THE SECOND TANO CONSONANT SHIFT AND ITS LIKENESS TO GRIMM'S LAW[1]

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If proto-Indo-European (pIE) is reconstructed with the Mbatto-type three-stop system **t,ɗ,d** instead of the typologically implausible **t,d,dh**, Grimm's Law is basically **t,d > θ,ð; ɗ > d; d > t**; and the parallel Greek shift **d > dh; ɗ > d; dh > th**. In each shift the first two substitutions trade in [implosive] for another feature, while the third devoices whichever of the two resulting voiced non-implosives finds itself without a voiceless counterpart. The second Tano consonant shift proposed here follows the same pattern: **d > ð; ɗ > d; ð > θ**. However, the Mbatto-type input to this shift is not, like the Mbatto-type pIE, reconstructed solely on typological grounds; the four-stop system **'t,ɪ,ɗ,d** of proto-Potou-Tano, which is reduced by the first Tano consonant shift to the three-stop input to the second shift, survives in proto-Potou, and Mbatto is one of the two Potou languages. The second Tano shift thus strengthens the typological case for an Mbatto-type pIE and the shifts it implies.

Si on reconstruit pour le proto-indo-européen (pIE) le système de trois occlusives **t,ɗ,d** que l'on trouve en mbatto à la place du système typologiquement peu plausible **t,d,dh**, la loi de Grimm se résume ainsi: **t,d > θ,ð; ɗ > d; d > t**; et la mutation grecque parallèle: **d > dh; ɗ > d; dh > th**. Dans chacune de ces mutations les deux premières substitutions échangent [Implosif] pour un autre trait, tandis que la troisième dévoise l'une des deux consonnes voisées non-implosives qui en résultent, à savoir celle qui ne s'oppose pas à une non-voisée. La deuxième mutation consonantique tano proposée ici comprend trois substitutions analogues: **d > ð; ɗ > d; ð > θ**. Cependant la base de type mbatto qui est soumise à cette mutation n'est pas, contrairement à la base de ce type que nous proposons pour le pIE, reconstruite uniquement par souci typologique. En effet, le système de quatre occlusives **'t,ɪ,ɗ,d** du proto-potou-tano, lequel est réduit par la première mutation consonantique tano au système de trois occlusives que modifiera la deuxième mutation, survit intégralement en proto-potou, et le mbatto est l'une des deux langues potou. La deuxième mutation tano appuie donc la défense typologique de l'hypothèse qui propose une base consonantique pIE analogue à celle du mbatto ainsi que les mutations qu'elle implique.

0. INTRODUCTION

The second Tano consonant shift is the second of two shifts posited in Potou-Tano-to-Tano (PT-to-T[2]) to account for the main reflexes in proto-Tano (pT) of the four series of stops reconstructed for proto-Potou-Tano (pPT). The reflexes in question are as in (1):

(1)	a. PROTO-POTOU-TANO	b. PROTO-TANO
	voiceless non-implosive stops	voiceless strident fricatives
	voiceless implosive stops	voiceless stops
	voiced non-implosive stops	voiceless non-strident fricatives
	voiced implosive stops	voiced stops

The Potou-Tano languages fall within (New) Kwa by Williamson's (1989:21) subclassification of the Niger-Congo languages; by that classification, (New) Kwa and (New) Benue-Congo, which includes Bantu, are co-ordinate branches of the Volta-Congo branch of the Atlantic branch of Niger-Congo. The subclassification of the Kwa languages adopted here is that of Stewart (1989a); by that classification, Tano and Potou are co-ordinate subgroups of the Potou-Tano subgroup of the Nyo subgroup of Kwa. The nine languages of the Tano group include Akan (Twi-Fante), the dominant language of Ghana, and Northern Bia (Anyi-Baule), the dominant language of the south-eastern Ivory Coast; Ebrié and Mbatto, the two languages of the Potou group, are spoken on the lagoons of the south-eastern Ivory Coast and have only about 70,000 speakers between them.

[1]The author has benefited greatly from comments by and discussions with Jean Blanchon, Bruce Connell, Tom Cook, Robert Hedinger, Jean-Marie Hombert, Baudouin Janssens, Thilo Schadeberg, Keith Snider, Erhardt Voeltz, Kay Williamson and André Wilson, but remains of course solely responsible for the views expressed.

[2]A list of abbreviations follows the References.

The same four series of stops are reconstructed for proto-Bantu-Potou-Tano (pBPT, a tentative proto-Volta-Congo) as for proto-Potou-Tano on the basis of the main correspondences between pPT and proto-Bantu (pB): the voiceless and voiced stops of pPT, whether non-implosive or implosive, correspond to the traditional voiceless and voiced stops respectively of pB. The four-stop system of pPT survives in pP and also, in a modified form, in present-day Ebrié, but in present-day Mbatto, in which the voiceless implosive stops of pP have become voiced and have merged with the existing voiced implosive stops, it has been reduced to a three-stop system.

The two consonant shifts posited in PT-to-T to account for the main reflexes of the four series of stops of pPT in pT (as indicated in (1)) are as in (2):

(2) **a. The first Tano consonant shift**

1. The plain voiceless stops (***p,*t** etc.) become (redundantly non-strident) fricatives (***ɸ,*θ** etc.).
2. The voiceless implosives (***'p,*'t** etc.) become plain stops (***p,*t** etc.).
3. The (redundantly non-strident) fricatives (***ɸ,*θ** etc.) become strident (***f,*s** etc.).

b. The second Tano consonant shift

1. The plain voiced stops (***b,*d** etc.) become (redundantly voiced) non-strident fricatives (***β,*ð** etc.).
2. The (redundantly voiced) implosives (***ɓ,*ɗ** etc.) become plain stops (***b,*d** etc.).
3. The (redundantly voiced) non-strident fricatives (***β,*ð** etc.) become voiceless (***ɸ,*θ** etc.).

