.349)

> It is worth pointing out that, in the use of the symbols *i, i, e, a, o, u, u* Common Bantu starred forms is mos

What this would mean is that lan o, u/ would have had to have develope a later article, Stewart (1983:22-23) rea

> I suggest that a sound change *e, o* > this case would not have been phonetically). In the first place the marked than the replaced sounds, an case in which the change can be clea

The idea here is that the widely a would not by itself change to the hi Stewart's intuition re the relative mark out by Maddieson (1984), who report opposition in ATR in the high vowel in the mid vowels.[19]

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[18] One would also have to make sure that training that the researchers obtained an that they studied.

[19] These are Kpelle, Dani and Kunama. L however, has informed me that Kunam

utilizing (15a), consists largely of a group of Zairian languages (plus Matuumbi P.13).[18]

Of course one question we should consider is whether it matters which of the vowel arrays in (15) represents the proto system, i.e. whether the relevant opposition is one between high vowels or mid vowels. As the above citations indicate, many researchers have found it difficult to decide on the proper analysis of individual languages. In addition, certain recent views on vowel features even attempt a uniform treatment of vowel height and ATR. Clements' (1991), for instance, proposes an aperture theory based on the single feature [open] as a uniform phonological dimension of vowel height [including ATR]. However, his theory is still also capable of distinguishing (15b) and (15c).

While some Bantuists have seen an equivalence in these two transcriptions of seven proto-vowels, others have taken sides on the question. Perhaps the most thoughtful response is seen in Stewart (1970), who argues that (15b) is the more likely reconstruction:

> The situation in Volta-Comoe languages... provides strong evidence for the plausibility of the possible post-Bantu shift (*i, u*) → ɩẹ, ọl but none for the plausibility of the possible post-Bantu shift (ẹ, ọ) → li, ul. (p.349)
>
> It is worth pointing out that, in the light of this, Professor Guthrie's use of the symbols *i̩, i, e, a, o, u, u̩* rather than *i, e, ɛ, a, ɔ, o, u* in his Common Bantu starred forms is most fortunate. (p.350)

What this would mean is that languages with the system /i, e, ɛ, a, ɔ, o, u/ would have had to have developed it from earlier /i, ɪ, e, u, ʊ, o, a/. In a later article, Stewart (1983:22-23) reaffirms his position:

> I suggest that a sound change *e, o* > ɪ, ʊ which is not a merger (and in this case would not have been a merger) is highly implausible phonetically). In the first place the replacing sounds are more highly marked than the replaced sounds, and in the second place I know of no case in which the change can be clearly shown to have occurred.

The idea here is that the widely attested 7V system /i, e, ɛ, u, o, ɔ, a/ would not by itself change to the highly marked one /i, ɪ, e, u, ʊ, o, a/. Stewart's intuition re the relative markedness of /i, ɪ, e, u, ʊ, o, a/, is borne out by Maddieson (1984), who reports only three languages which have an opposition in ATR in the high vowels without a corresponding opposition in the mid vowels.[19]

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[18]One would also have to make sure that the numbers aren't affected by either the training that the researchers obtained and what was the practice during the time that they studied.

[19]These are Kpelle, Dani and Kunama. Lionel Bender (personal communication), however, has informed me that Kunama does not have this vowel system, but

Besides the examples of the reverse changes in Volta-Comoe discussed by Stewart (1970), Mould (1981:187) suggests the same change to have occurred in Luhya E.40:

> Gusii and Logooli have seven vowel systems by virtue of being Bantu.... Gusii and evidentally all of East Nyanza (e.g. Kuria)... show other adjustments to the system: *i, i, e, ɵ, u, o, a > i, e, ɛ, u, o, ɔ, a.*

It is perhaps significant for our purposes that languages that are agreed unambiguously to have the vowel system /i, e, ɛ, u, o, ɔ, a/ all have symmetric VHH: If their vowel system has been altered since PB, perhaps their vowel harmony system has as well?

Although he uses the transcriptions in (15a) in presenting his comparative series of "Common Bantu" roots, Guthrie (1967) presents two arguments in favor of reconstructing (15c) as the likely pronunciations of these vowels in PB. The first argument is one of frequency:

> ...this series [(15c)—LMH] is the most widespread (series (2) [(15a)] occurring mainly in D.20, 40, 50, F.20, M.10, N.10 and P.10), and in consequence is likely to be closer to the original. (p.61)

However, this may be only the result of the fact that there are so many 7V languages clustered in the Northwest, where (15c) is the normal transcription (see above). In any case, as Stewart (1983) points out, frequency should not be the major guide to reconstruction. My own feeling, in fact, is that if the argument of frequency is relevant at all, it leads to the opposite conclusion: Given that /i, ɪ, e, u, ʊ, o, a/ is an unusual system, it would make more sense to reconstruct it once in PB—or innovate it once—rather than seeing it evolve independently in different Bantu subgroups.[20]

Guthrie's second argument is the following: If *[i, e, ɛ, u, o, ɔ, a] is reconstructed, then the change of this 7V system to [i, ɪ, e, u, ʊ, o, a] could be seen as an intermediate step on the way to the widely occurring 5V system [i, e, u, o, a]. By Guthrie's reasoning, two sets of sound changes would have occured, as in (16a).

(16)	a.	*e, *o	>	ɪ, ʊ	>	i, u
	b.	*ɪ, *ʊ	>	e, o	>	i, u
	c.	*ɪ, *ʊ	>	e, o		
	d.	*ɪ, *ʊ	>	i, u		

The mid vowels *e, *o are first "closed" to [ɪ, ʊ] and then again to [i, u]. The idea here is that [ɪ, ʊ] are logically mid-way between [e, o] and [i, u],

rather a 5V system with a tense/lax opposition. Interestingly Welmers (1962) transcribes Kpelle as /i, e, ɛ, u, o, ɔ, a/.

[20]The same argument will be made concerning asymmetric VHH: Since it is rare, I propose that it evolved only once, perhaps spreading through contact, rather than arising independently in different Bantu languages.

hence both the change within 7V s distinction between degree 1 and 2 process. By contrast, a reconstruction would not expect the lax high vowels then become high. Of course an e changes could be as follows: Let perceptual problem found in many B were very close perceptually to degr could have done one of two things. vowel space as in (16c): *ɪ, *ʊ becam second, they could simply have merg a 5V system. The result would be thr with the original system in (15b); (ii (15c); and (iii) those with the derived of course, attested, although Guthrie in distribution. Rather than pr reconstruction, (15b) could be the somewhat fewer languages because of of course related to Stewart's argume *e, o > ɪ, ʊ* is less natural than the reve also to be attested in the history of the

What other evidence might on choosing the appropriate vowel syst slight argument in favor of (15b) deri 2 vowels merge with degree 1 vowels with the degree 3 vowels *ɛ and *ɔ. A a wide (largely contiguous) area withi of Guthrie 1967:66). The argument distinction among high vowels is to b shifts of the sort Mid > High (althoug this context is the fact that the merge same for long vowels and short vowe of vowel height, one might expect sli laxness) and perhaps a merger patte vowels. A constant ATR specificatio consistent with the observed facts.

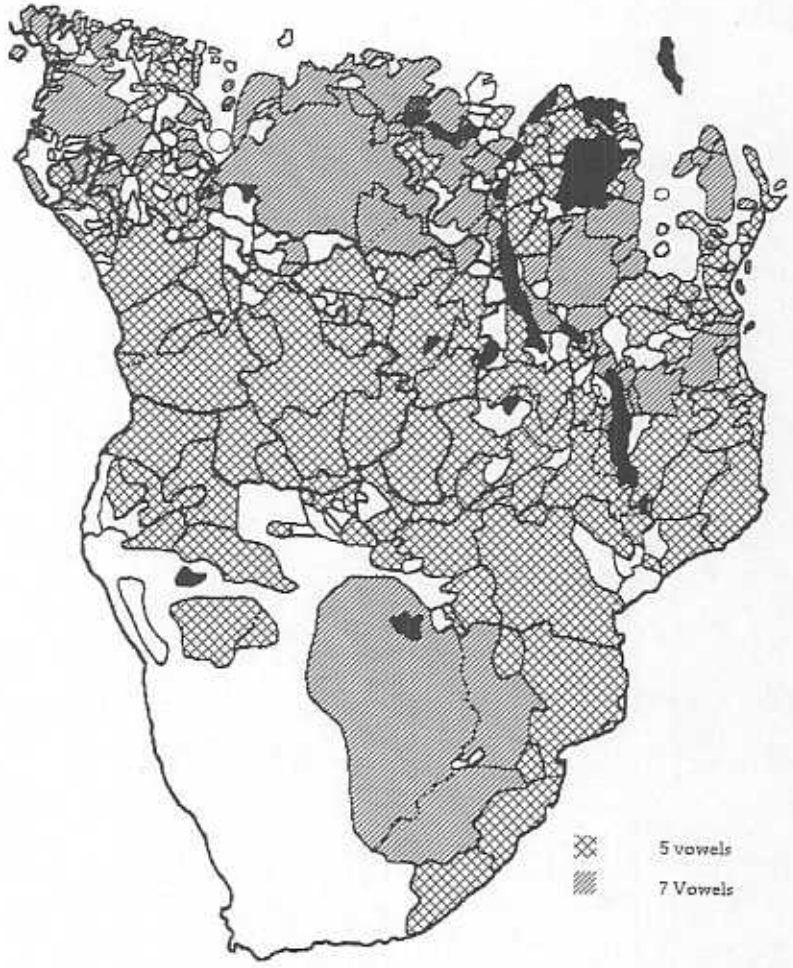
On the other hand, the same rea (15b) and in favor of (15c). If degree 2 of height similarity, then why do deg instead assume the proto system /i, e expected to harmonize with /ɛ, ɔ/, fro this argument, the degree 2 vowels /e, u/, because this is not height harm contrast, if we assume that the degree 2 with *e and *o, phonetically *[ɛ] and

hence both the change within 7V systems (to [e, o]) and the loss of the distinction between degree 1 and 2 vowels are actually part of the same process. By contrast, a reconstruction as in (16b) would not be coherent: We would not expect the lax high vowels to first become tense mid vowels and then become high. Of course an equally likely explanation of the two changes could be as follows: Let us assume that PB already had the perceptual problem found in many Bantu languages today: Degree 2 vowels were very close perceptually to degree 1 vowels. As a response, languages could have done one of two things. First, they could have reshaped the vowel space as in (16c): *ɪ, *ʊ became [e, o] (and *e, *o became [ɛ, ɔ]). Or, second, they could simply have merged *ɪ, *ʊ with *i, *u, thereby yielding a 5V system. The result would be three types of Bantu languages: (i) those with the original system in (15b); (ii) those with the derived 7V system in (15c); and (iii) those with the derived 5V system /i, u, e, o, a/. All three are, of course, attested, although Guthrie claims that (15b) is the most restricted in distribution. Rather than providing an argument against its reconstruction, (15b) could be the original vowel system maintained in somewhat fewer languages because of the natural changes in (16c,d). This is of course related to Stewart's argument in favor of (15b): a sound change of *e, o* > ɪ, ʊ is less natural than the reverse change ɪ, ʊ > *e, o*, which he argues also to be attested in the history of the Volta-Comoé languages.

What other evidence might one bring to bear on the question of choosing the appropriate vowel system for PB, (15b) or (15c)? Perhaps a slight argument in favor of (15b) derives from the fact that the proto degree 2 vowels merge with degree 1 vowels in so many Bantu languages—rarely with the degree 3 vowels *ɛ and *ɔ. As seen in Map 3, this has occurred in a wide (largely contiguous) area within the Bantu zone (cf. also Topogram 1 of Guthrie 1967:66). The argument here is that the loss of a tense/lax distinction among high vowels is to be expected, perhaps more than vowel shifts of the sort Mid > High (although these too occur). Perhaps relevant in this context is the fact that the merger of PB degree 1 and 2 vowels is the same for long vowels and short vowels. If the original opposition were one of vowel height, one might expect slight differences in quality (e.g. tense-laxness) and perhaps a merger pattern that is different for long vs. short vowels. A constant ATR specification independent of vowel length is thus consistent with the observed facts.

On the other hand, the same reasoning can be used to argue against (15b) and in favor of (15c). If degree 2 vowels merge with degree 1 because of height similarity, then why do degree 2 and degree 3 harmonize? If we instead assume the proto system /i, e, ɛ, u, o, ɔ, a/, then /e, o/ would be expected to harmonize with /ɛ, ɔ/, from which they differ only in ATR. By this argument, the degree 2 vowels /e, o/ do not harmonize with degree 1 /i, u/, because this is not height harmony, but rather ATR harmony. By contrast, if we assume that the degree 2 vowels were *ɪ and *ʊ, harmonizing with *e and *o, phonetically *[ɛ] and *[ɔ], this would have been a height

harmony between [-ATR] high and mid vowels. Cross-linguistically, ATR harmony of mid vowels is more expected than height harmony of [-ATR] vowels.



Map 3. 7 vs. 5 Vowels in Bantu Languages

To summarize, (15b) slightly better accounts for the merger of degree 1 and 2 vowels, while (15c) appears to much better account for VHH. So, perhaps the balance is tilted slightly in favor of */i, e, ɛ, u, o, ɔ, a/, which is typically preferred both as a static system as well as a degree 2-3 harmony system. It is important to note, however, that the second part of the conclusion in favor of (15c) depends crucially on there having been VHH in PB, the issue which I address in §4. Another issue: languages with the

vowel system /i, e, ɛ, u, o, ɔ, a/ and AT
back asymmetry so prevalent in Ea
asymmetric VHH bear on the question o
answer depends on whether asymme
reconstructed at the PB level. This is
section.

4. Reconstruction of vowel harmo

The question that we must now addres
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PB did not have VHH.[21] Virtually eve
issue agrees that VHH should be reconstr

> ...vowel harmony goes back to Prot
> found widely in Africa outside of the
> that systems similar to that of Prc
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> the African continent and from langua
> demonstrable genetic relation to each
> group, Lotuko). (Greenberg (1951:818

> Bien que les phénomènes d'harmoni
> répandus dans le monde et puissent ap
> par convergence, il semble que le pas
> troisième degré d'aperture puisse être
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While Stewart (1970) had once hypo
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> We now have good reason, then, to
> advancing harmony in any form, bu
> segmental feature category and th
> developed advancing harmony in one
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> height harmony as in the case of th
> with symmetric VHH—LMH], or b
> vowels to any +Advanced vowel in th
> height harmony as in the case of Nen"

The next question therefore is whether
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[21] A fourth possibility not considered here
from either of those under discussion
possibility that PB had other than a 7V sy

vowel system /i, e, ɛ, u, o, ɔ, a/ and ATR harmony do not show the front-back asymmetry so prevalent in Eastern Bantu. Could the issue of asymmetric VHH bear on the question of which system to reconstruct? The answer depends on whether asymmetric VHH (or any VHH) can be reconstructed at the PB level. This issue is taken up in the following section.

4. Reconstruction of vowel harmony in Proto-Bantu

The question that we must now address is: What kind of vowel harmony system existed in PB? There are at least three potential answers that must be considered: (i) PB had asymmetric VHH; (ii) PB had symmetric VHH; (iii) PB did not have VHH.[21] Virtually everyone who has commented on the issue agrees that VHH should be reconstructed for PB:

> ...vowel harmony goes back to Proto-Bantu.... vowel harmony... is found widely in Africa outside of the Bantu languages. It is noteworthy that systems similar to that of Proto-Bantu, in that they involve harmonisation of levels, have been described from distant portions of the African continent and from languages which in some cases have no demonstrable genetic relation to each other" (e.g. Twi, Ibo, Moru-Madi group, Lotuko). (Greenberg (1951:818-819).

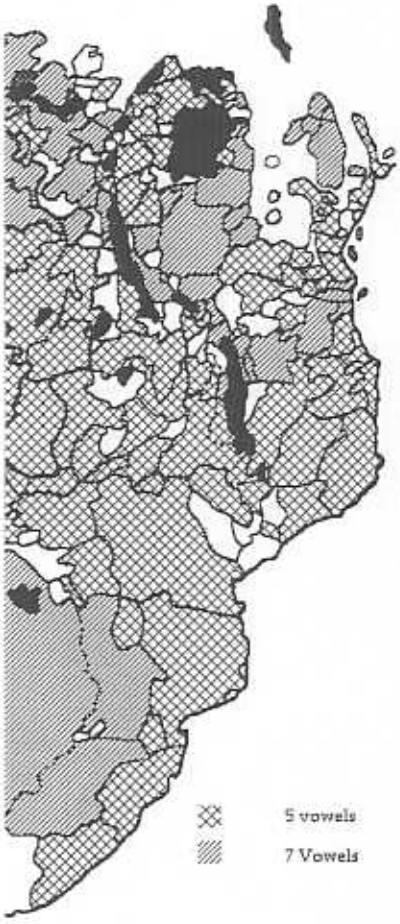
> Bien que les phénomènes d'harmonie vocalique soient très largement répandus dans le monde et puissent apparaître de manière indépendente par convergence, il semble que le passage de i à e après une voyelle du troisième degré d'aperture puisse être attribué au protobantou ou même à une période antérieure puisque J. Greenberg en a relevé des exemples dans d'autres langues du groupe Niger-Congo." (Bastin 1983a:32).

While Stewart (1970) had once hypothesized that PB or its immediate ancester had had a larger vowel inventory with ATR harmony, he has since modified his position in favor of height harmony in PB:

> We now have good reason, then, to suppose that proto-Bantu lacked advancing harmony in any form, but that it retained advancing as a segmental feature category and that some descendant languages developed advancing harmony in one or the other of two ways: either by reversing the pre-Bantu e, o > ɪ, ʊ shift, therefore introducing single-height harmony as in the case of the Bobangi-type languages [(15c) with symmetric VHH—LMH], or by assimilating all the -Advanced vowels to any +Advanced vowel in the word, thereby introducing cross-height harmony as in the case of Nen". (Stewart 1983:35)

The next question therefore is whether PB VHH was of the symmetric or asymmetric type. Basing himself in part on distributional restrictions of

[21] A fourth possibility not considered here is that PB had a VHH system different from either of those under discussion here. We also will not consider the possibility that PB had other than a 7V system.



vowels in CVCV noun stems, Greenberg (1951) assumes a symmetric system:[22]

> Evidently... the parent Bantu language did not permit vowels of level two and three in successive syllables. The vowel of the third level was lowered to the second level to harmonize with the vowel of the preceding syllable. Thus o was replaced by ɔ and e by ɛ when the preceding syllable had ɔ or ɛ. (Greenberg 1951:814)

However, virtually all other scholars have assumed asymmetrical VHH in PB. Thus, Meeussen (1967:92) states:

> The absence of morphophonemes lel and lol in suffixes is worth noticing; this gives free space to the rule stated in 1.7.

The rule in §1.7 to which Meeussen refers is asymmetric VHH:

> lil appears as /el/ after either lel or lol.... Similarly, lul appears as /ol/ after lol (but not after lel). (Meeussen 1967:84)

Other representative agreement with Meeussen's position include the following:

> Most Bantu grammars record the paired extensions *-ud-/-uk-. They both appear in two allomorphs conditioned by the preceding vowel but the distribution of the two variants is significantly different from the kind of vowel harmony applying to the front vowel suffixes -iC-:
>
> *-iC; *-uC- / *{ɨ, i, a, u, ụ} (C) __
> *-eC-; *-uC- / *e(C) __
> *-eC-; *-oC- / *o(C) __ (Schadeberg 1982:.61)
>
> Le plus souvent la voyelle s'ouvre uniquement lorsqu'elle succède à une autre voyelle postérieure dont le degré d'aperture est plus grande.... Le passage à o après e et o... est relativement rare et apparaît comme une extension du phénomène alors que ce type d'assimilation constituait le trait prédominant pour *-id-.... La distribution très générale de

[22]As seen in the quotation a few paragraphs below, Greenberg is of course aware that many Bantu languages have lowering of degree 2 /u/ to [o] only after degree 3 /o/. He is more impressed, however, with both the comparison with non-Bantu harmony systems as well as with his claim that degree 2 and 3 vowels do not cooccur in noun stems in Meinhof and van Warmelo's (1932) PB reconstructions, an issue which I shall address shortly. Let us note, however, that some scholars "misspeak" when characterizing height harmony in Bantu. For example, in presenting their reconstructions of Northeastern Coastal Bantu, Nurse & Hinnebusch (1993:370) state: "The limited vowel harmony...,whereby /-o-/ and /-e-/ occur after stems with mid vowels, and /-u-/ and /-i-/ after nonmid vowels, is an NEC feature, apparently inherited, as it also occurs widely in other eastern Bantu languages." Looking over the discussion, it is clear that they meant to reconstruct an asymmetric system which is remarkably stable in these languages (cf. also Bakari 1985).

> l'assimilation vocalique de la voyelle postérieure (o) indique que ce ph protobantou. (Bastin 1983a:33)
>
> This rule [VHH] extends to prefixes Llogoori), probably as an innovation. some languages (e.g. Kongo), also pr that [u] generally assimilates only a crosslinguistic tendency according t likely to assimilate to another segm have more features in common (Kipar

The earliest recognition of asymmetric V (1862), concerning Herero R.31:

> The rule of vowel harmony is in a ve the termination of inversive verbs, -u -ona after a preceding o, but retain vowels, even after the flat a and e." (B

However, in the "first Bantu dictiona Penders 1928]), which treats a southe clearly symmetric. Recall from earlier the only 5V language (dialect cluste forms were cited in (9) in §2. Given studies, it is not surprising that it has fre

> However, contrary to the general rul -uk- occur after e of the verb root inst seems to be generally true of the B instances, e.g. Kikongo, -ol-, -ok- are
>
> In general the presence of a vowel -e- a radical vowel -e- or -o- corresponds extensions preceded by any other rad extension is -o- following a rac corresponds to an extension with a radical vowel.... In a few languages, for example, extensions containing vowel -o- also have -o- following -e- 'chew/chew up completely', -komb completely', -yal-/-yalumun- 'sprea dialects of this language, however, th pairs occurs as -kesumun- and -kc 1962:102)

To summarize, as indicated in the to lean towards reconstructing asymmet cases of symmetric VHH would have saw in Map 1, a number of rather dispa

l'assimilation vocalique de la voyelle du suffix *-ud- après une voyelle postérieure (o) indique que ce phénomène peut être attribué au protobantou. (Bastin 1983a:33)

This rule [VHH] extends to prefixes in a few languages (e.g. Gusii, Llogoori), probably as an innovation. Also [u] lowers to [o] after [e] in some languages (e.g. Kongo), also probably as an innovation. The fact that [u] generally assimilates only after [o] and not [e] may reflect a crosslinguistic tendency according to which one segment, A, is more likely to assimilate to another segment B, to the extent that A and B have more features in common (Kiparsky 1988). (Clements 1991:59)

The earliest recognition of asymmetric VHH I have found comes from Bleek (1862), concerning Herero R.31:

The rule of vowel harmony is in a very restricted manner carried out in the termination of inversive verbs, -ura or -una, which become -ora or -ona after a preceding o, but retains its sharp vowel after all other vowels, even after the flat a and e." (Bleek 1862:62)

However, in the "first Bantu dictionary" (de Gheel 1652 [van Wing & Penders 1928]), which treats a southerly dialect of Kongo H.10, VHH is clearly symmetric. Recall from earlier discussion that Kongo was cited as the only 5V language (dialect cluster) with symmetric VHH. Relevant forms were cited in (9) in §2. Given the prominence of Kongo in Bantu studies, it is not surprising that it has frequently received special mention:

However, contrary to the general rule, the u form of suffixes, e.g.-ul-, -uk- occur after e of the verb root instead of the expected -ol-, -ok-. This seems to be generally true of the Bantu languages, though in a few instances, e.g. Kikongo, -ol-, -ok- are the rule." (Greenberg 1951:813).

In general the presence of a vowel -e- in an extension that is preceded by a radical vowel -e- or -o- corresponds to the presence of a vowel -i- in an extensions preceded by any other radical vowel. When the vowel of an extension is -o- following a radical vowel -o-, this normally corresponds to an extension with a vowel -u- following anly other radical vowel.... In a few languages, such as certain dialects of Kongo, for example, extensions containing a vowel -o- following a radical vowel -o- also have -o- following -e-, as in: S. Kongo -kes-/-kesomon- 'chew/chew up completely', -komb-/-kombomon- 'sweep/sweep up completely', -yal-/-yalumun- 'spread/spread out completely' in other dialects of this language, however, the extended radical of the first two pairs occurs as -kesumun- and -kombumun- respectively. (Guthrie 1962:102)

To summarize, as indicated in the above citations, most Bantuists seem to lean towards reconstructing asymmetric VHH. According to this view, all cases of symmetric VHH would have been innovative. Specifically, as we saw in Map 1, a number of rather disparate languages making up Northwest

Bantu in zones A, B and C, as well as the languages of EJ.40 to the East of Lake Victoria, would have had to innovate harmony of degree 2 *u after degree 3 *e. Since zone ABC languages do not constitute a genetic subgroup of Bantu (Heine 1973), it is unlikely that they would have independently innovated as a one-time change. Instead, one would have to propose that this change spread areally throughout must of the Northwest. The change in EJ.40 would have been an independent development. While this interpretation requires at least two statements, the alternate view that asymmetric VHH was an innovation is a simpler hypothesis to maintain. Asymmetric VHH could be viewed either as the result of areal spread *or* as a one-time innovation affecting the relatively coherent subbranch of Bantu in which it occurs. As Map 1 indicates, these languages are much more homogenous than their complement and correspond roughly to the Savanna branch of Bantu, as presented, for example, by Ehret (this volume). It would thus be quite significant if asymmetric VHH were a reliable genetic marker of this subbranch of the family—as I suggested in my presentation at the Table Ronde. In this case symmetric VHH would have existed in PB, with degree 2 and 3 vowels never mixing within stems. We thus would have had phonetic [CɛCɔC] rather than [CɛCʊC], the latter being introduced only later into the Savanna branch.

In support of this proposal was Greenberg's (1951) inquiry concerning the nature of VHH within words with bisyllabic stems:

> The question cannot be investigated further in the verb, since practically all verb roots in Proto-Bantu had only a single syllable and the effects of the addition of a derivational suffix has already been examined. For nouns, adjectives and other parts of speech a review of the forms that have been reconstructed suggests that it is indeed a general rule within Proto-Bantu that sequences of vowels one of which belongs to level three (e or o) and the other of which belongs to level two (ɛ or ɔ) are almost nonexistent. On the other hand, vowels in successive syllables both of which belong to level three or both of which belong to level two are very common" (Greenberg 1951:815).

The claim here is that monomorphemic forms such as noun stems show *symmetric* VHH in PB reconstructions (based on Meinhof and van Warmelo 1932). In fact, even some languages with asymmetric VHH in verbs, show symmetric VHH in bisyllabic noun stems. One such language is Nande DJ.42. As seen in (17a,b), based on Kavutirwaki (1978),

(17) Nande DJ.42 (Kavutirwaki 1978)

a.	-bóh-er-a	'tie + appl'	-boh-ol-a	'untie'
b.	-ses-er-a	'make a bed + appl'	-ses-ul-a	'unmake bed'
c.	-king-ir-a	'close + appl'	-king-ul-a	'open (door)'
	-sun-ir-a	'pinch + appl'	-sun-ul-a	'loosen (from fingers)'
	-land-ir-a	'sew + appl'		
d.	-hɟmb-ɨr-a	'build + appl'		
	-kʊ́mb-ɨr-a	'grasp firm +'		

Nande verb extensions show the class suffix is realized -er- after both /e/ realized -ol- only after /o/. In other ca hand, as seen in (18), a quite differe stems:

(18) $V_1 + V_2$ in Nande B

V_1/V_2	ɨ	i	e
ɨ	31	—	8
i	—	25	—
e	14	—	70
ʉ	29	—	4
u	—	15	10
o	18	—	16
a	21	21	12

As seen in the shaded cells, the con -CoCu, where a degree 3 vowel is fo exist in the language.[24] The second pattern found on longer forms, where of -CeCoC-.

Similar observations can be seen vowels of bisyllabic noun stems in Schadeberg (1992).

[23]Rightward spreading of the [+ATR] o Nande-specific innovation. In fact, (19) occur with [-ATR] [i, u] in either order.

[24]The language is less consistent abou followed by a degree 3 vowel. Although -CuCo all are. The only point I wish to degree 2 vowel would have to lower after stems but asymmetric in longer stems, -CVCVC- or longer.

	-land-ir-a	'sew + appl'	-land-ul-a	'unsew'
d.	-hɨmb-ɨr-a	'build + appl'	-hɨmb-ʉl-a	'demolish'
	-kʉ́mb-ɨr-a	'grasp firm + appl'	-kʉ́mb-ʉl-a	'release grasp'

Nande verb extensions show the classic asymmetric pattern: The applicative suffix is realized -er- after both /e/ and /o/, while the reversive suffix is realized -ol- only after /o/. In other cases the vowel is high.[23] On the other hand, as seen in (18), a quite different pattern emerges in bisyllabic noun stems:

(18) $V_1 + V_2$ in Nande Bisyllabic Noun Stems

V_1/V_2	ɨ	i	e	ʉ	u	o	a
ɨ	31	—	8	4	—	25	35
i	—	25	—	—	5	29	28
e	14	—	70	4	—	37	28
ʉ	29	—	4	7	—	18	32
u	—	15	10	—	43	16	42
o	18	—	16	5	—	46	28
a	21	21	12	17	10	38	113

As seen in the shaded cells, the combinations -CeCi, -CeCu, -CoCi and -CoCu, where a degree 3 vowel is followed by a degree 2 vowel, do not exist in the language.[24] The second of these, -CeCu, contrasts with the pattern found on longer forms, where -CeCuC- is attested to the detriment of -CeCoC-.

Similar observations can be seen in the following plotting of the two vowels of bisyllabic noun stems in Nyamwezi, based on Maganga & Schadeberg (1992).

[23]Rightward spreading of the [+ATR] of the root onto the suffixes in (17d) is a Nande-specific innovation. In fact, (19) shows that [+ATR] [ɨ, ʉ] may not co-occur with [-ATR] [i, u] in either order.

[24]The language is less consistent about sequences where a degree 2 vowel is followed by a degree 3 vowel. Although -CiCe is unattested, -CiCo, -CuCe and -CuCo all are. The only point I wish to make here is that a process by which a degree 2 vowel would have to lower after a degree 3 vowel is symmetric in -CVCV stems but asymmetric in longer stems, specifically, verb stems of the shape -CVCVC- or longer.

(19) $V_1 + V_2$ in Nyamwezi Bisyllabic Noun Stems

V_1/V_2	ị	i	e	ụ	u	o	a
ị	11	5	4	3	6	15	24
i	6	10	—	—	—	7	26
e	11	—	26	4	—	16	14
ụ	6	(1)	(1)	6	—	8	25
u	13	10	5	(2)	25	8	24
o	19	—	13	7	—	43	24
a	17	16	13	4	13	32	74

Again, the shaded cells, -CeCi, -CeCu, -CoCi and -CoCu, are completely lacking. Could this be a relic of symmetric VHH in PB?

I think not. First, Greenberg's reliance on Meinhof's limited reconstructions may have affected the overall picture. In (19) I plot out the 7 x 7 matrix of vowels in the bisyllabic stems in Meeussen's (1980[1969]) reconstructions:

(20) $V_1 + V_2$ in Meeussen's Proto-Bantu Bisyllabic Noun Stems

V/FV	ị	i	e	ụ	u	o	a
ị	9	4	4	3	7	14	25
i	6	19	—	2	9	10	36
e	7	5	31	3	6	13	19
ụ	2	6	1	3	5	9	12
u	9	25	2	4	58	17	43
o	11	7	16	8	2	60	29
a	16	24	6	9	32	24	113

As seen, although -CeCi, -CeCu, -CoCi and -CoCu reconstructions are not among the most numerous combinations, they do exist and should be examined carefully before concluding that symmetric VHH characterized noun stems in PB.

Nande does, however, underscore an important observation that cuts across the Bantu languages: VHH properties are frequently different within bisyllabic (nominal) -CVCV vs. longer -CVCVC... stems. Using "V_2" to designate vowels in second or later stem syllables, and # to designate word boundary, I refer to this as the independence of V_2C and V_2# vowel distributions. Harmony of medial vs. final vowels can be quite distinct—even when all vowels belong to the same morpheme.[25] Not only is this the case in Nande, where the opposition is between symmetric vs. asymmetric VHH, but also in languages where other environment.