It will be seen that the first Tano shift eliminates the voiceless implosives and thereby reduces the four-stop system of proto-Potou-Tano to a three-stop system identical to that of Mbatto, and that the second shift goes on to eliminate the remaining (voiced) implosives and thereby reduce the three-stop system in its turn to the two-stop system of proto-Tano.

The second shift is of special typological interest because of the Mbatto-type three-stop system which constitutes its input. As has already been noted elsewhere (Stewart 1989a:238), the three-stop system of present-day Mbatto is of outstanding significance for the continuing controversy over the traditional three-stop system reconstructed for proto-Indo-European. Jakobson writes as follows:

> To my knowledge, no language adds to the pair /t/—/d/ a voiced aspirate /dh/ without having its voiceless counterpart /th/ . . . ; therefore theories operating with the three phonemes /t/—/d/—/dh/ in Proto-Indo-European must reconsider the question of their phonemic essence. (1962:532)

Most reconsiderations to date have proceeded on the assumption that any three-stop system in which two of the stops are voiced is typologically implausible, but this assumption is of course falsified by present-day Mbatto. The possibility that proto-Indo-European had a three-stop system identical to that of Mbatto clearly merits consideration; and the approach adopted in this article is to compare the second Tano consonant shift with various post-Indo-European shifts that an Mbatto-type proto-Indo-European would have to be presumed to undergo, and in particular with the Greek shift, which differs from the second Tano shift only in that the voiced non-implosive stops become (redundantly voiceless) ASPIRATES (or heightened subglottal pressure stops) instead of (redundantly voiceless) FRICATIVES.

The reconstruction of proto-Tano with the four series of non-sonorants listed in (1b) represents a revision of Stewart (1973), in which I did not reconstruct a series of non-strident voiceless fricatives, and in which I assumed that the VOICED NON-LENES or VOICED FORTES (the plain voiced stops) of pPT, like the VOICELESS LENES (now the

voiceless implosives), had voiceless stops as their main reflexes in pT. The revised reconstruction of the non-sonorants of pT is presented in §1.

The reconstruction of proto-Potou with a non-implosive/implosive contrast similarly represents a revision of Stewart (1973), in which I reconstructed a less explicit NON-LENIS/LENIS contrast. The revised reconstruction of the non-sonorants of pP is presented in §2.

Updated and greatly expanded accounts of Stewart's (1973) reconstruction of the four-stop systems of pPT and pBPT, in both of which the non-implosive/implosive contrast replaces the earlier non-lenis/lenis contrast as in pP, are presented in §§3 and 4 respectively. Also presented in §4 is a reconstruction of a special variety of Mbatto-type three-stop system in pB: one in which the two voiced series are in complementary distribution, the plain voiced stops occurring if and only if a homorganic nasal precedes.

In §5 the second Tano consonant shift is compared with consonant shifts that might be proposed for various branches of Indo-European if pIE was reconstructed with an Mbatto-type three-stop system.

It should be noted that the phoneme is accorded no theoretical status for any purpose whatsoever in this article, and that the consonants reconstructed are not phonemes but segments defined in terms of binary phonological features; where Guthrie's Common Bantu has the one phoneme ***d** (1967-71 vol.1:62), for instance, the pB proposed in §4 has, in the contexts examined, the three different contextually conditioned segments ***d,*ɗ,*l** distinguished in terms of the features [implosive] and [sonorant].

A most important consequence of the feature-oriented approach adopted is that many systematic sound changes are recognized where phonemicists would see mere phonetic changes.

1. THE NON-SONORANTS OF PROTO-TANO

Akan is typical of the Tano languages in general in that it has the following three series of non-sonorants: voiceless stops, voiced stops, and strident voiceless fricatives. It is reasonable in the first instance, therefore, to attempt to reconstruct proto-Tano and each of its daughter protolanguages with the same three series, and in fact the proto-Tano (pT) non-sonorants shown in Table 1 alongside the non-sonorant correspondences across proto-Western Tano (pWT), proto-Central Tano (pCT) and proto-Guang (pGu) from which they are reconstructed allows us to account plausibly for a large proportion of the data.

The reflexes of the pT non-sonorants in Table 1 in the three daughter protolanguages are derived as in Table 2. By T-WT.2 (the second of the rules whereby pWT is derived from pT), ***c** becomes ***s** provided no nasal consonant precedes. By T-CT.5, a rounded consonant becomes unrounded before a round vowel, and merges with its unrounded counterpart if it has one. By T-Gu.3, ***k^{w}** becomes ***g^{w}** before the ATR vowels ***i,*u,*e,*o**. By T-Gu.5, ***t** becomes ***c** before the high ATR vowels ***i,*u**. Each of the remaining rules affects only one consonant and affects it unconditionally.

Note that there is no ***h** in pT, and that two push-chains exploit the gap: initial ***c** becomes ***s** in T-to-WT, displacing the existing ***s**, which becomes ***h**, and ***p** becomes ***f** in T-to-CT, displacing the existing ***f**, which becomes ***h**.

Foremost among a number of correspondences for which the above reconstruction of the pT non-sonorants fails to account is a correspondence between pCT ***s** and pGu ***t** shown in Table 3. This cannot be derived either from pT ***s** or from pT ***t**, and the obvious solution is to posit a contrast between strident ***s** and non-strident ***θ** in pT and to say that pT ***θ** becomes ***s** in pCT and ***t** in pGu. Mispronunciations of English **th** by non-native speakers abundantly testify to the plausibility of both changes. Note that apparently as a consequence of change T-Gu.8 of Table 7 which we posit below to

account for the correspondence displayed by [A11d] 'water', the correspondence ***s** = ***t** occurs only before vowels other than ***u**.

Appx A	1	2	3	5	6	7	8,12	14	15	16	17	18	9
pT	f	s	h^w	p	t	c	k	k^w	b	d	j	g^w	gb
pWT	f	h	?	p	t	c,s	k	?	b	d	j	g^w	gb
pCT	h	s	h^w	f	t	s	k	k^w,k	b	d	j	g^w,g	kp
pGu	f	s	f	p	t,c	c	k	kp,g^w	b	d	j	g_w	kp

Table 1. The main non-sonorant correspondences across pWT, pCT and pGu.[3]

a.	pT	f	s	h^w	p	t	c		k	k^w	b	d	j	g^w	gb
	1.			h											
	2.						c	s							
	pWT	f	h	?	p	t	c	s	k	?	b	d	j	g^w	gb
b.	pT	f	s	h^w	p	t	c		k	k^w	b	d	j	g^w	gb
	1.	h													
	2				f										
	3.														kp
	4.						s								
	5.									k^w	k			g^w	g
	pCT	h	s	h^w	f	t	s		k	k^w	k	b	d	j	g^w	g	kp
c.	pT	f	s	h^w	p	t	c		k	k^w		b	d	j	g^w	gb
	1.	f														
	2.															kp
	3.									k^w	g^w					
	4.									kp						
	5.					t	c									
	pGu	f	s	f	p	t	c	c	k	kp	g^w	b	d	j	g^w	kp

Table 2. A derivation of the reflexes of the pT non-sonorants of Table 1 in the three daughter protolanguages.

Appx A	11a-c,11e-h	cf. 2	6a-c,6e-f	6d,6g-h
pT	θ	s	t except /—i,u	t/—i,u
Ab (WT)	s,c	Y	t	t
Eo (WT)	s	h	t	t
pCT	s	s	t	t
pGu	t	s	t	c

Table 3. A further alveolar non-sonorant correspondence across pCT and pGu. For Y see under WT-Ab.8 of Table 5.

[3]Each number in the row marked Appx A is that of a group of comparative series in Appendix A, all of which, with the exception of [16f-g] and [17e-h], illustrate the correspondence(s) indicated in the same column. h^w,k^w,g^w are rounded segments. The pCT reflexes ***k,*g** of pT ***k^w**,***g^w** occur before round vowels and the complementary reflexes ***k^w**,***g^w** elsewhere. The PGu reflex ***c** of pT ***t** occurs before the high ATR vowels ***i,*u** and the complementary reflex ***t** elsewhere. The pWT reflex ***c** of pT ***c** occurs after a (homorganic) nasal consonant and the complementary reflex ***s** elsewhere. The pGu reflex ***g^w** of pT ***k^w** occurs before ATR vowels and the complementary reflex ***kp** elsewhere.

Two further correspondences, shown in Table 4, are plausibly derived from two further proto-Tano non-strident voiceless fricatives, namely ***ɸ** and ***χ**. As the correspondence **w** = **w** = ***w** = ***k** which is here derived from pT ***χ** is not in contrast with any correspondence derivable from any other voiceless velar fricative, strident or non-strident, it is perhaps not immediately obvious why we should posit ***χ** and not ***h** in pT; however, with pT ***χ** we have a change from ***χ** to ***k**, the plausibility of which is amply confirmed by English mispronunciations of **ch** in Scottish placenames and personal names such as **Leuchars** and **McKechnie**.

Appx A	10	1	5	13	8
pT	a. ɸ	cf. f	p	b. χ	cf. k
Ab (WT)	f	f	p	w	h
Eo (WT)	f	f	p	w	k
pCT	f	h	f	w	k
pGu	f	f	p	k	k

Table 4. Two further non-alveolar non-sonorant correspondences across pCT and pGu.

The revised derivations in Tables 5–7 of the reflexes of the pT non-sonorants in the three daughter protolanguages take account not only of the reconstruction of the three pT non-strident voiceless fricatives ***ɸ**,***θ**,***χ** as above but also (i) of that of pT ***θ** for a correspondence Ab **c** = Eo **s** = pCT ***s** = pGu ***c** displayed by [A11d] 'water', the only series in [A11] in which the following vowel is ***u** (cf. Table 3), (ii) of that of pT ***d** for a correspondence Ab **ɪ̃** = Eo **n** = An **n** = Ba **n** = Ak d = Nk **d** = Kr **d** displayed by [A16f] 'extinguish', the only series in [A16] in which a nasalized ATR vowel follows, and (iii) of that of a pT non-strident voiced fricative ***ð** for a correspondence Ab d = Eo **d** = Ba **s** = Ak **f** displayed by [A16g] 'stick to', the only series in [A16] in which a nasalized non-ATR vowel follows. In addition, the derivations in Tables 5–7 are extended in the case of each of the three daughter protolanguages to one of its daughter present-day languages, namely Abouré, Akan (Akuapem dialect), and Larteh in the case of pWT, pCT, and pGu respectively.

pT	f	s	h^w	p	t	c	k	k^w	ɸ	θ	χ	b	d	ð	j	g^w	gb
1.											w						
2.		h															
3.						c	s										
4.													d	n			
pWT	f	h	?	p	t	c	s	k	?	ɸ	θ	w	b	d	n	ð	j	g^w	gb
pWT	f	h		p	t	c	s	k		ɸ	θ	w	h	d	n	ð	j	g^w	gb
1.													β						
2.																			b
3.																		gb	
4.														l	ɪ̃				
5.																d			
6.									f	s			v						
7.										s	c								
8.		Y																	
9.								h											
Ab	f	Y		p	t	c	s	h	f	s	c	w	v	l	ɪ̃	d	j	gb	b

Table 5. A derivation of the reflexes of the pT non-sonorants in pWT and Abouré.