The ideal languages in which to course those like Nande and Nyamw and have preserved the 7V system CBOLD are at present accidentally s languages, we have to calculate th respectively, of *ị and *i and of *ụ an can be quite revealing of the discrepar

A case in point is Yaka H.32. T (1971), show that neither the /i/ of th and -is-, nor the /u/ of the reversive s after /e/ and /o/:

(21) Applicative -il-

a.	kik-il-a	'barrer pour'
	kud-il-a	'chasser pour'
	kas-il-a	'lier pour'
	keb-il-a	'faire attentio
	sol-il-a	'déboiser pour

Reversive intransitive -uk-

c.	zib-uk-a	'être ouvert'
	hul-uk-a	'être sauvé'
	bal-uk-a	'être renversé'
	yek-uk-a	'être séparé'
	tob-uk-a	'être percé'

This would seem to suggest tha language. How then to reconcile thes suffix *-idi* harmonizes to -ele after a perfectives of the forms in (21) show

(22) Applicative + Perfective

a.	kik-id-idi	'barrer pour'
	kud-id-idi	'chasser pour'
	kas-id-idi	'lier pour'
	keb-el-ele	'faire attentio
	sol-el-ele	'déboiser pour

[25] I thus am not referring to the oft made observation that a FV morpheme does not harmonize in many Bantu languages. See, for example, Leitch's (1996) treatment of this as a parameter within zone C.

yllabic Noun Stems

ụ	u	o	ɑ
3	6	15	24
—	—	7	26
4	—	16	14
6	—	8	25
(2)	25	8	24
7	—	43	24
4	13	32	74

-CoCi and -CoCu, are completely ic VHH in PB?

reliance on Meinhof's limited erall picture. In (19) I plot out the 7 stems in Meeussen's (1980[1969])

ıntu Bisyllabic Noun Stems

ụ	u	o	a
3	7	14	25
2	9	10	36
3	6	13	19
3	5	9	12
4	58	17	43
8	2	60	29
9	32	24	113

and -CoCu reconstructions are not ons, they do exist and should be hat symmetric VHH characterized

an important observation that cuts rties are frequently different within -CVCVC... stems. Using "V_2" to syllables, and # to designate word endence of V_2C and V_2# vowel nal vowels can be quite distinct— e morpheme.[25] Not only is this the between symmetric vs. asymmetric

bservation that a FV morpheme does See, for example, Leitch's (1996) C.

VHH, but also in languages where VHH may be lacking in one vs. the other environment.

The ideal languages in which to compare V_2C and V_2# harmony are of course those like Nande and Nyamwezi, which both have asymmetric VHH and have preserved the 7V system of PB. Unfortunately, the resources in CBOLD are at present accidentally skewed towards 5V languages. In these languages, we have to calculate that /i/ and /u/ represent the merger, respectively, of *ị and *i and of *ụ and *u. Nevertheless, even 5V languages can be quite revealing of the discrepancies between V_2C and V_2# harmony.

A case in point is Yaka H.32. The forms in (21), based on Ruttenberg (1971), show that neither the /i/ of the applicative or causative suffixes -il- and -is-, nor the /u/ of the reversive suffixes -uk- and -ul- undergo lowering after /e/ and /o/:

(21)

	Applicative -il-			Causative -is-	
a.	kik-il-a	'barrer pour'	b.	kik-is-a	'faire barrer'
	kud-il-a	'chasser pour'		kud-is-a	'faire chasser'
	kas-il-a	'lier pour'		kas-is-a	'faire lier'
	keb-il-a	'faire attention pour'		keb-is-a	'faire faire attention'
	sol-il-a	'déboiser pour'		sol-is-a	'faire déboiser'
	Reversive intransitive -uk-			Reversive transitive -ul-	
c.	zib-uk-a	'être ouvert'	d.	zib-ul-a	'ouvrir'
	hul-uk-a	'être sauvé'		hul-ul-a	'sauver'
	bal-uk-a	'être renversé' (camion)		bal-ul-a	'renverser'
	yek-uk-a	'être séparé'		yek-ul-a	'séparer'
	tob-uk-a	'être percé'		tob-ul-a	'percer'

This would seem to suggest that there is no left-to-right VHH in this language. How then to reconcile these data with the fact that the perfective, suffix *-idi* harmonizes to -ele after a mid vowel in (7)? The corresponding perfectives of the forms in (21) show a similar pattern in (22).

(22)

	Applicative + Perfective			Causative + Perfective	
a.	kik-id-idi	'barrer pour'	b.	kik-is-i	'faire barrer'
	kud-id-idi	'chasser pour'		kud-is-i	'faire chasser'
	kas-id-idi	'lier pour'		kas-is-i	'faire lier'
	keb-el-ele	'faire attention pour'		keb-es-e	'faire faire attention'
	sol-el-ele	'déboiser pour'		sol-es-e	'faire déboiser'

	Reversive intransitive + Perfective			Reversive transitive + Perfective	
c.	zib-uk-idi	'être ouvert'	d.	zibwel-e	'ouvrir'
	hul-uk-idi	'être sauvé'		hulwel-e	'sauver'
	bal-uk-idi	'être renversé' (camion)		balwel-e	'renverser'
	yek-ok-ele	'être séparé'		yekwel-e	'séparer'
	tob-ok-ele	'être percé'		tobwel-e	'percer'

The realizations in (22a,c) are as in (7): -idi after /i, u, a/ vs. -ele after /e, o/. (22b) shows the same vowel distribution, though in this case the [id] or [el] part of the perfective suffix does not surface. It apparently fuses with the reversive transitive -ul- suffix in (22d) and for some reason requires the vowel [e] even after root /i, u, a/.

As argued in Hyman (1998), the alternation between [i] and [e] found only in the perfective is not a case of the left-to-right VHH we have been considering up to now. Instead, recognizing that the perfective ending reconstructs as *-jd-e (Meeussen 1967, Bastin 1983b), what we have in (7) and (22) is a case of where the height feature of the final [e] spreads right-to-left. In order for this process to occur, the root syllable must, however, contain a mid vowel. Hence the process is one of "plateauing": high vowels become mid when wedged between mid vowels. Concerning (22d), the first three forms would be expected to zibwid-i, hulwid-i andbalwid-i, a pattern that is attested in certain Kongo dialects. However, the sequence [wi] cannot occur in Yaka (Hyman 1998). As a second right-to-left harmony process, the height feature of the final [e] thus spreads to convert a [Cwi] syllable to [Cwe], as seen.

With this explanation of the limited (right-to-left) VHH found in Yaka only in the perfective, let us now consider the 5 x 5 matrix of vowels in bisyllabic noun stems in this language:

(23) $V_1 + V_2$ in Yaka Bisyllabic Noun Stems

V_1/V_2	i	e	u	o	a
i	41	—	51	—	66
e	32	(3)	14	56	112
u	61	(1)	124	—	140
o	56	(1)	5	104	94
a	121	—	126	(1)	205

The shaded cells indicate which combinations are not found (or are found only exceptionally, typically in borrowings). As seen, there are two relevant generalizations. First, bisyllabic noun stems do not have the shape CVCe. Second, CVCo noun stems are acceptable only if the first vowel is /e/ or /o/. However, CeCo and CoCo contrast with CeCu and CoCu. What this means is that there has been an on-going change of "peripheralization" finally in bisyllabic noun stems. In th to change *o to [u] has been been suc a mid root vowel, which reinforces, *e, this does not happen: For *e to preceding *medial* syllable with [e]. Th in (22), this has the effect of saving obtain -idi or -is-i, as seen.[26]

The above Yaka discussion estab First, individual Bantu languages not innovate VHH. This is clearly the cas a response to the unacceptability (conjecture that all VHH is innovati Kongo dialects that also restrict V important point is that internal vs. fi each other. This conclusion is al neighbors, the languages/dialects mal turn.

We saw earlier in the data in (symmetric VHH operating left-to- however, lack this harmony and in f This includes the "Mazinga or Centra Warmelo (1932), based on material c forms, taken from Laman (1936), sho

[26]This right-to-left VHH triggered b alternation between the final [o] in méé the corresponding singulars dfísú and d *-jjno fuse with the class 6 prefix ma- i initial syllable [mee], which in turn pro it does in the singular forms). A similar in Kongo (Meinhof & van Warmelo 19

[27]The only reason to "hedge" is that Ya as a retention in the following way: First to-right VHH, affecting the derivationa the perfective. Second, assume that peripheralization process on medi peripheralization would have failed to consists of mid vowels: i.e. where pe vowels surrounded by mid vowels. This the data in (22d), where the penultimate account for the fact that the perfective e preceded by a CVCaC- base (Hyman, in

[28]A classification of Kongo dialects is f summary in Meinhof & van Warmelo (1

finally in bisyllabic noun stems. In the case of the back vowel, the pressure to change *o to [u] has been been successfully countered by the presence of a mid root vowel, which reinforces, as it were, the final *o. In the case of *e, this does not happen: For *e to survive finally, there must also be a preceding *medial* syllable with [e]. Thus, when right-to-left spreading occurs in (22), this has the effect of saving the final [e] of *-ɟd-e. Otherwise we obtain -idi or -is-i, as seen.[26]

The above Yaka discussion establishes two crucial points for our study. First, individual Bantu languages not only potentially inherit, but may also innovate VHH. This is clearly the case in (22d), where VHH is triggered as a response to the unacceptability of [wi] sequences in Yaka. I would conjecture that all VHH is innovative rather than original in Yaka, as in Kongo dialects that also restrict VHH to the prefective.[27] The second important point is that internal vs. final VHH can vary independently from each other. This conclusion is also suggested by Yaka's next door neighbors, the languages/dialects making up Kongo H.10, to which we now turn.

We saw earlier in the data in (9) that some dialects of Kongo have symmetric VHH operating left-to-right within the verb stem. Others, however, lack this harmony and in fact are like Yaka in most respects.[28] This includes the "Mazinga or Central dialect" described by Meinhof & van Warmelo (1932), based on material collected by Laman. The following verb forms, taken from Laman (1936), should be compared to those in (9):

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[26]This right-to-left VHH triggered by a final mid vowel also explains the alternation between the final [o] in méésó 'eyes' and méénó 'teeth' vs. the [u] in the corresponding singulars díísú and díínú. The reconstructed roots *-jɟco and *-jɟno fuse with the class 6 prefix ma- in the plural, creating the mid vowel in the initial syllable [mee], which in turn protects the final [o] from becoming [u] (as it does in the singular forms). A similar interpretation can be given to the forms in Kongo (Meinhof & van Warmelo 1932:168).

[27]The only reason to "hedge" is that Yaka perfective harmony could be described as a retention in the following way: First, assume that pre-Yaka had standard left-to-right VHH, affecting the derivational suffixes in (21) even in the absence of the perfective. Second, assume that this VHH is subsequently lost as a peripheralization process on medial vowels. The only cases where peripheralization would have failed to apply would be where the whole stem consists of mid vowels: i.e. where peripheralization would have created high vowels surrounded by mid vowels. This analysis would of course not account for the data in (22d), where the penultimate [e] is clearly innovative. It also fails to account for the fact that the perfective ending is -ene (rather than -ini) whenever preceded by a CVCaC- base (Hyman, in press).

[28]A classification of Kongo dialects is found in Laman (1912, 1936) as well as a summary in Meinhof & van Warmelo (1932). See also Mabiala (1996).

(24) No VHH in Central Kongo

a.	-somp-il-a	's'attacher à'	b.	-tol-ul-a	'casser, briser'
	-lèng-il-a	'se flétrir, s'affaisser'		-lēmb-ul-a	'barrer, effacer'
	-sīik-il-a	'soutenir, fortifier'		-viz-ul-a	'toucher à'
	-vud-il-a	'surpasser'		-būb-ul-a	'corrompre'
	-lànd-il-a	'suivre'		-bāng-ul-a	'faire violence'

As seen, in Central Kongo, in contradistinction to Southern Kongo in (9), derivational suffixes do not by themselves undergo VHH. As in Yaka, the perfective ending conditions VHH, with -ili occurring after /i, u, a/ and -ele after /e, o/ (or their nasal variants -ini and -ene).[29]

In his comparative study of six Kongo dialects, Mabiala (1996) considers vowel harmony in Bembe H.11, Vili H.12a, Yombi H.12b, Sundi H.13, Laadi H.16f, and Hangala H.16j. The following tables summarize the distribution of vowels in CVCV stems on the left and CVCVC- stems on the right in three of Mabiala's dialects/languages:[30]

(25) Comparison of 5 x 5 vowel distributions in Kongo dialects/languages

a. Laadi CVCV

V_1/V_2	i	e	u	o	a
i	11	—	21	—	32
e	4	13	—	14	31
u	15	—	31	—	69
o	14	(2)	—	22	53
a	21	—	31	—	80

b. Laadi CVCVC...

V_1/V_2	i	e	u	o	a
i	11	—	7	—	7
e	—	8	—	4	6
u	7	—	22	—	16
o	(3)	2	—	6	1
a	15	—	16	—	23

c. Hangala CVCV

V_1/V_2	i	e	u	o	a
i	19	—	24	—	59
e	(1)	50	—	12	8
u	21	—	51	—	80
o	15	(2)	—	26	45
a	22	—	31	—	94

d. Hangala CVCVC...

V_1/V_2	i	e	u	o	a
i	14	—	7	—	5
e	14	(3)	8	(1)	6
u	8	—	38	—	9
o	7	—	9	(3)	1
a	17	—	26	—	17

e. Yombi CVCV

V_1/V_2	i	e	u	o
i	15	—	24	—
e	21	—	25	—
u	14	—	51	—
o	11	—	27	—
a	22	—	31	—

In (25a) we see that Laadi ger preceding vowel is itself /e/. W the detriment of CoCe, of whic The four occurrences of CeCi a are exceptional. Mabiala's num could change as further data are CeCi is disallowed in Hangal identical to Laadi in (25a). Th quite different. Here we see t second vowel in a CVCV stem.

Let us now compare these vowel of CVCVC... stems. Wh both Hangala and Yombi lacl consistent in its peripheralizati CVCV stems and in internal Hangala is not consistent. Whil has non-peripheral [e] after /e/ a final mid vowel is peripheralize which occurs to the detriment o

The following summar languages/dialects line up with r

(26) *Ste*

CV(

a. Laadi H.16f CeCe/ CoCi/ (CeCi

b. Hangala H.16j CeCe/ CoCi/

[29]The corresponding perfective passive endings are -ulu/-unu and -olo/-ono (Meinhof & van Warmelo 1932:167-8).

[30]In this case, in the addition to CVCVC- verb stems, the survey includes CVCVCV noun stems, which, due to reduplications and borrowings, accounts for some of the exceptions, indicated between parentheses.

[31]The numbers in (26b) are low a over CoCiC-. However, Jacquot symmetrical in Laadi.

b. -tol-ul-a 'casser, briser'
aisser' -lēmb-ul-a 'barrer, effacer'
er' -viz-ul-a 'toucher à'
-būb-ul-a 'corrompre'
-bāng-ul-a 'faire violence'

istinction to Southern Kongo in (9), lves undergo VHH. As in Yaka, the h -ili occurring after /i, u, a/ and -ele nd -ene).[29]

‹ Kongo dialects, Mabiala (1996) 11, Vili H.12a, Yombi H.12b, Sundi The following tables summarize the s on the left and CVCVC- stems on anguages:[30]

ɔutions in Kongo dialects/languages

b. Laadi CVCVC...

V_1/V_2	i	e	u	o	a
i	11	—	7	—	7
e	—	8	—	4	6
u	7	—	22	—	16
o	(3)	2	—	6	1
a	15	—	16	—	23

d. Hangala CVCVC...

V_1/V_2	i	e	u	o	a
i	14	—	7	—	5
e	14	(3)	8	(1)	6
u	8	—	38	—	9
o	7	—	9	(3)	1
a	17	—	26	—	17

endings are -ulu/-unu and -olo/-ono

VC- verb stems, the survey includes plications and borrowings, accounts for ı parentheses.

e. Yombi CVCV

V_1/V_2	i	e	u	o	a
i	15	—	24	—	46
e	21	—	25	—	33
u	14	—	51	—	64
o	11	—	27	—	40
a	22	—	31	—	85

f. Yombi CVCVC...

V_1/V_2	i	e	u	o	a
i	7	—	5	—	6
e	9	(1)	4	—	5
u	3	—	12	—	4
o	3	—	14	—	1
a	8	—	22	—	5

In (25a) we see that Laadi generally allows CVCe stems only when the preceding vowel is itself /e/. What this means is that CoCi is obtained to the detriment of CoCe, of which there are only two exceptional instances. The four occurrences of CeCi are not shaded in, since it is not clear if they are exceptional. Mabiala's numbers are, of course, somewhat limited and could change as further data are considered. On the other hand, we see that CeCi is disallowed in Hangala in (25c), which in all other respects is identical to Laadi in (25a). The situation in Yombi in (25e) is, however, quite different. Here we see that /e/ and /o/ simply cannot occur as the second vowel in a CVCV stem.

Let us now compare these results with the realization of the internal vowel of CVCVC... stems. While Laadi shows symmetric VHH in (25b), both Hangala and Yombi lack VHH in (25d,f).[31] Yombi is of course consistent in its peripheralization of *e and *o in both final position in CVCV stems and in internal position in CVCVC... stems. However, Hangala is not consistent. While it has only [i] and [u] internally in (25f), it has non-peripheral [e] after /e/ and non-peripheral [o] after both /e/ and /o/. A final mid vowel is peripheralized in all other combinations, including CoCi which occurs to the detriment of *CoCe.