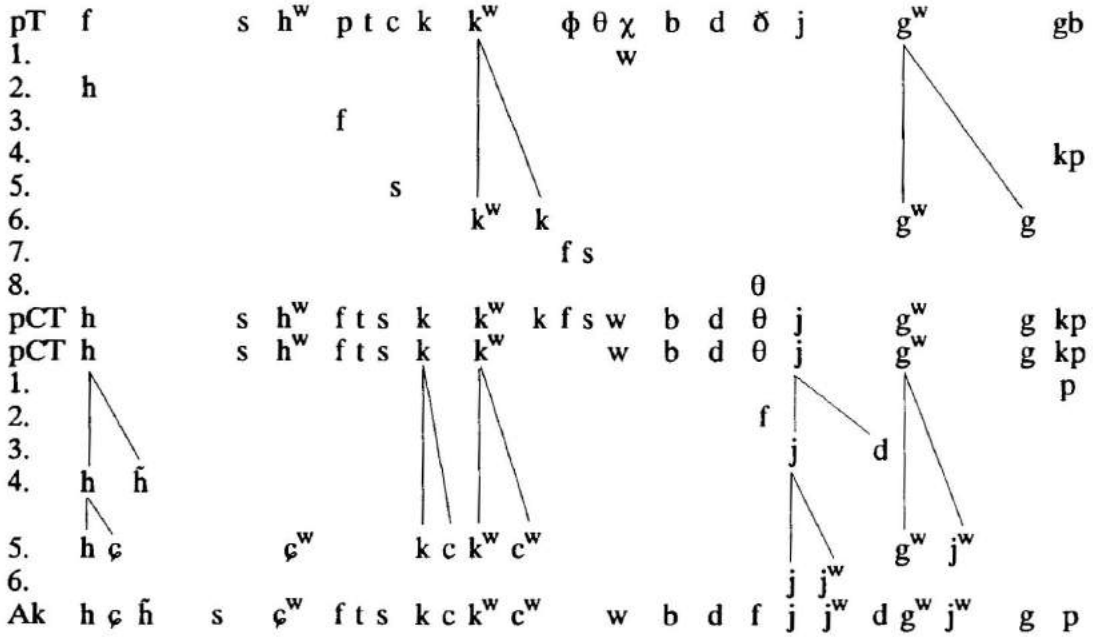

Table 6. A derivation of the reflexes of the pT non-sonorants in pCT and Akan.

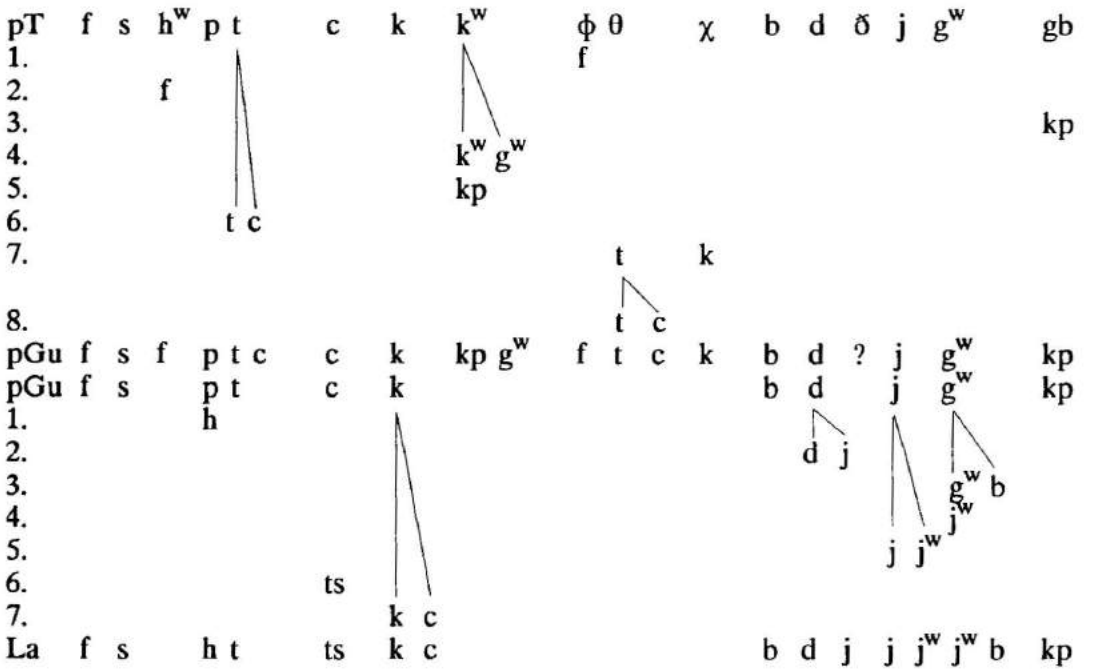

Table 7. A derivation of the reflexes of the pT non-sonorants in pGu and Larteh.

By T-WT.1 and also by T-CT.1, ***χ** becomes ***w**. By T-WT.4, ***d** becomes ***n** before a nasalized vowel. By T-CT.7, the non-strident voiceless fricatives become strident, whereupon by T-CT.8, the non-strident voiced fricative ***ð** becomes voiceless ***θ**. By T-Gu.1, ***ɸ** becomes ***f**, merging with the existing ***f**. By T-Gu.7, the remaining non-strident voiceless fricatives become stops, merging with their non-continuant counterparts. By T-Gu.8, the ***t** resulting from T-Gu.7 becomes ***c** before ***u**; note that pT ***t** has already become ***c** before ***u** by T-Gu.6. The remaining T-to-WT, T-to-CT and T-to-Gu rules differ only in their index numbers from those seen in Table 2.

By WT-Ab.3, *g^{w} becomes *gb, displacing the existing *gb, which, by WT-Ab.2, becomes *b, displacing the existing *b, which, by WT-Ab.1, becomes *β, filling the [+Voiced, +Labial] gap in the set *ɸ,*θ,*ð. By WT-Ab.4, *d,*n become *l,*l̃. By WT-Ab.5, *ð becomes *d. By WT-Ah.6, the non-strident fricatives hecome strident, merging with their strident counterparts wbere these exist; pWT *ð, however, is unaffected as it has already become *d by WT-Ab.5. By WT-Ab.7, *s becomes *c after a (bomorganic) nasal consonant; this is simply a matter of bringing the new *s from *θ by WT-Ab.6 into line witb the synchronic alternation displayed by the existing *s, which results from pT *c becoming *s by T-WT.3 only where no nasal consonant preccdes. By WT-Ab.8, *h becomes *Y; Y is a cover symbol for y before oral non-round vowels, w before oral round, ỹ or ɲ before nasalized non-round, or w̃ or ŋ^{w} before nasalized round. By WT-Ab.9, *k becomes *h.