The following summary in (26) shows how Mabiala's six languages/dialects line up with respect to VHH:

(26)

		Stem Shape		VHH	
		CVCV	CVCVC...	CVCV	CVCVC...
a.	Laadi H.16f	CeCe/CeCo	CeCeC/CeCoC	S	S
		CoCi/CoCo (CeCi)	CoCeC/CoCoC	S	S
b.	Hangala H.16j	CeCe/CeCo	CeCiC/CeCuC	S	N
		CoCi/CoCo	CoCiC/CoCuC	A	N

[31]The numbers in (26b) are low and do not clearly show that CoCeC- is preferred over CoCiC-. However, Jacquot's (1962) study makes it clear that VHH is symmetrical in Laadi.

c.	Suundi H.13	CeCe/CeCo	CeCiC/CeCuC	S	N
		CoCi/CoCo	CoCiC/CoCuC	A	N
d.	Yombi H.12b	CeCi/CeCu	CeCiC/CeCuC	N	N
		CoCi/CoCu	CoCiC/CoCuC	N	N
e.	Vili H.12a	CeCi/CeCu	CeCiC/CeCuC	N	N
		CoCi/CoCu	CoCiC/CoCuC	N	N
f.	Bembe H.11	CeCe/CeCu	CeCiC/CeCuC	A	N
		CoCi/CoCo	CoCiC/CoCuC	A	N

In (26) S, A and N stand, respectively, for symmetric, asymmetric and no VHH, respectively. As seen, Laadi is alone among the languages surveyed by Mabiala to have symmetric VHH in both V_2# and V_2C positions. None of the languages in (26b-f) has internal VHH. Hangala and Suundi have the same asymmetric pattern in bisyllabic stems, where CoCi occurs instead of *CoCe.[32] Yombi and Vili, on the other hand, have no VHH in either context. Turning to Bembe in (27f), there appears to be a double asymmetry in bisyllabic stems: CeCe and CoCo instead vs. CeCu and CoCi. On the other hand, Mabiala reports no VHH in CVCVC stems, while Jacquot (1981) indicates that there is symmetric harmony in such cases.[33]

We are now ready to consider what these data may have to say about reconstruction of VHH in PB. Some Kongo dialects are fully harmonizing, while others have no harmony other than in the perfective (which I have claimed to be a right-to-left innovation). If asymmetric VHH is reconstructed, then some Kongo dialects would have generalized it to symmetric (the only such case among 5V Bantu languages), while others would have lost left-to-right VHH altogether (replacing it in some cases with right-to-left perfective harmony). This would seem a rather complex set of developments, as all Kongo dialects would have changed in various directions without any one of them keeping the asymmetric pattern. If we thus instead reconstruct symmetric VHH, then some some dialects could be said to conserve it, while others would have lost it.

Of the two, this second hypothesis thus far seems preferable. In view of the fact that Kongo stands out among 5V Bantu languages (having symmetric VHH), I would further hypothesize that both sets of VHH properties in Kongo dialects were set in motion at a point when these

[32]Since the asymmetric pattern in Hangala and Sundi is one of CeCo vs. CoCi, it is the opposite of the Savanna Bantu case, where we obtain CoCeC-, but CeCuC-.

[33]Relevant perhaps to this discrepancy, Laman (1936:lxx) shows VHH variation in Bembe. Thus, kébe 'garder' has the perfective keberi or kebiri. The Bembe material are complicated by the fact that internal vowels also tend to be realized as schwa, an indication of the fact that we are dealing with a form of vowel reduction—which may trigger VHH, peripheralization, "bleaching", or, syncope in extreme cases in Northwest Bantu.

languages had 7V. On the one hand, well in the situation in zone C (Lei frequently have assimilations of *a Koyo C.24 in (13). Interestingly, (Ndembe-Nsasi 1972), one of only property:

> La voyelle de 3ème degré d'aper d'une voyelle de 2ème degré d'ap morphème /-a/ des noms verbau respectivement, après 2ème degre (Jacquot 1962:241).

We thus obtain the following re: infinitives:[34]

(27) a. kù-búl-à 'casser'
kù-síís-à 'abandonner'
kùsál-à 'travailler'.

The hypothesis, therefore, is that bo certain 7V systems in the geogr symmetric suffixal harmony, as ir Mongo C.61, whose symmetric VHI not have harmony, as in (24), patt C.24. Symmetric VHH does occur prefixes and CVCV noun stems in only /i/, /u/ and /a/ occur medially ir

(28) $V_1 + V_2$ in Koyo

V1/V2	i	e	ɛ
i	14	—	—
e	14	—	—
ɛ	5	—	(2
u	19	—	—
o	9	—	—
ɔ	7	—	—
a	16	—	—

[34]Mabiala (1996) has a final schwa suggests, first, that there might be var a contributing factor, perhaps critical,

CiC/CeCuC	S	N
CiC/CoCuC	A	N
CiC/CeCuC	N	N
CiC/CoCuC	N	N
CiC/CeCuC	N	N
CiC/CoCuC	N	N
CiC/CeCuC	A	N
CiC/CoCuC	A	N

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hat we are dealing with a form of
peripheralization, "bleaching", or,

languages had 7V. On the one hand, the dialects with symmetric VHH fit in well in the situation in zone C (Leitch 1996), which have 7V. These also frequently have assimilations of *a to a preceding /ɛ/ or /ɔ/, as we saw in Koyo C.24 in (13). Interestingly, Bembe H.11 is, with Lwalwa L.00 (Ndembe-Nsasi 1972), one of only two 5V languages that also have this property:

> La voyelle de 3ème degré d'aperture [=a] n'apparait jamais précédée d'une voyelle de 2ème degré d'aperture, avec pour conséquence que le morphème /-a/ des noms verbaux présente les variantes [-o] et [-e], respectivement, après 2ème degré postérieur et 2ème degré antérieur" (Jacquot 1962:241).

We thus obtain the following realizations of the final vowel /-a/ on infinitives:[34]

(27)

a.	kù-búl-à	'casser'	b.	ku-ból-ò	'pourrir'
	kù-síís-à	'abandonner'		ku-kéb-è	'garder'
	kùsál-à	'travailler'.			

The hypothesis, therefore, is that both types of Kongo dialects pattern with certain 7V systems in the geographical vicinity. Those which have symmetric suffixal harmony, as in (9), pattern with 7V languages like Mongo C.61, whose symmetric VHH was illustrated in (8). Those which do not have harmony, as in (24), pattern instead with languages like Koyo C.24. Symmetric VHH does occur in this language, as was illustrated in prefixes and CVCV noun stems in (5) and (6). However, as seen in (29), only /i/, /u/ and /a/ occur medially in CVCVC- verb stems:

(28) $V_1 + V_2$ in Koyo CVCVC- Verb Stems

V1/V2	i	e	ɛ	u	o	ɔ	a
i	14	—	—	1	—	—	4
e	14	—	—	2	—	—	—
ɛ	5	—	(2)	1	—	—	(1)
u	19	—	—	3	—	—	2
o	9	—	—	2	—	—	2
ɔ	7	—	—	3	—	(1)	—
a	16	—	—	4	—	—	3

[34]Mabiala (1996) has a final schwa on many of his infinitive forms, which suggests, first, that there might be variation, and second that reduction could be a contributing factor, perhaps critical, to the assimilations in question.

In this language, most verbal suffixes have the vowel /i/, as in causative -is- and even reciprocal -in- (from PB *-an-):[35]

(29)

a.			b.		
	lím-is-a	'extinguish'		yís-in-a	'hide oneself'
	yég-is-a	'teach'		tég-in-a	'meet'
	kɛ́ng-is-a	'make observe'		ɲwɛm-in-a	'have rashes'
	kúr-is-a	'make warm'		kúl-in-a	'separate from each other'
	wóm-is-a	'to dry (tr.)'		wóg-in-a	'agree'
	kɔs-is-a	'soften'		lɔnd-in-a	'follow each other'
	bág-is-a	'make think'		sang-in-a	'amuse oneself'

Internal vowels are clearly peripheralized and exempt from VHH in Koyo. This should be contrasted with the following table of vowel distributions in CVCV stems, which shows that /e, o/ cannot co-occur with /ɛ, ɔ/:

(30) $V_1 + V_2$ in Koyo Bisyllabic Noun Stems

V1/V2	i	e	ɛ	u	o	ɔ	a
i	26	(1)	11	26	—	—	51
e	24	36	—	13	10	—	42
ɛ	17	—	50	10	—	11	(1)
u	27	(1)	(3)	65	—	—	40
o	23	(2)	—	7	66	—	50
ɔ	27	—	—	9	—	72	(2)
a	55	8	—	40	45	—	116

While bisyllabic noun stems show symmetric VHH among mid vowels, internal syllables of verbs have been peripheralized to /i, u, a/. The possibility that stem-internal vowels may undergo a different history than stem-final vowels thus needs to be recognized and factored into the equation.[36] This makes our reconstruction effort that much more difficult.

[35]Data are from the Koyo lexicon of 1700+ entries that I developed in Lyon during 1995-1996 with Yvon Dzamba, based loosely on Gazania (1972). All of the verbs that have the shape CVCaC- have a /g/ in C_3 position, e.g. kír-ag-a 'curse', as do the two verbs that have the shape CɛCɛC-, from /CɛCag-/. By comparison, the 84 CVCiC- verb bases divide themselves up among CVCis- (56), CVCin- (16), CVCit- (11) (pronounced [CVCir-]), and CVCing- (1). The 16 CVCuC- verbs have the following C_3 consonants: CVCus- (6), CVCun- (4), CVCum- (3), CVCumw- (2) and CVCul- (1). (Note that Koyo does not have an applicative suffix.)

[36]In Hyman & Inkelas (1997) and Hyman (1998) I have referred to the relevant stem-internal sequence as constituting a "prosodic trough" within which specific phonotactic constraints may hold that do not characterize the "perimeters."

In the next section I attempt to present a di might have been in PB.

5. An alternative hypothesis

In this section I shall depart from the a suggest a different view of what might ha would like to tentatively advance for consi nor asymmetric VHH existed in PB—at l the verb stem. My proposal will involve certain suffixes than usually assumed as v that worked quite differently from the synchronic descriptions—whether of PB o

Most recent discussions of VHH ir languages start from two assumptio assimilation of a degree 2 vowel to a pre thus either a lowering process, if one ass (15a,b), or a vowel laxing process, if one related assumption, is that insight into t best acquired by examining the alternatio verb suffixes such as applicative *-id-, *-ud-, etc. In this study I have accordingl citing such alternations in support of presented in (1). That is, suffixal *i is re *oC, while suffixal *u is realized [o] afte "symmetric" VHH systems). I shall nov turn and argue that they should be questio

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[37]On the other hand, Meinhof (1948) prev specific suffixes, e.g. causative *-ik- vs. i point of view is that Meinhof and van suffixes with a front vowel with *e, e.g. rounded vowel are cited either with a high after the other, e.g. -uka, -oka and -ula, suggest a difference between the front vs. interpretation can also be extracted from of Cewa, with its indication of *eka > -ek Meyer thus sees a change of *e > i in the view that I will also defend below.

In the next section I attempt to present a different view of what the situation might have been in PB.

5. An alternative hypothesis

In this section I shall depart from the assumptions outlined above and suggest a different view of what might have existed in PB. The position I would like to tentatively advance for consideration is that neither symmetric nor asymmetric VHH existed in PB—at least as concerned suffixes within the verb stem. My proposal will involve both different reconstructions for certain suffixes than usually assumed as well as an historical VHH process that worked quite differently from the way it is normally conceived in synchronic descriptions—whether of PB or of the daughter languages.

Most recent discussions of VHH in PB and present day TV Bantu languages start from two assumptions. First, VHH involves the assimilation of a degree 2 vowel to a preceding degree 3 vowel.[37] VHH is thus either a lowering process, if one assumes the vowel representations in (15a,b), or a vowel laxing process, if one assumes those in (15c). A second, related assumption, is that insight into this lowering or laxing process is best acquired by examining the alternations that are observed in isolatable verb suffixes such as applicative *-id-, stative *-ik-, reversive *-uk- and *-ud-, etc. In this study I have accordingly followed the general practice of citing such alternations in support of the putative historical processes presented in (1). That is, suffixal *i is realized [e] after a preceding *eC or *oC, while suffixal *u is realized [o] after preceding *oC (and after *eC in "symmetric" VHH systems). I shall now reconsider these assumptions in turn and argue that they should be questioned, if not rejected.

I begin by raising the following question: What is the evidence that degree 2 vowels should be reconstructed with a concomitant lowering or laxing to degree 3—rather than the reverse? It is universally accepted that degree 2 and 3 vowels did not contrast in stem-internal positions, i.e. where these suffixes occur. So why not reconstruct *-ed-, *-ek-, *-ok- and *-od-, etc.? While I am unaware of any explicit argumentation, I imagine the reconstructions with *-iC- and *-uC- to be based, first, on the relatively unmarked status of [i, u] vs. [e, o]. Those taking this view may also see

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[37] On the other hand, Meinhof (1948) previously reconstructed both *i and *e in specific suffixes, e.g. causative *-ik- vs. intransitive *-ek-. Interesting from my point of view is that Meinhof and van Warmelo (1932:43-46) generally cite suffixes with a front vowel with *e, e.g. -eka and -ela, while suffixes with a rounded vowel are cited either with a high vowel, e.g. -uka and -ula, or with one after the other, e.g. -uka, -oka and -ula, -ola. The intention seems to be to suggest a difference between the front vs. back vowels in verb extensions. This interpretation can also be extracted from Meyer's (1937) historical phonology of Cewa, with its indication of *eka > -eka, -ika vs. *-uka > -uka, -oka (p.186). Meyer thus sees a change of *e > i in the front series vs. *u > o in the back, a view that I will also defend below.

support from the fact that some Bantu languages without VHH disallow [e, o] in stem-internal position, e.g. Punu B.43, Lengola D.12, Suku H.32, Mbala H.41, and Ruund L.53—to which we can also add Yaka H.31 and Easterly Kongo H.10 dialects which allow (right-to-left) VHH only in the perfective—and which otherwise limit internal vowels to [i, u, a]. However, we know that these languages are quite evolved in this and other ways—e.g. in limiting or modifying stem-internal vowels in sequence. As an example, consider the possible internal -VCVC- sequences found in quadrisyllabic (CVC-VCVC-V) verb stems in the Yaka "prosodic trough" (Hyman 1998):

(31) Attested internal -VCVC- sequences in Yaka verbs

a. -ikis- (42), -idil- (10), -ikil- (9), -idik- (5), -inin- (3), -inis- (2)

b. -umun- (56), -ulul- (36), -umuk- (27), -uluk- (9), -unun- (2)

c. -asan- (40), -akan- (34), -alal- (17), -aman- (14), -anan- (6), -amas- (5), -angan- (4), -asal- (3), -angas- (2), -akas- (1)

d. -ukil- (6), -ukis- (1)

The number in parentheses after each sequence indicates how many entries (out of 1781 verbs) appear with this form in the CBOLD version of Ruttenberg (1971). As can be correctly generalized from (31), the only consonants that appear in these two C positions are the four coronals /t, l, n, s/ and the three non-coronals /m, k, ng/ (vs. a much larger inventory in the preceding CVC "perimeter"). In addition, vowels are limited to /i/, /u/ and /a/, which however appear in only four out of nine logical combinations. In (31) I indicate some of the historical innovations which removed non-occurring vowel sequences from the "trough":

(32) Historical innovations yielding trough properties

a.	*-am-uk-, *-am-ud-	> -umuk-, -umun-	(positional + reversive)
b.	*-is-an-, *-ik-an-	> -asan-, -akan-	(causative/impositive + reciprocal)
c.	*-am-is-, *-am-id-	> -amas-/-aman-	(positional + causative/ applicative)

We thus cannot take comfort from such languages, which seem to be moving in the direction of fewer vowel oppositions in stem-internal position in general. While we might take solace from these evolved systems which reveal a tendency to exclude mid vowels from the positions where Bantuists have preferred to reconstruct *i and *u, this only begs the question: Were there never any mid vowels in these positions? It is hard to accept that we would not eventually meet a fuller set of vowels if we could go back far enough in history. So the issue is whether PB is "back far enough" or not. I shall suggest below that it is.

But first let us consider the oth
reconstruction of degree 2 vowels. If
development of [-eC-] and [-oC-] c
preceding degree 3 vowel. This wa
VHH in (1), for instance. If, on the
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(33) Asymmetric VHH reinterprete

a. front height harmony :

b. back height harmony :

As seen in (33a), *e would h
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(33b). Where the mid vowels raise
could view this as assimilation. How
[ɔ] raise to degree 2 [ɪ] and [ʊ], respe
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as *e becoming [ɪ] except where *e
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As shown by Ngunga (1997), f
ek- are rounded to -uk-/-ok- in exan
are followed by the reversive suffix -

(34) Rounding of suffixal -ik-ul-/-

a.	lum-ik-a	'have
	lum-uk-ul-a	'take
	wun-ik-a	'clos
	wun-uk-ul-a	'oper
	wuund-ik-a	'stor
	wuund-uk-ul-a	'take
b.	aan-ik-a	'spre
	aan-uk-ul-a	'gath

But first let us consider the other intuition that may be involved in the reconstruction of degree 2 vowels. If *-iC- and *-uC- are postulated, then the development of [-eC-] and [-oC-] can be explained as assimilations to the preceding degree 3 vowel. This was seen in the derivation of asymmetric VHH in (1), for instance. If, on the other hand, we were to begin with *-eC- and *-oC-, we would need VHH to be stated as in (33).

(33) Asymmetric VHH reinterpreted

a. front height harmony : *e > i / { ɨ, ʉ, i, u, a } C __

b. back height harmony : *o > u / { ɨ, ʉ, i, u, e, a } C __

As seen in (33a), *e would have to raise to [i] after five different vowels, while *o would have to raise to [u] after six different vowels in (33b). Where the mid vowels raise to high vowels after high vowels one could view this as assimilation. However, why should degree 3 *e [ɛ]and *o [ɔ] raise to degree 2 [ɪ] and [ʊ], respectively, when preceded by *a? So, some of the process would seem to be assimilatory, some dissimilatory, clearly a more complicated interpretation of the facts than in (1).

The reasoning in arriving at the interpretation of (1), then, is that VHH is actively conditioned by the preceding vowels. Let us instead consider the possibility that (33) is correct and that the motivation for the changes indicated is "peripheralization," i.e. the tendency for vowels to migrate to the peripheries of the vowel space, becoming /i, u, a/ in "weak" positions (e.g. internally and/or finally). Viewed this way, (33a) could be interpreted as *e becoming [ɪ] except where *e is "reinforced" by a preceding degree 3 vowel. Similarly, (33b) could be interpreted as *o becoming [ʊ] except when reinforced by a preceding *o. Such "passive conditioning" or blocking of a sound change is not unknown in historical linguistics, and can be easily demonstrated with solid Bantu examples.

As shown by Ngunga (1997), for instance, the Yao P.21 suffixes -ik-/-ek- are rounded to -uk-/-ok- in examples such as the following, where they are followed by the reversive suffix -ul-/-ol-:

(34) Rounding of suffixal -ik-ul-/-ek-uk- in Yao P.21

a.	lum-ik-a	'have between the teeth'
	lum-uk-ul-a	'take out of mouth'
	wun-ik-a	'close (book); put together'
	wun-uk-ul-a	'open'
	wuund-ik-a	'store fruit by sealing in pot'
	wuund-uk-ul-a	'take fruit out of sealed pot; unseal'
b.	aan-ik-a	'spread out to dry in the sun'
	aan-uk-ul-a	'gather up sth. spread in sun to dry'

	saj-ik-a	'put on top'
	saj-uk-ul-a	'remove from top of something else'
	taand-ik-a	'spread (bed, mat, table cloth).'
	taand-uk-ul-a	'fold up (table cloth); unmake bed'
c.	kol-ek-w-a	'be hung; be caught by thorns'
	kol-ok-ol-a	'take down sth. that is hung'
	lov-ek-a	'steep in water; soak'
	low-ok-ol-a	'remove from water (from soaking); unsoak'
	tot-a	'sew; rivet; fasten together'
	tot-ok-ol-a	'unpick sewing; unfasten sth fastened'

In (34a,b) /-ik-ul-/ rounds to -uk-ul-, while in (34c), /-ek-ul-/ is realized -ok-ol- by rounding as well as VHH. These examples thus amply demonstrate that there is a rounding harmony affecting the suffixal vowels /i/ and /e/. Now compare the data in (34) with those in (35).

(35) Rounding of -ik-ul- and -ek-ul- fails to occur

a.	sim-ik-a	'fix upright'
	sim-ik-ul-a	'remove what has been fixed upright'
	siind-ik-a	'protect a village or house with medicine'
	siind-ik-ul-a	'unprotect a village or house that was protected with medicine'
	siing-a	'twist strands (of cotton, sisal, etc.) into thread or rope'
	siinj-ik-ul-a	'disentangle, unravel'
b.	eej-ek-a	'place leaning against or on'
	eej-ek-ul-a	'remove what has been placed'
	vel-ek-a	'carry on back (child); bear child'
	vel-ek-ul-a	'swing child from back to hip'
	tej-ek-a	'be easily set (a trap); be cocked.'
	tej-ek-ul-a	'unset (trap), uncock (gun)'

In these examples there is no rounding harmony. A close comparision of these data will reveal that the input -ik-ul- or -ek-ul- sequence is preceded by a back vowel in (34) vs. a front vowel in (35). Note the importance, again, of the form the vowel takes after /a/: Had it not been for the rounding of -ik-ul- to -uk-ul- in (34b), we might have concluded that (34a,c) represented a rounding of -ik- *after* /u/ or /o/, rather than the right-to-left process that it clearly is. Although rounding harmony targets suffix vowels, what is crucial is that the presence of the process.[38]

Returning to VHH, Caga E.62 (that the processes could have been generally assumed not to have VHH fact that the applicative suffix is reali through Müller (1947), however, tell:

(36) Mid V + Mid/High V i

VCVC	All	s	y	k	r	t
eCeC	83	4	5	9	20	11
eCiC	17	6	3	6	2	—
oCeC	—	—	—	—	—	—
oCiC	29	16	1	8	4	—
eCoC	—	—	—	—	—	—
eCuC	17	—	1	13	2	1
oCoC	53	2	3	11	8	4
oCuC	10	—	2	8	—	—

The numbers in this table show how the indicated sequences. Thus, ther eCeC, 17 having eCiC, and so forth where a mid vowel is followed by ar survey indicated that there would be follow /i/, /u/ or /a/. The columns h of examples occurring as a function sequence. Two observations shoul following vowel agree in frontness 5/6 of the cases: 83 vs. 17 in the f series. Second, when the two vowel

[38]That only suffixes are affected by dim-uk-a 'be scared away' and sip-uk-a suffix -uk- does not affect the precedin of Sanderson (1954) reveals only t CiCuCuCa: -diimbukuka 'tumble; sag; -siimbukula 'dig up a plant with roots a wound)'. The first two verbs have a sequence, which I hypothesize to break root vowel. (None of the verbs having labial second consonant.) The third fo from vin-ik-ul-a but rather from vin-ul to go round) an obstacle'.

what is crucial is that the presence of a preceding root vowel /i/ or /e/ blocks the process.[38]

Returning to VHH, Caga E.62 (5V) provides very suggestive evidence that the processes could have been as indicated in (33). This language is generally assumed not to have VHH (cf. note 8), a view reinforced by the fact that the applicative suffix is realized as an invariant -i-. A manual search through Müller (1947), however, tells a different tale, summarized in (36).

(36) Mid V + Mid/High V in Caga CVCVC... Verb Stems

VCVC	All	s	y	k	r	t	d	n	l	š	ny	ng	m	v	w	b
eCeC	83	4	5	9	20	11	2	2	11	7	1	2	7	1	1	–
eCiC	17	6	3	6	2	—	–	–	—	–	—	—	–	–	–	–
oCeC	—	—	–	–	—	—	–	–	—	–	—	—	–	–	–	–
oCiC	29	16	1	8	4	—	–	–	—	–	—	—	–	–	–	–
eCoC	—	—	–	–	—	—	–	–	—	–	—	—	–	–	–	–
eCuC	17	—	1	13	2	1	–	–	—	–	—	—	–	–	–	–
oCoC	53	2	3	11	8	4	1	–	5	2	—	3	5	6	3	2
oCuC	10	—	2	8	—	—	–	–	—	–	—	—	–	–	–	–

The numbers in this table show how many verb stems were found that attest the indicated sequences. Thus, there were 83 stems having the sequence eCeC, 17 having eCiC, and so forth. A count was made only of sequences where a mid vowel is followed by another (non-low) vowel, since an initial survey indicated that there would be extremely few cases where mid vowels follow /i/, /u/ or /a/. The columns headed by s, y, k, r etc. plot the number of examples occurring as a function of the second consonant in the VCVC sequence. Two observations should be made. First, when the mid and following vowel agree in frontness and roundness, VHH applies in about 5/6 of the cases: 83 vs. 17 in the front series and 53 vs. 10 in the back series. Second, when the two vowels different in frontness and roundness,

[38] That only suffixes are affected by this process is seen in examples such as dim-uk-a 'be scared away' and sip-uk-a 'sprout', where the reversive intransitive suffix -uk- does not affect the preceding root /i/. A search of the CBOLD version of Sanderson (1954) reveals only three cases of verbs having the shape CiCuCuCa: -diimbukuka 'tumble; sag; fall over slowly (e.g., a tree or a pole)', -siimbukula 'dig up a plant with roots and soil attached', and -vinukula 'gap (of a wound)'. The first two verbs have a labial consonant preceding the -ukuk- sequence, which I hypothesize to break the blocking effect of the preceding front root vowel. (None of the verbs having the shape CiCiCuCa in the database has a labial second consonant.) The third form is either exceptional or is not derived from vin-ik-ul-a but rather from vin-uk-ul-a—cf. vin-uk-a 'go over (as opposed to go round) an obstacle'.

VHH is impossible. That is, neither oCeC nor eCoC occur in verb stems. In other words, if two vowels in successive syllables are mid, they must be identical.

There are two possible interpretations of these facts: (i) VHH is incipient in Caga and has begun by affecting vowels which agree in frontness and roundness. (ii) VHH is moribund in Caga and has begun by affecting vowels that disagree in frontness and roundness. A major difficulty with the first interpretation is that Caga clearly belongs to the same Eastern Bantu group as other languages in the area which have (canonical) VHH, e.g. Kamba E.55, Shambala G.23, etc. While Caga is somewhat isolated and detached from other Bantu languages, it is hard to conceive of VHH as a recent enough innovation for it to have escaped it. This view is further supported by the facts of contiguous Asu (Pare) G.22 (Kotz 1909). Like Caga, the applicative is non-harmonizing -i- in most cases, e.g. tet-a 'speak', tet-i-a 'speak for someone'. The applicative is however realized as harmonizing -ir-/-er- in frozen forms, e.g. tet-a 'speak', tet-er-a 'cackle'; teka 'get lost', tek-er-a 'get lost on someone'. I therefore adopt the second interpretation: the gradual loss of VHH has been innovated in Caga (and Asu), beginning with applicative -i-.

An additional argument weighs in on the side of gradual loss of VHH in Caga: Note in (36) that the second consonant of disharmonic eCiC and oCuC sequences is more restricted than in the corresponding harmonic sequences eCeC and oCoC. In fact, the only attested disharmonic eCiC and oCuC sequences are: eCis, eCiy, eCik, eCir, oCuy and oCuk, i.e. where the second consonant is [s], [y], [k] or [r]. All of these consonants are involved in suffixal allomorphy in Caga, e.g. causative -is-/-es-, applicative -iy-/-ey-, stative -ik-/-ek-, causative -ir-/-er-. There may therefore be a sporadic differential treatment of stem-internal vowels in cases where a suffix can be identified: Whereas eCeC and oCoC do not become eCiC and oCuC when the second consonant is non-suffixal, these latter may occur, sometimes apparently as variants, when suffixation is involved.

Finally, I should note that 8 of the 17 disharmonic eCiC forms have the sequence emiC vs. only three harmonic emeC forms—two of which are reduplications: *memeluka* 'albern sein, unnützen' and *memes&wa* 'jemdm. mit dem Finger ans Unterkinn fahren' (Müller 1947:199). Similarly, of the 10 disharmonic oCuC forms, 7 have omuk or omuy and one has onuk. By contrast, only one verb, *omoma*, the iterative of *-oma* 'tanzen' (and hence obviously a reduplication), has an omoC sequence. It thus appears that loss of VHH has been further hastened by the presence of a nasal consonant preceding the vowel in question. This presumably correlates with the fact that stem-initial [me], [mo], [ne] and [no] sequences are rare in Caga as in many Bantu languages. A rough count of the number of verb entries in Müller (1947) beginning with /m/ and /n/ is given in (37).

(37) Mid V + Mid/High V

[NV...]stem	i
m	12
n	7

Thus, rather than having the exp
find CeNiC and CoNuC, respe
contribute to the loss of VHH
important point is that height agr
[e] or [o] is preceded by an ident
this happened in the history of
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This, then, is what I believe
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*-ek-, respectively, which were
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we can now interpret some crucia

(i) The non-alternating mid v
in Southern Bantu (all of zone S
are original. If we assumed the re
at a loss to explain why these su
languages—which include the 7V

[39]Another example may be Salam
suffixes s'ouvre en e uniquement
causative of -end-a 'voyager' is thu
'charger un fusil' is -som-ish-a. '
neighbors Ruund L.53, which has
propose is that Salampasu i/e VHH
precedes. A slightly different, but c
Leung (1986:83) shows that the PB
in the imperative when the verb ha
degree 1 and degree 2 vowels:

kɪ-gur-iz-ɪ	'sell it!'
kɪ-duy-ɪŋɪ	'hit for it!'
kɪ-guut-ɪ	'defeat it!'
kɪ-rum-ɪ	'bite it!'

It is clear in this case that *-e >
vowel, another precedent for what I

[40]Bastin (1983a) sees this outcome
after *a in languages such as tho
argument goes as follows: While *-i
most Bantu languages, in several
extended to occurring also after the
the balance towards the -eC- allom

(37) Mid V + Mid/High V in Caga CVCVC... Verb Stems

[NV...]stem	i	e	u	o	a
m	12	3	10	—	26
n	7	1	11	1	11

Thus, rather than having the expected CeNeC and CoNoC sequences, we find CeNiC and CoNuC, respectively. In other words, various factors contribute to the loss of VHH in Caga, as well as to its retention. The important point is that height agreement will generally be maintained when [e] or [o] is preceded by an identical mid vowel.[39] The question now is: if this happened in the history of Caga, why not in the history of Bantu in general?

This, then, is what I believe to be going on in suffixal VHH in Bantu. I propose that the applicative and stative suffixes reconstruct as *-ed- and *-ek-, respectively, which were "peripheralized" to -id- and -ik- in most Bantu languages except where "held back" by a preceding mid root vowel (cf. below for discussion of u/o harmony). Assuming these reconstructions we can now interpret some crucial facts in the following way.

(i) The non-alternating mid vowels of applicative *-ed- and stative *-ek- in Southern Bantu (all of zone S except Shona S.10) and in Makua (P.31) are original. If we assumed the reconstructions *-id- and *-ik-, we would be at a loss to explain why these suffixes employ a degree 3 vowel in these languages—which include the 7V Sotho group, e.g. Tswana S.31.[40]

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[39] Another example may be Salampasu L.51: "En salampusu, la voyelle i des suffixes s'ouvre en e uniquement après cette voyelle" (Bastin 1986:76). The causative of -end-a 'voyager' is thus -end-esh-a, while the causative of -som-a 'charger un fusil' is -som-ish-a. This could be significant, since Salampasu neighbors Ruund L.53, which has no VHH at all. The interpretation I would propose is that Salampasu i/e VHH has been lost except when an identical /e/ precedes. A slightly different, but case involving comes from Logoli E.41 (7V). Leung (1986:83) shows that the PB final vowel *-e, used in the subjunctive and in the imperative when the verb has an object prefix, is realized [ɪ] after both degree 1 and degree 2 vowels:

kɪ-gʊr-iz-ɪ	'sell it!'	ke-veg-e	'shave it!'
kɪ-dʊy-ɪŋɪ	'hit for it!'	ke-ŋoor-e	'obtain it!'
kɪ-guut-ɪ	'defeat it!'	ke-saamb-e	'burn it!'
kɪ-rʊm-ɪ	'bite it!'		

It is clear in this case that *-e > -ɪ unless "held back" by a degree 3 (or 4) vowel, another precedent for what I am proposing here.]