By CT-Ak.1, *kp becomes *p, filling the gap resulting from T-CT.3. By CT-Ak.2, *θ hecomes *f, merging with the existing *f. By CT-Ak.3, *j becomes *d before high vowels, merging with the existing *d; the only example in Appendix A of the change tbus formulated is [17d], but when we take the non-sonorants into accouot we find tbat we can say that *j,*ɲ become *d,*n before high vowels, merging with tbe existing *d,*n, and we can cite two additional examples, namely [17f-g]. By CT-Ak.4, *h becomes *h̃ before nasalized vowels; *h^{w} similarly becomes *h̃^{w}, but the structural description is not met in any of the examples in [A3]. By CT-Ak.5, non-anterior oral obstruents are palatalized before front vowels except in the first syllable of certain disyllables; note that in final syllables pCT *b^{w}, provided it has not become *h̃^{w} by CT-Ak.4, is always affected as it occurs only before front vowels, and that pCT *g is never affected as it never occurs before front vowels. By CT-Ak.6, *j becomes *j^{w} before rounded vowels, merging with the *j^{w} resulting from CT-Ak.5.

By Gu-La.1, *p becomes *h (cf. Snider 1990:12,26). By Gu-La.2, *d becomes *j before *i (cf. Snider 1990:6,26, and note that we do not follow Snider in saying that *t becomes *ts—or even *c—by the same change). By Gu-La.3, *g^{w} becomes *b before *i (cf. Snider 1990:6-8,25, and note that Snider does not reconstruct pGu *g^{w}). By Gu-La.4, *g^{w} becomes *j^{w}. By Gu-La.5, *j becomes *j^{w} before round vowels, merging with the existing *j^{w} resulting from Gu-La.4. By Gu-La.6, *c hecomes *ts (cf. Snider 1990:12,26). By Gu-La.7, *k becomes *c hefore high front vowels except in the first syllable of certain disyllables (cf. Snider 1990:6-7,26).

The above account is compatible with the following two assumptions we make ahout non-strident fricatives: first, that they are highly marked sounds and tend as such to be replaced diachronically by other sounds, and second, that the replacement sounds are most commonly strident fricatives, as in WT-Ab.6, T-CT.7 and T-Gu.1, but also quite commonly stops, as in T-Gu.7.

The parallel development of all three non-strident fricatives in T-to-WT and T-to-CT calls for comment, as it is appropriate to demonstrate that it is not a matter of a period of common development after an initial split between WT+CT on the one hand and Gu on the other. Thc main considerations are, of course, that the change from *ɸ to *f cannot have taken place in T-to-CT until after the change from *f to *h by T-CT.2 and that the change from *θ to *s cannot have taken place in either T-to-WT or WT-to-Ab until after thc change from *s to *h by T-WT.2. This, however, leaves open the possibility that thc change from *χ to *w took place during a period of common development, and we acknowledge that it is possible that there was such a period and that we may eventually have to recognize a Greater Central Tano grouping made up of CT and WT together.

However that may be, the clear cases of parallel development suggest that there was relatively close contact between WT and CT after they split, whenever the split was. Note that therc is another clear case in the change from *c to *s, which cannot have

taken place in T-to-WT until after the change from *s to *h by T-WT.2. A parallel development of a different nature is the filling of the *h gap by T-WT.2 and T-CT.2.

2. THE NON-SONORANTS OF PROTO-POTOU

The Ebrié line in Table 8(a) gives the main non-sonorant segments of Ebrié as reported by Bole-Richard (1982:327) except for my retranscription of his **j** as **j**. I take his **ph,th,ch,kh** to be heightened subglottal pressure (HSP) stops in the meaning of Chomsky and Halle (1968:326); he writes:

> Elles ont une articulation forte: élévation de la pression de l'air pendant l'occlusion, suivie d'une expiration appuyée qui se manifeste sous forme de friction (consonnes dites improprement aspirées: **ph,th,kh**) ou d'affriction /ch/ → [tʃ]).

It should be noted that his treatment is, unlike mine, phonemic, and that he treats [ɗ] as an allophone of /l/; this allophone, in common with the allophone [ɓ] of /6/, occurs only in a wholly oral context and is in complementary distribution with the corresponding simple nasal, but unlike the allophone [ɓ] of /ɓ/, occurs only before /i,u,y,w/ or before the allophone [r] of /l/ (p.329).

Bole-Richard follows Stewart (1973) in describing the four series of stops as 'voiceless fortes' ('sourdes fortes'), 'voiceless lenes' ('sourdes douces'), 'voiced fortes' ('sonores fortes'), and 'voiced lenes' ('sonores douces'), but eschews my 1973 use of a preceding apostrophe to mark the 'lenes'. In this I now follow him; I now assume that 'fortis/lenis' is not the simple phonetic distinction which I previously took it to be but rather two separate distinctions which happen to be in complementary distribution with each other in Ebrié: HSP/non-HSP ('aspirated/unaspirated') in voiceless stops and non-implosive/implosive in voiced stops. My 1973 transcription is shown in the line marked 'cf. 1973' in Table 8(a).