[40] Bastin (1983a) sees this outcome as a possible extension of the -eC- found after *a in languages such as those mentioned in the next paragraph. The argument goes as follows: While *-iC- lowers to -eC- only after mid vowels in most Bantu languages, in several zone K and R languages this process is extended to occurring also after the low vowel *a. Once this happens, this tilts the balance towards the -eC- allomorphs, which occur more frequently—and

(ii) The mid vowel realization of *-ed- and *-ek- following *a in the preceding syllable in Mbundu H.21a, Mbunda K.15, Kwangali K.33, Kwezo K.35, Dciriku K.62, Pende L.11/K.52, Mbundu R.11, Kwanyama R.21, Ndongo R.22, and Herero R.31 is also original. Rather than saying that *-id- and *-ik- lower to -ed- and -ek- by assimilation, in these languages the preceding *a hindered the peripheralization of *-ed- and *-ek- to -id- and -ik- in this account.

(iii) The mid vowel realization of *-ed- and *-ek- following *Ca- roots is also original. Thus, the applicative of *pá- 'give' would have been *pá-ed-a, which in turn would be expected to be realized as [péela], as it is in Bemba M.42, for instance. In a language like Haya.EJ.22, where 'to give for/at' is realized as [héera], an input such as *pá-id-a would have been expected to come out as *[híira] by the normal vowel coalescence rules.

(iv) By setting up these suffixes as *-ed- and *-ek-, we can now resolve a dilemma faced by Bastin (1986) concerning the long causative suffix "-is-" which co-occurs with the short causative *-į-. In many languages, there is a morph -is- which harmonizes to -es- in exactly the same contexts as the applicative, e.g. Bemba M.42, Cewa N.31b, Shona S.11. If the applicative is reconstructed as *-id-, this would suggest that the causative sequence should be reconstructed as *-ic-į-. The problem is that individual languages from all parts of the Bantu zone also show evidence that the vowel of the causative is higher than that of the applicative. Thus, the causative suffix is -is- in Bobangi C.32 in the Northwest vs. applicative -el- (which harmonizes to -ɛl-). Similarly, in the South, the causative suffix is -is- in Lozi K.21/S.34, Luyana K.31, Mbukushu K.33, Makua P.31, Venda S.21, Sotho-Tswana S.30 and Nguni S.40 vs. applicative -el- (neither of which harmonizes). Finally, note that there are traces of this difference even in the East. Thus we have said that the applicative form /há-ir-a/ 'give for/at' is realized [héera] in Haya. However, the causative of /há-/ is [háisa]—even though both suffixes harmonize identically (-ir-/-er- and -is-į-/-es-į-) when following a consonant. We might follow Guthrie's suggestion (reported in Bastin 1986:89) and say that the morph -į- which directly follows the longer morph raised or tensed the vowel of *-ic-į- to -jc-į- so that we sometimes

hence are extended to occuring after the rounded vowel as well. While this might seem plausible in 5V systems, where 2 harmony triggers vs. 3 non-triggers changes to 3 vs. 2, in the 7V Sotho group the change would have been from 2 harmony triggers vs. 5 non-triggers to 3 vs. 4, hardly making -eC- the dominant allomorph! If the putative extension of VHH to occurring after *a took place before the 7V > 5V merger, this would thereby weaken this interpretation even further. Finally, as I discuss below, the preponderance of stem-internal [e] (over degree 1 or 2 front vowels) in Tswana S.31 extends beyond recognizable suffixes to characterize so-called "expansions" and unanalyzeable non-initial root syllables. While one could see Tswana analogizing applicative -el- and stative -ek- to all environments, it would seem unlikely to have done the same with corresponding tautomorphemic post-root vowels.

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these discrepancies between the vowel of the applicative and the vowel of the causative. Bastin goes as far as to reconstruct *-ịc-ị-, with harmony as a secondary development (much as in the case of perfective *-ịd-e, which historically did not undergo VHH, but which has been "regularized" to undergo VHH in such languages as Bukusu EJ.31c and Bemba M.42. Unlike the perfective, however, there is precious little evidence that her *-ịc-ị- conditions frication on preceding consonants, as *ị should—and as Bastin herself notes.[41]

My proposal handles both of these problems (higher vowel height than applicative which cannot however be *ị because of lack of frication) by recognizing the applicative as *-ed- and the causative as *-ic-ị-. The applicative harmonizes as above, i.e. except where held back by mid vowels in most harmonizing languages. The causative, on the other hand, has a degree 2 vowel which may lower (lax) as a result of VHH coming to be more general in Bantu languages, or it may tense (peripheralize) instead. Or, as in Haya, it may do a bit of both, depending on whether it follows a consonant or a vowel. Two bits of data further support this view. First, Batibo (1985:168) indicates that Sukuma F.21 (7V) has the interesting realization of causative *-is-ị-: -ịs-ị- after /ị, ụ, a/, -is-ị- after degree 2 /i, u/, and -es-ị- after degree 3 /e, o/. This situation contrasts with the "canonical" VHH pattern that characterizes the applicative and stative suffixes which are realized -el- and -ek- after mid vowels, otherwise degree 2 -il- and -ik-.[42]

Why should this be? My hypothesis would be to attribute the difference between these suffixes to a difference in the vowel that is reconstructed in causative *-is-ị- vs. applicative *-ed- and stative *-ek-. When VHH was introduced into this language, *-ed- and *-ek- harmonized to a preceding degree 2 *i or *u, while *-is- harmonized to a preceding degree 3 vowel. In addition, the degree 1 vowel -ị- further exerted an influence, causing the degree 2 vowel of (non-harmonized) -is- to become -ịs- as a secondary development—which was blocked, however, by a preceding degree 2 *i or *u. Again it is the vowel /a/ that tells us what is going on. Had we obtained -is-ị- after /a/, we might have interpreted the process as left-to-right agreement in [ATR]. However, /a/ is followed by -ịs-ị-. Thus, as in the Yao rounding harmony in (34) and (35), the innovation is for -is-ị- to become

[41] Languages which do show such frication often do so by analogy. Thus, Ashton et al (1954) claim that the long causative of Ganda EJ.15 ku-túuk-a 'to arrive, reach' should be ku-túus-is-a, but I have been able to elicit only ku-túuk-is-a. If such forms exist, even marginally, it may be by analogy with the short causative form ku-túus-a whose applicative is ku-túus-iz-a.

[42] Batibo mentions that Swahili might be exerting an influence on these realizations. In addition, causative *-ic- was almost certainly followed by *-ị- in PB (Bastin 1986), as it is in many Eastern Bantu languages today, e.g. Haya (Trithart 1977). Thus, the possibility is always there that the correct reconstruction could be with the same vowel as the applicative and stative suffixes—and that languages later and independently raised the vowel.

-ịs-ị- by a right-to-left process, which is secondary to VHH. This process is however blocked when the preceding *i or *u shares the degree 2 vowel height with the suffix -is-.

Corroboration of such a vowel height distinction in verb extensions comes from as far away from Eastern Bantu as Duala A.24 (Ittmann 1939[1978]). In this language both the applicative and stative are realized -e-, e.g. *lóng-a* 'build', *lóng-e-a* 'build for'; *túm-a* 'tear (tr.)', *túm-e-a* 'tear (intr.)'. However, the causative is realized -is- (followed by the final vowel -ɛ): *wút-a* 'become short', *wút-is-ɛ* 'shorten'; *lónd-a* 'to fill (intr.)', *lónd-is-ɛ* 'to fill (tr.). Reconstructing a different vowel in causative *-ic- vs. applicative *-ed- would thus go a long way towards accounting for vowel height differences sporadically noted throughout the Bantu zone.

Now it is conceivable still that the vowel height differences are due to the following degree 1 causative morph *-ị- which obligatorily accompanied *-ic- in PB (as in many daughter languages).[43] A close examination of stem-internal vowels, whether suffixal or not, is of course required and has been only partially effected at the time of this writing. Other citations of differential vowel height in Bantu languages include harmonizing impositive -ik-/-ek- vs. non-harmonizing stative -ik- in Ndonga R.22 (Viljoen & Amakali 1978) and Herero R.31 (Meinhof & van Warmelo 1932:44). Since invariant applicative -i- is presumably an innovation in Caga E.62, and since leveling of VHH is likely to hit the most productive suffixes first (e.g. the applicative and stative), it is conceivable that this distinction is a secondary development.[44]

If the causative and applicative suffixes are reconstructed with different vowels, they could have been subject to VHH with slightly different results, as we have seen. However, I wish to consider the alternative hypothesis that PB did not have had stem-internal VHH at all. One area that may shed some light on these questions is the realization of suffixes (and expansions) after CV- roots. I have already alluded to the fact that differences in vowel height between the applicative and causative is sometimes attested only after a vowel, e.g. Haya EJ.22 *hé-er-a* 'give for/at' vs. *hé-is-a* 'cause to give' (from *-há-*). Besides freely combining roots such as *-*pá-* 'give', *-*lí-* 'eat', *-*nó-* 'drink' etc., there are a number of frozen -CV-VC- combinations where the

[43]Evidence that would support the tensing of a vowel immediately followed by *-ị- would consist of a language in which -ịs-ị- is non-harmonizing when these two morphs occur in sequence, but harmonizing when another morph, e.g. the applicative, intervenes, i.e. -is-il-ị- vs. -es-el-ị- (with possible frication of the [l] of the applicative). I know of no such language. However, I am struck by the fact that *-ị- tenses mid vowels that precede it in Sotho-Tswana S.30 (cf. discussion of Tswana S.31 below). The question is why *-ị- does not affect the vowel of suffixes other than *-ic- to e.g. the applicative. In my account this is because the two sequences were *-ic-ị- and *-ed-ị-, respectively.

[44]Ndonga apparently uses -ik-/-ek- as its general causative, perhaps productively, whereas Herero utilizes invariant -is- for this purpose.

-CV- "root" does not occur i
and -CwVVC- verbs from B
arranged by the vowel of the

(38)	a.	fu-ik-	(fwík-)
		fu-is-	(fwiis-)
		fu-it-	(fwiit-)
		ku-ik-	(kwík-)
		ku-il-	(kwíil-)
		pu-il-	(pwiil-)
	b.	fí-uk-	(fyúuk-)
		fí-ul-	(fyúul-)
		si-uk-	(šuuk-)
		si-ul-	(šuul-)
	c.	fo-el-	(fweel-)
		fo-en-	(fween-)
		kó-el-	(kwéel-)
		kó-es-	(kwees-)
		po-ek-	(pweek-)
		pe-et-	(pyeet-)
		se-el-	(šeel-)
		se-et-	(šeet-)
	d.	be-ol-	(byool-)
		se-ob-	(šoob-)
		se-ok-	(šook-)
		se-ol-	(šool-)
		se-on-	(šoon-)
	e.	bi-al-	(byaal-)
		fu-al-	(fwáal-)
		fí-al-	(fyáal-)
		fi-am-	(fyaam-)
		kú-at-	(kwáat-)
		lú-al-	(lwáal-)
		sí-al-	(šaal-)
		si-am-	(šaam-)
		tu-al-	(twaal-)

-CV- "root" does not occur independently. The following list of -CyVVC- and -CwVVC- verbs from Bemba M.42 was presented in Hyman (1995), arranged by the vowel of the hypothetical suffix:

(38)	a.	fu-ik-	(fwíik-)	'dress (tr.), clothe'	*-dʊ́ik-	'clothe'
		fu-is-	(fwiis-)	'spit'	*-tʊ́id-	'spit'
		fu-it-	(fwiit-)	'refuse a gift'		
		ku-ik-	(kwíik-)	'set handle on tool'	*-kúik-	'put into
		ku-il-	(kwíil-)	'earn'		handle'
		pu-il-	(pwiil-)	'sip'		
	b.	fí-uk-	(fyúuk-)	'run away'		
		fí-ul-	(fyúul-)	'dislocate'		
		si-uk-	(šuuk-)	'be lucky'		
		si-ul-	(šuul-)	'dig up, de-stump'	*-djud-	'disinter'
	c.	fo-el-	(fweel-)	'bend, droop'		
		fo-en-	(fween-)	'scratch'		
		kó-el-	(kwéel-)	'climb'	*-koid-	'climb'
		kó-es-	(kwees-)	'rub'		
		po-ek-	(pweek-)	'have diarrhea'	*-puak-	'have
		pe-et-	(pyeet-)	'wimper'		diarrhea'
		se-el-	(šeel-)	'drag on buttocks'		
		se-et-	(šeet-)	'chew'		
	d.	be-ol-	(byool-)	'belch'		
		se-ob-	(šoob-)	'reproach'		
		se-ok-	(šook-)	'take a detour'		
		se-ol-	(šool-)	'crave meat'		
		se-on-	(šoon-)	'run over, crush'		
	e.	bi-al-	(byaal-)	'sow'	*-bé(j)ad-	'sow'
		fu-al-	(fwáal-)	'get dressed, wear'	*-dʊ́ad-	'wear'
		fí-al-	(fyáal-)	'give birth'	*-bʃad-	'give
		fi-am-	(fyaam-)	'be wedged'		birth'
		kú-at-	(kwáat-)	'have'	*-kúat-	'seize'
		lú-al-	(lwáal-)	'be sick'	*-dúad-	'be ill'
		sí-al-	(šaal-)	'remain'	*-tʃgad-	'remain'
		si-am-	(šaam-)	'be unlucky'		
		tu-al-	(twaal-)	'take sth. to'	*-túad-	'carry'

Since /s/ becomes [š] only before [i] or the glide [y] in Bemba, I have included forms such as šeet- 'chew' as having the intermediate structure -CyVVC-. Further evidence that this and certain other verbs from (38) have a bimorphemic structure is seen from the verb pairs in (39).

(39)	a.	fu-ik-	(fwiik-)	'dress (tr.), clothe'	*-dụ́ik-	'clothe'
		fu-al-	(fwaal-)	'get dressed, wear'	*-dụ́ad-	'wear'
	b.	si-uk-	(šuuk-)	'be lucky'		
		si-am-	(šaam-)	'be unlucky'		
	c.	se-et-	(šeet-)	'chew'		
		se-ol-	(šool-)	'crave meat'		
	d.	si-ul-	(šuul-)	'dig up, destump'	*-dịud-	'disinter'
		si-ik-	(šiik-)	'bury'	*-dịik-	'bury'

In both (38) and (39) I have given corresponding reconstructions from Meeussen (1980[1969]). The interesting cases are (38c,d) and (39c), where mid root vowels are involved. Three important observations should be made about these forms:

(i) A mid vowel must glide before another mid vowel, e.g. /pe-et-/ → *pyeet-* 'whimper', rather than simply fusing into a long vowel as elsewhere in the language, e.g. in imbrication (Hyman 1995).[45]

(ii) The vowel /o/ appears directly after the the root vowel /e/, e.g. /be-ol-/ → *byool-* 'belch', even though Bemba is has asymmetric VHH. Bemba thus has words such as *-beluk-* 'knock off (work)' *-lépul-* 'tear', not **-belok-*, **-lépok-* etc.

(iii) Although the consonant [f] appears in Bemba as the reflex of *p and *b before *į and of any obstruent before *ụ, the first two forms in (38c), *fweel-* 'bend, droop' and *fween-* 'scratch', appear to require the representations given: fo-el-, fo-en-. Otherwise we have no explanation as to why the vowel is mid.

Of course all of the above falls into place if we abandon the requirement that vowel sequences need to show the same VHH requirements as vowels separated from each other by a consonant. In this case we can have representations such as /si-et-/, /pi-et-/, /bi-ol-/, /fu-el-/ and /fu-en-/. Already Meeussen (1967:87) recognized the problem:

> The presence of vowel /o/ without preceding /o/ in *-pịong-* ['press (out)'] and *-pịom-* ['stammer'] as also of /e/ in *-tịed-* ['slip'] is

[45]Hyman & Katamba (to appear) make a similar observation for Ganda EJ.15. What is also interesting about the Bemba form -pyeet- is that the hypothetical extension is -Vt- and the form hence analyzed as -pe-Vt-, where V = a copy of the preceding vowel (cf. §6). Needless to say, the mid feature can only come from the first vowel.

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By 1.7 Meeusssen is of c
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(1980[1969]) reconstructio

(40) Internal V_1V

V_1/V_2	į	i
į	1	1
i	—	8
e	—	1
ụ	—	4
u	—	6
o	—	2
a	2	1

Note first that although ir
there is only one example
black', *-pụ̀ụk-* 'mature'.[46]
be attributed to the difficul
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should be contrasted with

(41) a. *-jued- 's
*-kued- 'v
*-puen- 's
*-tuet- 'b

It is unclear how *-kt
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mentioned by Meeussen
reconstructions with *ụi in

(42) a. *-dị-ud- 'pu
*-dịunguk- 'tu

[46]Guthrie (1967-1971) has
of the proposed shapes of hi
characterized PB.

remarkable; it would seem to suggest an earlier stage of the language which had not yet the Proto-Bantu rules given in 1.7.