The Mbatto line of Table 8(b) gives the main non-sonorants of Mbatto as reported by Grassias and Bole-Richard (1982:475) except again for my retranscription of their **j** as **j** and except also that Table 8(b) gives three of the non-sonorants, namely **p,ɓ,ɗ**, twice each.

a. pP	p	t	c	k	'p	't	'c	'k	'kp	b	d	j	g	gb	ɓ	ɗ	f s h
1.	ph	th	ch	kh													
2.					p	t	c	k	kp								
Eb	ph	th	ch	kh	p	t	c	k	kp	b	d	j	g	gb	ɓ	ɗ	f s h
cf.1973	p	t	c	k	'p	't	'c	'k	'kp	b	d	j	g	gb	'b	'd	f s h
b. pP	p	t	c	k	'p	't	'c	'k	'kp	b	d	j	g	gh	ɓ	ɗ	f s h
1.					ɓ	ɗ	'j	'g	'gb								
2.										p							
Mb	p	t	c	k	ɓ	ɗ	'j	'g	'gh	p	d	j	g	gb	ɓ	ɗ	f s h

Table 8. The proposed derivation of the reflexes of the main proto-Potou non-sonorants in Ebrié and Mbatto.

Each of the Ehrié non-sonorants corresponds to the Mhatto non-sonorant in the same column. It will be seen that not only the voiced implosives but also the unaspirated voiceless stops of Ebrié correspond to the voiced implosives of Mbatto, and that not only the **p** but also the **b** of Ebrié correspond to the **p** of Mbatto. In recognizing these correspondences I follow Stewart (1973) and Bole-Richard (1984).

Both Stewart (1973) and Bole-Richard (1984) assume that the Ebrié non-sonorants have been inherited unchanged from proto-Potou, but here, with a view to being able to account economically for the implosives of Mbatto, I reconstruct the non-implosive/

implosive distinction to the exclusion of the aspirated/unaspirated distinction in the voiceless stops as well as in the voiced stops in proto-Potou and posit in Potou-to-Ebrié what I shall call the Ehrié sound shift, whereby the voiceless implosives become plain voiceless stops, displacing the existing plain voiceless stops, which become voiceless HSP stops. This new derivation is shown in Table 8(a).

Table 8(b) shows the corresponding Potou-to-Mbatto derivation. By P-Mb.1, which I shall call the Mbatto sound shift, the voiceless implosives become voiced, merging with their voiced counterparts where these exist; note, however, (i) that while the old voiced implosives continue to participate in the 'allophonic variation' referred to in the first paragraph of this section, the new ones do not become subject to any of the contextual restrictions in question, and (ii) that consequently Bole-Richard (1984), who, as we have seen, adopts a phonemic approach, does not treat P-Mb.1 as a merger. By P-Mb.2, ***ɓ** becomes **p**, merging with the existing ***p**.

3. THE NON-SONORANTS OF PROTO-POTOU-TANO

The proto-Potou-Tano (pPT) non-sonorants reconstructed in the present writer's earlier (1973) study on the evidence of correspondences across the Potou-Tano languages are shown in Table 9, together with the reflexes of these pPT non-sonorants in proto-Potou (pP) and proto-Tano (pT) as reconstructed in the same study.

The reflexes in pP and pT were derived as in Table 10, in which we also include two additional pPT consonants, ***'t** and ***ɗ**(73), which in the 1973 study were reconstructed not on the evidence of any pP = pT correspondences but on the evidence of wider correspondences involving proto-Bantu which we shall discuss in the next section; note that the two correspondences, which are illustrated by [A6b,f,g] and [A6d] respectively, are treated as complementary in the present study and that we now reconstruct pPT ***'t** for both of them.

By PT-P.1 of Table 10, velars become palatals before front vowels; note that the correspondence derived from pPT ***k**(73) is found only before non-front vowels. By PT-P.2, ***ɗ** becomes ***l** before non-high (oral) vowels. By PT-T.1, the plain voiceless stops become fricatives. By PT-T.2, the plain voiced stops become voiceless. By PT-T.3, the 'lenis stops' (the precursors of the implosive stops reconstructed in the present study) become plain stops, merging in the voiceless case with the plain voiceless stops resulting from PT-T.2. By PT-T.4, ***χ** becomes ***w**; note again that the correspondence derived from pPT ***k**(73) is found only before non-front vowels.

Appx A	1g	2a-d	4d	5b	8c	10g	12a,c	15a-c	16a,d
	(1e)	2g-h	(4a-b)	(5a)	8f-g		12e-f	15f,h	(16b)
			(4c)	(5e)			(12b,d)	(15d,g)	
pPT	p	t	k(73)	'p	ƙ	b	g	ɓ	ɗ
pP	p	t	k	'p	ƙ,'c	b	j	ɓ	ɗ,l
pT	f	s	w	p	k	p(73)	k	b	d

Table 9. The non-sonorant correspondences across pP and pT noted in Stewart 1973.[4]

[4]Where the reference number of a comparative series in Appendix A is enclosed in brackets, that series is not one of those cited in the 1973 study in support of the pP = pT correspondence in question. Where a reconstructed consonant is marked (73), it differs from the one reconstructed in the present study and cited in Appendix A. The 'lenis stops' of the 1973 study are retranscribed as implosives.

a. pPT	p	t	k(73)	'p	't	ƙ	b	d(73)	g	ɓ	ɗ
1.						ƙ 'c			g j		
2.											ɗ l
pP	p	t	k	'p	?	ƙ, 'c	b	?	? j	ɓ	ɗ l
b. pPT	p	t	k(73)	'p	't	ƙ	b	d(73)	g	ɓ	ɗ
1.	f	s	χ								
2.							p	t	k		
3.				p	t	k				b	d
4.			w								
pT	f	s	w	p	t	k	p(73)	t	k	h	d

Tahle 10. Stewart's 1973 derivation of the reflexes of the nine pPT non-sonorants in Tahle 9 and two others in the two daughter protolanguages.

The attempt at pPT and pBPT reconstruction was limited in the 1973 study to the labial, alveolar and velar orders, and we sball continue to confine ourselves to these for the present. Consider, then, the derivations in Table 11 which we now propose for these three orders. The correspondence pP ***k** = pT ***w** is excluded as we now propose to derive it not from a simple velar ***k** in pPT but from a rounded velar ***k^{w}**; as we shall see presently, we now propose to reconstruct a separate order of rounded velars in pPT. A new correspondence pP ***d** = pT ***θ** is included under a new pPT ***d**; it is illustrated hy [A11d,g]. A new correspondence pP ***h** = pT ***χ**, which is complementary with the correspondence pP ***j** = pT ***k** and which is illustrated by [A13a], is ineluded under pPT ***g**; while the latter correspondence, as we have seen, has been found only hefore front vowels, the former has not been found before a front vowel. A new correspondence pP ***l** = pT ***ð**, which is illustrated by [A16g], is included under pPT ***ɗ**; it is found only hefore non-ATR vowels which are nasalized in pT and is complementary with the correspondence pP ***l** = pT ***d**, which is found only hefore non-ATR vowels which are not nasalized in pT.

By PT-P.2 of Table 11, after ***g** has become ***j** before front vowels by PT-P.1, the remaining instances of ***g** become ***h**. By PT-P.3, ***ɗ** becomes ***l** before non-ATR vowels, instead of before non-high vowels as was proposed in the 1973 study; the rule in its revised form is less ad hoc as it is identical to Bantu-Potou-Tano-to-Bantu 8 in Table 17 below, and the revision has no implications for the rest of Potou-Tano-to-Tano beyond requiring that the rule be ordered before rather than after a rule (Stewart 1973:30, rule VP.P.2) whereby the [-Nasal, +High, -ATR] vowels ***ɪ,*ʊ** are replaced by their [-High, +ATR] counterparts ***e,*o**. PT-T.1-3 and PT-T.4-6 constitute the first and second Tano consonant shifts respectively, which we have already seen in (2), and take the place of PT-T.1-3 in Table 10b. By PT-T.7, ***χ** becomes ***k** before front vowels. By PT-T.8, ***d** becomes ***ð** before nasalized non-ATR vowels.

The 1973 study, in which, as we have seen, no pT non-strident voiceless fricatives were reconstructed, assumed a correspondence hetween the pP plain voiced stop series and the pT voiceless stop series, and cited four examples of pP ***j** = pT ***k** and one of pP ***b** = pT ***p.** The present study assumes instead a correspondence between the pP plain voieed stop series and the newly-reconstructed pT non-strident voiceless fricative series, and the correspondence pP ***b** = pT ***p** of the 1973 study is replaced by pP ***b** = pT ***ɸ**. The correspondence ***j** = ***k** of the 1973 study, however, is retained, and it is now an exception to the general rule; the last step in the change from pPT ***g** to pT ***k** is now the result not of a rule affecting the whole series in all contexts but of a rule affecting only one of the consonants of the series and affecting it before front vowels only.

We pass now to our new proposals to reconstruct three rounded velars and one labiovelar in pPT, as in Table 12. PP ***k** = pT ***w**, which was derived from pPT ***k** in the 1973 study, has been found only before non-front vowels, and is assumed to he in

complementary distribution with pP ***f** = pT ***h^{w}** which has not been found before non-front vowels, and both are now derived from pPT ***k^{w}**.

The display in Table 11 is expanded in Tables 13-14 to accommodate the derivations of the pP and pT reflexes of the four extra pPT consonants.

a. pPT	p	t	'p	't	ƙ	h	d	g	ɓ	ɗ
1.					ƙ 'c			g j		
2.								h		
3.										ɗ l
pP	p	t	'p	't	ƙ 'c	b	d	h j	ɓ	ɗ l
b. pPT	p	t	'p	't	ƙ	b	d	g	ɓ	ɗ
1.	ɸ	θ								
2.			p	t	k					
3.	f	s								
4.						β	ð	ɣ		
5.									b	d
6.						ɸ	θ	χ		
7.								χ k		
8.										d ð
pT	f	s	p	t	k	ɸ	θ	χ k	b	d ð

Table 11. A derivation of the reflexes of the pPT labial, alveolar and velar non-sonorants in the two daughter protolanguages.

Appx A	3	4	14	18	9
pPT	k^{w}	k^{w}	g^{w}	'g^{w}	'gb
pP	f	k	b	gu, g	gb
pT	h^{w}	w	k^{w}	g^{w}	gb

Table 12. Additional non-sonorant correspondences across pP and pT.

pPT	p	t	k^{w}	'p	't	ƙ	b	d	g	gw	ɓ	ɗ	'g^{w}	'gb
1.						ƙ 'c			g j					
2.										b				
3.													g^{w}	gb
4.									h					
5.			k^{w} k										g^{w} g	
6.			h^{w}											
7.			f											
8.													gu	
9.												ɗ l		
pP	p	t	f	k	'p	't	ƙ	'c	b	d	h	j	b	ɓ ɗ l	gu	g	gb

Table 13. A derivation of the reflexes of the pPT non-sonorants in pP.

pPT	p	t	k^w	'p	't	ƙ	b	d	g	g^w	ɓ	ɗ	$'g^w$	'gb
1.	ɸ	θ	χ^w											
2.				p	t	k								
3.	f	s	h^w											
4.							β	ð	ɣ	$ɣ^w$				
5.											b	d	g^w	gb
6.							ɸ	θ	χ	χ^w				
7.										k^w				
8.									χ	k				
9.												d	ð	
10.			h^w	w										
pT	f	s	h^w	w	p	t	k	ɸ	θ	χ	k	k^w	b	d	ð	g^w	gb

Table 14. A derivation of the reflexes of the pPT non-sonorants in pT.

The most significant component of the Potou-Tano-to-Potou derivations in Table 13 is what we shall call the Potou consonant shift, whereby the voiced dorsal (i.e. 'non-anterior') implosives ***'g^w**,***'gb** become plain stops, i.e. ***g^w**,***gb**, by PT-P.3, and the new ***g^w** displaces the existing ***g^w**, which becomes ***b** by PT-P.2, merging with the existing ***b**. This shift explains a striking gap in the present-day Ebrié system: there are no implosives apart from **ɓ,ɗ**.