By 1.7 Meeusssen is of course referring to VHH. In the following table I have plotted out all of the stem-internal VV sequences in Meeussen's (1980[1969]) reconstructions:

(40) Internal V_1V_2 in Meeussen's Proto-Bantu Verb Stems

V_1/V_2	i̱	i	e	ụ	u	o	a
i̱	1	1	2	—	5	2	4
i	—	8	—	—	3	—	7
e	—	1	12	—	—	—	1
ụ	—	4	—	1	2	—	3
u	—	6	4	—	15	—	9
o	—	2	—	—	—	6	—
a	2	1	—	—	1	—	9

Note first that although internal long vowels occur in the reconstructions, there is only one example each involving the two degree 1 vowels: *-pi̱i̱t-* 'be black', *-pụ̀ụ́k-* 'mature'.[46] The effective absence of *ea and *oa can perhaps be attributed to the difficulty of distinguish these from *ia and *ua. While it is not clear what to say about the absence of *eo or *eu, the absence of *oe should be contrasted with Meeussen's reconstruction of both *ue and *oi:

(41) a. *-jued- 'speak'
*-kued- 'whistle'
*-puen- 'smoke'
*-tuet- 'breathe, wheeze'

b. *-coid- 'spy'
*-koid- 'climb'

It is unclear how *-kued- and *-koid- might have contrasted in PB, or how their reflexes differ in the daughter languages. As seen in (38c), I have identified 'climb' as /ko-el-/ in Bemba. While the number of reconstructed roots with *VV is not large, the table in (40) nonetheless suggests that disharmonic VV sequences were likely to have occurred in PB. Since VHH is definitely more general in CVC-VC- sequences than it is in CV-VC- forms, it would be particularly striking if we could find differences in recognizable -VC- suffixes in one vs. the other structure.The two roots mentioned by Meeussen with *i̱o in (42b) are contrasted with his five reconstructions with *ụi in (42a).

(42) a. *-di̱-ud- 'pull out of grond'
*-di̱unguk- 'turn round'

b. *-pi̱om- 'stutter'
*-pi̱onj- 'squeeze out'

[46] Guthrie (1967-1971) has more, but many of these are suspect, either in terms of the proposed shapes of his common forms, or in terms of whether these forms characterized PB.

*-kɟud-	'break wind'
*-tɟugud-	'wipe off, rub'
*-tɟuk-	'shake'

As seen, the forms in (42a) all involve verbs that end in either *-ud- or *-uk-, i.e. the shapes of the transitive and intransitive reversive suffixes, respectively. On the other hand, the two forms in (42b) end in -om- and -onj-, respectively, which do not resemble suffixes. Could this be the difference, then, between the two sets of forms? The question is whether *-ud- and *-uk- behave any differently from other proto round vowels in post-radical position.

A possible answer comes from Southern Bantu. The languages of Guthrie's zone S fall into two distinct groups from the point of view of VHH. The Shona S.10 group has asymmetric VHH exactly as other most other Savannah Bantu languages to its North, e.g. Tonga M.64, Cewa N.31b, Yao P.21. The rest of zone S lacks VHH in the front series, exhibiting, for instance, invariant applicative -el- and stative -ek-, but causative -is-. In the back series, these languages fall into two groups: Certain have VHH in the back series, where -uk- and -ul- are realized -ok- and -ol- after /o/, e.g. Venda S.21 (Murphy 1997[van Warmelo 1937]) and Lozi K.21/S.34 (Gowlett 1967). To this group one can also add Makua P.31 which has invariant applicative -el- and causative -ih-, but alternating u/o in the back series.[47] The other group shows the same facts in the front series, but exhibits a more complex situation concerning internal [u] and [o]. Among these latter languages are Tswana S.31 and Ndebele S.44.

Tswana is typical of the Sotho group in having a recently developed 9V system from the tensing of /ɛ/ and /ɔ/ to [e] and [o]. In many cases the tense variants are predictable, occurring before a following higher vowel or a consonant such as /ts/, itself derived from a following lost historical causative *-ɟ- suffix. However, there are also instances of unpredictable tensing. The following table, based on Creissels (1996) and using his transcription, shows the plotting of the nine potention V1 and V2 vowels in CVCVC-a verb stems:

[47]This is another sense in which Makua, despite its northerly location, belongs with the languages of zone S (cf. Janson 1991/1992 for further discussion).

(43) CVCVC-a

V1V2	i	
i	12	
ɪ	5	
e	8	
ɛ	—	
u	8	
ʊ	7	
o	3	
ɔ	—	
a	25	

Note, first along the
followed by itself, a
constraints. In additi
causatives, i.e. CVC
after /a/. Since /e/ a
their numbers we se

The back series
very general distribu
occurs generally, the
from *CɪCʊC-, sinc
note that /o/ and /ɔ/
suggests vowel har
contrasting with the
entries with CoCʊC-
50% of the relevant
'désespérer (intr.)' a
verbs as a function
obtain the following

(44) ɔ/o

CVCVC	All
CɔCɔC	16
CoCoC	6
CoCʊC	23

We are concerne
Only 4 out of 22 C
consonants vs. 19 ou
of CVCVC-a and lon
which only 3 were C
which 31 had the se
outnumbers CɔCɔl te

(43) CVCVC-a verb stems in Tswana (based on Creissels 1996)

V1V2	i	ɪ	e	ɛ	u	ɷ	o	ɔ	a
i	12	—	(2)	11	—	17	—	—	8
ɪ	5	6	3	9	—	—	—	—	10
e	8	—	9	—	—	24	—	—	(1)
ɛ	—	—	—	22	—	—	—	—	4
u	8	—	—	24	19	3	—	—	10
ɷ	7	(1)	5	14	—	34	—	—	22
o	3	—	10	—	3	23	6	—	—
ɔ	—	—	—	24	—	—	—	16	16
a	25	6	10	52	3	64	—	—	51

Note, first along the top left/bottom right diagonal, that any vowel can be followed by itself, a property that is typical of Southern Bantu, despite other constraints. In addition, of the 68 verbs having the shape CVCiC-a, 52 are causatives, i.e. CVCis-a. Degree 2 /ɪ/ mostly occurs after itself, but also after /a/. Since /ɛ/ and /e/ differ only in secondary tensing, if we combine their numbers we see that 195 V_2 vowels are mid vs. only 58 /i/ and 13 /ɪ/.

The back series shows something quite different. Although /a/ has a very general distribution, tense /u/ occurs only after back vowels. /ɷ/ also occurs generally, though not after /ɪ/. One possibility is that CɪCɪC- derives from *CɪCɷC-, since internal /ɪ/ otherwise occurs only after /a/. Finally, note that /o/ and /ɔ/ occur only after an identical mid vowel. This last fact suggests vowel harmony in the back series. However, we also see that contrasting with the 6 cases of CoCoC- and 16 cases of CɔCɔC- are 23 entries with CoCɷC-. In other words, back VHH appears to occur in about 50% of the relevant verb forms. We, thus, obtain verbs such as tɬhɔ́bɔ́χá 'désespérer (intr.)' as well as *tɬòbɷ̀χà* 'peler (intr.)'. If we plot out these 45 verbs as a function of the consonant that follows the /ɷ/, /o/ or /ɔ/, we obtain the following results:

(44) ɔ/o + ɔ/o/ɷ in Tswana CVCVC-a Verb Stems

CVCVC	All	l	χ	t	tl	b	k	m	s	ts	ntsh	tlh
CɔCɔC	16	2	2	2	5	3	1	1	—	—	—	—
CoCoC	6	—	—	—	—	—	—	—	2	2	1	1
CoCɷC	23	13	6	—	—	—	—	—	2	2	—	—

We are concerned with CVCVC-a verb stems whose last C is /l/ or /χ/: Only 4 out of 22 CɔCɔC-a or CoCoC-a verbs end in one of these two consonants vs. 19 out of 23 CoCɷC-a verbs. In addition, a combined search of CVCVC-a and longer verbs turned up 60 CɔCɔC or CoCoC sequences of which only 3 were CɔCɔl (and none CoCol) vs. 46 cases of CoCɷC, of which 31 had the sequence CoCɷl. In other words, the sequence CoCɷl outnumbers CɔCɔl ten to one! This cannot be accidental.

The picture is even clearer in the 5V Nguni S.40 languages, where similar distributions are found. Within this group I shall briefly consider only Ndebele S.44, based on the CBOLD version of Pelling (1971). The first two vowels of CVCVC... verb stems are plotted in (45).

(45) $V_1 + V_2$ in Ndebele CVCVC... verb stems

V_1/V_2	i	e	u	o	a
i	92	42	8	(2)	36
e	28	99	67	(1)	26
u	29	45	141	—	35
o	19	27	36	75	21
a	52	80	107	—	127

As seen, both /i/ and /e/ occur frequently after all root vowels. This isn't surprising, given that the causative suffix is invariant -is- and the applicative and stative suffixes invariant -el- and -ek-, respectively. Of 220 verbs that begin CVCiC-, only 21 have neither the root vowel /i/, nor have /s/ following the V_2 /i/. The back series, on the other hand, clearly shows, first, that /o/ occurs only after root /o/. However, /u/ may also occur after root /o/. Upon closer inspection of the data in (46), however, we note that the C_3 consonant plays an important role in predicting whether the form will be CoCuC... or CoCoC...:

(46) CoCuC.../CoCoC... in Ndebele Verb Stems

CVCVC	All	l	k	b	d	m	n	ng	nq	s	th	tsh	z
CoCoC	75	10	5	9	3	3	1	2	2	2	7	1	28
CoCuC	36	27	9	—	—	—	—	—	—	—	—	—	—

As seen, all 36 CoCuC... verb stems have either the shape CoCul... or CoCuk.... By contrast, the final consonant of CoCoC... stems can be quite varied. Particularly noteworthy is the fact that 28 verbs have the shape CoCoz. Why should this be?

In order to address this question, let us take a closer look at the distribution of vowels in verb stems that begin with the sequence CVCVz.... The results are displayed in (47).

(47) $V_1 + V_2$ in Ndebele CVCVz... verb stems

V_1/V_2	i	e	u	o	a
i	23	7	—	1	6
e	—	34	8	—	—
u	—	5	28	—	10
o	—	1	—	28	—
a	5	10	13	—	45

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(48) a. dondoloze
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londoloz-
mpompol
nyonkolo
zongoloze

b. godol-a
kopol-a
lobol-a
qobol-a

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A number of important observations can be made from this table. First, as elsewhere, a postradical vowel seems always able to immediately follow an identical preceding root vowel. Hence, the sequences iCiz, eCez, uCuz, oCoz and aCaz are all found in relative abundance. Second, we see that postradical *ez* appears after all root vowels, though less frequently after /u/ and /o/. In fact, there is only one example, *sondez-a* 'bring near', where root /o/ is followed by *ez*. This verb is clearly a causative of the corresponding verb *sondel-a* 'go near', where the *el* sequence may itself be a frozen applicative. If this is so, why aren't there more examples of CoCez? The answer, I believe, derives from the tendancy of S.30 and S.40 languages to modify stem-vowel sequences that disagree in roundness. We already noted with respect to the table in (43) that Tswana lacks CiCuC-, CɪCuC- and CɪCɷC-. We also hypothesized that the latter has been replaced by CɪCɪC-, noting especially that postradical [ɪ] occurs mostly after root /ɪ/. I would, thus, like to suggest a similar scenario here: What would have been pronounced CoCez- is instead realized CoCoz-, i.e. with agreement in rounding. Note that this latter form ends in [z], which is elsewhere associated with causative *-ɟ-. What this means is that one might expect some confusion with CoCul- forms, which normally do not undergo harmony. It was noted in (46) that 10 verbs occur in the database with the shape CoCol... (vs. 27 verbs of the shape CoCul...). As seen now in (48a), six of these 10 verbs are further "extended" by [oz]!

(48) a. dondolozel-a 'go along with a staff'
gombolozel-a 'encircle, surround'
londoloz-a 'take care of, look after'
mpompoloz-a 'talk boisterously'
nyonkoloz-a 'scowl, glower at'
zongolozel-a 'wind round, wind up'

b. godol-a 'cold, feel the cold'
kopol-a 'peck at'
lobol-a 'give lobolo [bride price]'
qobol-a 'cuff gently on the head'

Further, of the four verbs in (48b), one is clearly denominal (lobol-a), while others may be de-ideophonic (see below) or borrowings. It is, therefore, clear that the reversive transitive should be invariant -ul- in Ndebele, even in CoC-ul- forms. The forms in (48a) should therefore not have the extension shape *-oloz-*, but rather *-uluz-*, as in the three examples occurring in the database: *phephuluz-a* 'blow away', *huquluz-a* 'take, appropriate' and *hlukuluz-a* 'annoy, intimidate'. Thus, the development of *oz* from *ez* by

assimilation to a preceding /o/ has caused a realignment—and perhaps introduced VHH in the back series in Ndebele.[48,49]

Assimilation may not be the only source of the discrepancy between CoCuC- and CoCoC-. Recall from (46) that there are 9 CoCuk... verbs in Ndebele vs. 5 CoCok.... Since our contention is that the former set is "regular", showing a direct reflex of reversive intransitive *-uk-, it is significant to note in (49) that all but one of these verbs has a corresponding reversive transitive in -ul-:

(49)				
	hotsh-uk-a	'get pulled out'	hotsh-ul-a	'pull out'
	mony-uk-a	'slip out'	mony-ul-a	'pull out'
	ngcom-uk-a	'come out, slip out'	ngcom-ul-a	'pull out'
	ngcoth-uk-a	'get plucked/pulled out'	ngcoth-ul-a	'pluck/pull out'
	nyom-uk-a	'slip (knot), get pulled'	nyom-ul-a	'slip out knot'
	photh-uk-a	'get round'	photh-ul-a	'grind mealies'
	qoth-uk-a	'get rubbed off'	qoth-ul-a	'rub smooth'
	yoc-uk-a	'get taken off (skin)'	yoc-ul-a	'tear skin off'

[48]Of perhaps potential significance to this problem is the fact that semantically related verbs exist with similar forms that cannot exactly be derived from each other. We have cited the verb *zongolozel-a* 'wind round, wind up' in (48). Seven other verbs occur in Pelling (1971) that begin with a zVng... sequence: *zeng-a* 'loiter', *zengel-a* 'hunt, persecute', *zingelez-a* 'go round', *zingelezel-a* 'encircle, surround', *zungelez-a* 'encircle', *zunguz-a* 'sway, wave (tr.)', *zunguzek-a* 'sway (intr.)'. As seen, there appears to be a relatedness, even though the root vowel varies between [e], [o] and [u]. Given the restrictions on vowel sequencing in Ndebele, it would not be without interest to investigate how the suffix might have affected the root vowel, rather than the reverse.

[49]One other issue not mentioned is the potential interaction of reduplication with VHH. In a language with canonical VHH such as Ganda EJ.15, the full reduplication of a verb such as kól-à 'do' as kólàà-kola will mean that an [o] follows an [a], which is disharmonic. We can easily ignore such cases (also in languages where verb stem reduplication is limited to two syllables). However, most Bantu languages have roots that begin with what appears to be the reduplication of the first root syllable, e.g. Ndebele *xoxomela* 'stand on tiptoe'. To test whether this factor might contribute to the occurrence of CoCoC... verbs, I did the following count of $C_iV_iC_iV_iC$... verbs for the 5 vowels in Ndebele. The results are as follows:

C_iiC_iiC...	7/92	(8%)	C_iuC_iuC...	16/141	(11%)
C_ieC_ieC...	12/99	(12%)	C_ioC_ioC...	25/75	(33%)
C_iiC_iiC...	22/271	(8%)			

Whereas reduplicated first syllables with the vowels /i, e, u, a/ hover around 8-12% of the number of verbs with identical first and second syllable vowels, as seen, a full 33% of CoCoC... verbs appear to be reduplicative. The exact significance of this is not clear, but definitely merits further attention.

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(50) bhobok-a 'get pi
phoqok-a 'snap
wohlok-a 'fall/sl
phohlok-a 'get b
tshopok-a 'sprin

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(51) a. cheni-m-a
chezi-m-a
nyeti-m-a
nyezi-m-a
pheni-m-a
yeti-m-a
c. tsenjil-á

As seen, the six verbs
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	god-uk-a	'depart, die of old age'	—

By contrast, none of the CoCok- verbs has a corresponding CoCol-. Instead, four have a corresponding transitive of the form CoCoz-:

(50)	bhobok-a	'get pierced'	bhoboz-a	'break
	phoqok-a	'snap in two (intr.)'	phoqoz-a	'snap in two (tr.)'
	wohlok-a	'fall/shower down'	wohloz-a	'shake down (tr.)'
	phohlok-a	'get broken, smashed'	bohloz-a[50]	'break, smash'
	tshopok-a	'spring (intr.)'		—

My hypothesis is thast these verbs derive historically from bisyllabic ideophones of the shape CoCo. These ideophones would have been verbalized with intransitive -k- and transitive -z-, hence *wohlo-k-a* 'shower down (intr.)' and *wohlo-z-a* 'shower down (tr.)', etc. Although Pelling (1971) does not have an extensive list of such ideophones, one relevant form does appear in the dictionary: *wohlololo* 'ideophone expressing idea of collapsing', which is clearly related to the two verbs just cited. In other words, there is a potential difference in morphological segmentation between CoC-uk-a vs. CoCo-k-a.[51]

Ideophones are widespread in Bantu, particularly Southern Bantu, and can be assumed to have existed quite early in Bantu linguistic history. They are also known to produce disharmonic verb forms. Thus, in Cewa N.31b, which has canonical (asymmetric) VHH, the following are the complete set of CeCiC- disharmonic verbs in the CBOLD database for that language:

(51)	a.	cheni-m-a	'to shine'	b.	cheni	'shining' (ideo.)
		chezi-m-a	'to shine'		chezi	'shining' (ideo.)
		nyeti-m-a	'to shine'		nyeti	'shining' (ideo.)
		nyezi-m-a	'to shine'		nyezi	'shining' (ideo.)
		pheni-m-a	'to shine'		pheni	'glittering; truly'
		yeti-m-a	'to glitter'		yeti	'shining; glistening'
	c.	tsenjil-á	'to disappear, be out of sight'			

As seen, the six verbs in (51a) all derive from bisyllabic ideophones in (51b), which have the shape CeCi. (The one disharmonic verb in (51c) remains an unaccounted for exception.) Although CeCi is an acceptable bisyllabic stem shape, CeCiC-V is disharmonic.

The verbs in (51) suggest that disharmonic (de-ideophonic) verbs constitute a well-defined semantic glass 'shining' in Cewa. This need not be the case. One of the most extensive documentations of ideophones is

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[50] As seen, there is an irregular correspondence in the voicing of the initial consonant of the root.

[51] This result should cause one to reponder the conclusion drawn from Caga E.62, whose limited VHH resembles the S.30-S.40 situation in obvious ways.

available from Shona S.11, just to the south of Cewa N.31b. Fortune (1962) indicates that almost every verb has a corresponding ideophone in Shona. Shona, like Cewa, has canonical VHH. While there is significant dialect variation, (52) provides a representative sampling of disharmonic verb stems of the shapes CoCiC- and CoCuC- and their corresponding ideophones (Hannan 1987):

(52) De-ideophonic verbs in Shona and their source ideophones

a. CoCiC- verbs

bóidza	blink, flicker	bói bói ideo. of blinking
chómwira	swallow w/difficulty	chomwí ideo. of swallowing without chewing'
dórika	hop (esp. insects that do not fly)	dóri dóri ideo. of hopping (esp. non-flying insects)
dórinha	run, trot	dóri dóri ideo. of running, trotting
kóira	copulate	kói kói ideo. of copulating
kórofika	be lazy when hoeing	kórófi kórófi ideo. of hoeing lazily
kótsidza	make nod; drowsy; put to sleep	kotsí ideo of nodding with sleep
kotsira	nod with sleep, be asleep	kotsí ideo of nodding with sleep
ngóndika	bend right over (tall person)	ngóndi ideo of bending forwards (tall object)
nyobidza	cause to sink, pulling from below	nyobí nyobí ideo of bobbing (float on fishing line)
nyobika	bob (as fishing-float, when fish are nibbling)	nyobí nyobí ideo of bobbing (of float on fishing line)
pfóridza	make sleepy, cause to fall asleep	pforí ideo of falling fast asleep, going astray
pfórika	become sleepy (not in one's bed), fall asleep	pforí ideo of falling fast asleep, going astray
tóira	shine distantly	tói tói ideo of flickering (esp. in distance)
tórika	hop (insect)	tóri tóri ideo of hopping (insects)
tsómwidza	cause to swallow sth difficult	tsómwi ideo of swalling sth difficult to swallow
tsomwira	swallow something difficult	tsómwi ideo of swalling sth difficult to swallow

hómura	bark
hómuka	turn (oxen)
hópuka	be lif (heav
hóura	bark (
kóbvudza	make
kóbvuka	grow
kómuka	turn r (oxen

As seen, the id Co(C)u. Derived intr Co(C)u-k-, while the as their verbalizing inhibited, either gene a corresponding Co(C

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(53) a. -gézi-w-al
-genyi-w-

b. -ógi-w-
-kópi-w-a

c. -zito-w-

In these examples, ve (al)-, a direct reflex o CeCi-w..., while thos also disharmonic, is d frequently disharmon DJ.53 *zido-h-*; Yao P.

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[52]On the other hand, H Co(C)uC- verbs whose are indicated as borrow to surface' (<English],

b. CoCuC- verbs

hómura	bark (baboon)	hómu ideo. of barking (baboon)
hómuka	turn (inspanned oxen)	hómu inter. turn (to inspanned oxen)
hópuka	be liftable, movable (heavy obj.)	hópu inter: pull (to oxen)
hóura	bark (dog)	hóu ideo. of barking (dog)
kóbvudza	make thick	kobvú adj. thick
kóbvuka	grow thick	kobvú adj. thick
kómuka	turn right round (oxen)	kómu inter: turn! (to oxen); cf. homu

As seen, the ideophones in question have the shapes Co(C)i and Co(C)u. Derived intransitive verbs generally have the shapes Co(C)i-k- and Co(C)u-k-, while the corresponding transitives may have use -r-, -dz- or -s- as their verbalizing consonant. What's important is that VHH may be inhibited, either generally or dialectally, by virtue of a verb's relationship to a corresponding Co(C)i or Co(C)u ideophone in Shona.[52]

In fact, disharmonic verbs can be not only de-ideophonic, but also de-nominal (usually de-adjectival), as in Ganda EJ.15 (Hyman 1994):

(53)	a.	-gézì-w-al-	'grow wise'	cf.	-gézì	'wise'
		-genyi-w-(al)-	'visit'	cf.	-genyi	'visiting'
	b.	-ógì-w-	'grow sharp'	cf.	-ógì	'sharp'
		-kópì-w-al-	'become common'	cf.	-kópi	'common'
	c.	-zito-w-	'be heavy'	cf.	-zito	'heavy'

In these examples, verb bases are derived from adjectives by suffixing -w-(al)-, a direct reflex of PB *-p-(ad)-. The data in (53a)show forms that begin CeCi-w..., while those in (53b) begin CoCi-w-. In (53c) the verb *-zito-w-*, also disharmonic, is derived from the adjective *-zito* 'heavy' (PB *-dịto). It is frequently disharmonic in Bantu languages with canonical VHH (cf. Shi DJ.53 *zido-h-*; Yao P.21 *-sito-p-*).

In studies on VHH such derivational relationships are often overlooked, as such scholars typically privilege the alternations found in the applicative, stative, causative and other "alternating" suffixes. While these forms are easily isolable, morphologically, they show in language after language that disharmonic verb bases can and do co-exist along side canonical VHH. The examples just considered involve "exceptional" non-harmonizing forms. In

[52]On the other hand, Hannan (1987) includes a smaller number of Co(C)iC- and Co(C)uC- verbs whose corresponding ideophone is not provided. Some of these are indicated as borrowings, e.g. kórisa 'enjoy' (<Nguni), pórisha 'apply polish to surface' (<English], komburena 'complain' (<English).

the discussion of CoCoz... verbs in Ndebele, where we instead have "exceptional" harmony, it was suggested that the existence of ideophones of the shape CoCo might be sought as a partial explanation for some of the observed facts. In other words, de-ideophonic, de-nominal and, ultimately, borrowed verbs, should be carefully considered for their potential relevance in determining the rise and fall of VHH in Bantu.

6. Conclusion

In the preceding sections we have taken a close look at VHH as it is realized throughout the Bantu family. We have considered a number of issues on which VHH depends, including the distribution of the features that define both canonical and non-canonical VHH throughout the Bantu zone. We have also considered the nature of the PB vowel system, specifically, how different interpretations of it might intersect with the job of reconstructing the historical devleopment (and loss) of VHH in the various branches and individual languages. While virtually everything said here must be taken as tentative, I hope to have at least mapped out some of the broad issues with which we must still contend. As seen particularly in §5, this study has led us to take a close look at the distribution of vowels not only within the derived Bantu stem, where most attention on VHH has focused, but in non-derived verb and noun stems as well.

While this study has confirmed many of the prior observations made about VHH in different Bantu languages, I have, however, speculatively, parted company with majority views in certain of my conclusions. First, I have suggested that VHH did not exist in PB—at least not as usually cited with derivational suffixes such as the applicative, stative, causative, reversive etc. Second, in order to account for their differential realization across languages, I have proposed to reconstruct some of these latter suffixes with degree 3 vowels, e.g. applicative *-ed- and stative *-ek- vs. causative *-ic-ɟ-, reversive intr. *-uk-, and reversive tr. *-ud-. In my view, VHH is so often asymmetric in the front vs. back series because of a different in starting point: *-ed- and *-ek- begin as degree 3 vowels, while *-uk- and *-ud- begin as degree 2 vowels. Front height harmony thus involves a raising of *e to degree 2 [ɪ] by a process of "peripheralization", inhibited by the presence of a preceding mid vowel (as well as by /a/ in parts of zones K and R. Back height harmony, on the other hand, involves the lowering of *u to degree 3 [ɔ̧] by assimilation to a preceding [ɔ]. The fact that causative *-ic-ɟ- sometimes joins *-ed- and *-ek- in its harmony properties, and sometimes doesn't, is accounted for by reconstructing *-ic- with a degree 2 vowel.

Looked at more specifically, I would claim that these derivational suffixes did not harmonize in PB. That is, they had the same behavior as we suppose both for the inflectional final vowel morphemes *-i, *-e, and *-ɟd-e and their derivational counterparts, e.g. *-ɣ, *-o etc. This prior resemblance must certainly have something to do with the tremendous temptation

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[54] See Hyman & Katamb

Bantuists have had to view certain or all of the derivational suffixes as bimorphemic: Intransitive *-k- combines with both *-e- and *-u- (my reconstructed vowels) to form statives and intransitive reversives, while transitive *-d- combines with these same vowels to form applicatives and transitive reversives, and so forth. If front height harmony is largely a peripheralization process (*e > i), as I have suggested, then the process might not have gotten seriously under way until after the ubiquitous final vowel *-a was added to all verb forms lacking an otherwise clearly demarcated inflectional ending (cf. Grégoire 1979 for discussion of this possible interpretation of PB). We Bantuists are struck not only by the possible factoring out of *-d-, *-k- etc., but also by the striking resemblance of the vowel of the deverbal (e.g. agentive) nominalizer -ị with the vowel of causative *-ị-. Could this latter have been a "final vowel" morpheme? Consider also the resemblance between passive *-u- and the deverbal (e.g. adjectival) nominalizer *-ụ. Maybe the longer causative *-ic-ị- and the longer passive *-ib-u- were once derivatives of a verb such as 'do', with meaning of 'make do' and 'being done'?[53] Could their earlier status as final vowel's also account for Meeussen's (1967, 1973) contention that causative *-ị- and passive *-u- may have had high tone in PB?[54]

Whatever the answer, what is important for the purpose of this study is that there is no apriori reason to reconstruct the same vowel height on all derivational suffixes, which, with the exception of the Meinhof school, has usually been done. Since I have reconstructed *-ed- and *-ek- vs. *-ud- and *-uk-, one might reasonably ask why these vowel heights might have been different in this way in PB? If non-accidental, I would seek an answer in the fact that *-uC- suffixes are more tightly bound with their radical than are *-eC- and *-iC- suffixes. Although Meeussen (1967) and others distinguish between two types of "extension" (suffix vs. expansion), there seems in fact to be good reason to make at least a three-way distinction: (i) relatively productive suffixes such as applicative *-ed-, causative causative *-is-ị-, and reciprocal *-an-; (ii) relatively unproductive suffixes such as the reversives *-uk- and *-ud-; and (iii) unanalyzable expansions (see next paragraph). By this typology *-uk- and *-ud- fall in the second category, i.e. somewhere between expansions and productive suffixes. Although there is some variation, they often are restricted to occurring immediately after the verb root, which in most cases cannot occur without a suffix. Coming "early" in the verb stem, *-uk- and *-ud- may also be followed by other suffixes, if valence requirements are met, e.g. the applicative, reciprocal, passive, etc. Thus, in this medial position, they might have been subject earlier to the restriction of having to be [+high].

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[53] I know that the consonant of the causative suffix cannot be regularly derived from PB *t in all languages, but once proposed that *-ic- could be related to *-kit- 'do'.

[54] See Hyman & Katamba (1990) for further discussion and exemplification.

My view, then, is that stem-internal VHH was not fully formed in PB, and that the verbal derivational suffixes should be reconstructed with more than the three vowels *i, *u and *a. As I have pointed out, most work on VHH has focused on these derivational suffixes, which have often been synchronically represented as degree 2 vowels or as the archiphonemes /I/ and /U/. Constrast this with the frozen "expansions" reconstructed by Meeussen (1967) in (54).

(54) a. *-ụ-, *-ɨm-, *-ụn-, *-ɨng-
b. *-ang-, *-ab-, *-ag-, *-ak-
c. *-im-, *-om-, *-ong- (these occur only after CV-)
d. *-ut-

What is most striking about the above array is, first, how many degree 1 vowels there are in the expansions in (54a), and second, how utterly lacking degree 1 vowels are in derivational suffixes (except causative -ɨ-). (54b) shows that *a also appears to be prevalent in expansions, just as it is in derivational suffixes, e.g. in the productive reciprocal suffix *-an- 'reciprocal' and the usually non-productive positional *-am- (which, however, does occur as a productive passive suffix in certain areas, e.g. in Mongo C.60).

My contention is that the only overlap between expansion vowels and derivational extension vowels is *a. I must therefore address the expansions in (54c,d), which are purported to contain a degree 2 or 3 vowel. First, as indicated, *-im-, *-om- and *-ong- occur only after a CV- "radical". It is therefore not clear that they should be compared with derivational suffixes, which of course appear after all verb bases. In any case, note that the expansions *-om- and *-ong- are reconstructed with a degree 3 vowel—vs. the degree 2 Meeussen proposes for *-uk- and *-ud-. This leaves the expansion *-ut- in (54d). In order to determine the synchronic status of this proposed expansion, I have searched for CVCut- verb stems in several languages for which CBOLD has on-line dictionaries: Nande D1.42, Kiga EJ.14, Pende L.11/K.52, Bemba M.42, Cewa N.31b, Yao P.21, Makua P.31, Kalanga S.16, Venda S.21, Ndebele S.44. What I have found is that except for *-tkut-* 'be satisfied (with food)', which may contain an historical reflexive -i-, almost all such verbs exhibit an initial CuCut- sequence (1 exception each in Pende, Makua, Kalanga and Venda; 3 exceptions in the large Kiga corpus). This is consistent with the overall distribution of CVCVt-, which is for the second vowel to agree with the first. (There also are verbs that have the shape CVCat-.) I therefore do not know on what basis Meeussen arrived at the reconstruction of an *-ut- expansion.

Instead, expansion vowels, where they are determinable, do not general reconstruct with either degree 2 or degree 3 vowels, rather with *ɨ, *ụ and *a. In other words, they are subject even more to the peripheralization process that clearly affects stem-internal vowels (i.e. what I have called the "prosodic trough"). Expansion vowels are also more subject to assimilation to the preceding (root) vowel than are suffixal vowels. Thus, many of these,

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including those reconstructed with *a, show a tendency for the vowel to completely assimilate to the preceding vowel. In many languages the process appears to be incomplete. This is what I suspect for the expansion *-at-: Some verbs are realized as CVCat-, while others appear as CV$_i$CV$_i$t-. If I am correct that expansion vowels were different from suffixal vowels in PB, then this obviously raises the question of why? I have suggested that the vowels of verb suffixes may have been final vowel morphemes, which were perhaps restricted, but this goes only part way towards an explanation. Why couldn't these same FV vowels appear as expansions? Or if they did, why did they become *i and *u at the PB stage? Unfortunately we don't have good examples of recognizable morphemes appearing with one vowel as an expansion, but with another vowel as a derivational suffix. Or could it be that the expansions *-u-, *-im-, *-un-, *-ing- are related to passive *-u-, positional *-am-, reversive transitive *-ud- and (?) *-ang-. With Tervuren's recent completion of Bantu Lexical Reconstructions II, it may be possible to study these and related questions with greater certitude.

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