After the Potou consonant shift there are only two rounded velars left, namely the two non-implosive stops ***k^w**,***g^w**. These are simplified to ***k**,***g** before round vowels by PT-P.5, and the new ***g** from ***g^w** displaces the existing ***g**, which becomes ***h** before round vowels by PT-P.4, a rule which we have seen already (as PT-P.2 in Table 11a) but not previously explained; note that there is no existing ***k** for the new ***k** from ***k^w** to displace. The remaining instances of ***k^w** become ***h^w** by PT-P.6, and thereby become complementary with the ***h** from ***g** instead of with the ***k** from ***k^w**. This ***h^w** goes on to become ***f** by PT-P.7. The remaining instances of ***g^w** then become ***gu** by PT-P.8, and the rounded velar order is thereby finally eliminated.

There are only two new rules in the Potou-Tano-to-Tano derivations in Table 14, and neither of these affects more than one segment. By PT-T.7, ***χ^w** becomes ***k^w**, thereby filling a gap in the voiceless stop series, which is, of course, less marked than the voiceless non-strident fricative series. By PT-T.10, ***h^w** becomes ***w** before non-front vowels; note that as ***χ** has already become ***k** before front vowels by PT-T.6, ***h^w** and ***χ** are now no longer in contrast but in complementary distribution.

The Potou-Tano-to-Tano derivations in Table 14 account for all the pT non-sonorants reconstructed in §1 with the exception of the two palatals, ***c** and ***j**, which are illustrated by [A7a-f] and [A17a-d] respectively. Their correspondents in non-Tano languages are far from obvious, but it should be noted that they appear to have been in complementary distribution with each other in pT, with ***c** and ***j** occurring before non-ATR and ATR vowels respectively, and that it would be plausible to derive them both from a pPT ***'j**; this would first become ***j** by the second Tano consonant shift, and this ***j**, having no voiceless counterpart, would go on to become ***c** before non-ATR vowels.

4. THE NON-SONORANTS OF PROTO-BANTU-POTOU-TANO

The proto-Bantu-Potou-Tano (pBPT) non-sonorants reconstructed at C1 in the present writer's earlier (1973) study are shown in Table 15, together with their main reflexes in proto-Potou-Tano (pPT) and proto-Bantu (pB).

We have already seen that the ***k**(73) and ***d**(73) of pPT are rejected in favour of ***k^w** and ***'t** respectively in the present study as the correspondence in [A4], which

appeared to require pPT ***k**, has been found to be in complementary distribution with that in [A3], which requires pPT ***k^{w}**, and the correspondence in [A6d], which appeared to require pPT ***d**, with that in [A6b,f,g], which requires pPT ***'t**. The ***k**(73) and *d(73) of pBPT are similarly rejected in favour of ***kp** and ***'t**, the consonants required by the correspondences in [A3] and [A6b,f,g] respectively.

The derivation of the reflexes of the pBPT non-sonorants in the two daughter protolanguages was very simple, at least in terms of the number and the formal simplicity of the diachronic rules required: the pPT reflexes showed no change, and the pB reflexes were derived by the merger of the plain stops with the 'lenis stops' (the precursors of the implosives now reconstructed).

It was acknowledged (p.37) that as the unmarked value of the 'lenis' feature was minus in non-sonorants, the postulation of 'lenis' rather than plain stops in pB was costly, and called for comment. The benefit which appeared to justify the greater cost was that if one took the voiced stops of pB to be 'lenis', one could comfortably accommodate the fact that Guthrie's Common Bantu stem-initial ***ba** had the reflex **6a**, with a voiced implosive—and thus voiced 'lenis'—**ɓ**, in many sectors of Zones A, B and C in the extreme northwest, and also in the Nguni sector of Zone S in the extreme southeast (Guthrie 1967-71 vol.1:71 topogram 6). These occurrences of the labial implosive suggested the hypothesis that in the labial case at least, the voiced stops of pB were implosives since, as Guthrie said himself (Guthrie 1967-71 vol.1:60 §54.14), "if there seems to be an identical independent increase in complexity in separate places, this is almost certainly an illusion due to the preservation in those places of some original feature or features lost elsewhere".

Appx A	1d	2a,f	4d	5f	6b	8f	6d	16a,c
	(1e-g)	(2e,g)	(4a,c,e)	(5a)	(6f,g)	(8a,b,d,h)		(16d)
Appx B	1a	1h	1d2	2a	2b2	2c	2b1	4b1
	(10)	(10)	(4)	(2)	(5)	(8)	(1)	(6)
pBPT	p	t	k(73)	'p	't	ƙ	d(73)	ɗ
pPT	p	t	k(73)	'p	't	ƙ	d(73)	ɗ
pB	'p(73)	't(73)	ƙ(73)	'p(73)	't(73)	ƙ(73)	ɗ(73)	ɗ(73)
cf. CB	p	t	k	p	t	k	d	d

Table 15. The non-sonorant correspondences across pPT and pB noted in Stewart 1973[5].

In the present study we secure essentially the same benefit at a lower cost; we retain only the voiced implosives, and we retain them only where no homorganic nasal precedes. We reconstruct (i) plain voiceless stops in place of the former voiceless 'lenis' stops in all contexts, and (ii) plain voiced stops in place of the former voiced 'lenis' stops after homorganic nasals. We thus posit the same three series of stops in pB as in Mbatto, albeit with the difference that in pB the plain voiced stops and the implosives are complementary, the former occurring if and only if a homorganic nasal precedes.

This of course implies a rather more eventful BPT-to-B. First we posit a merger of the voiceless implosives with their non-implosive counterparts (BPT-B.1 in Table 17b), after which we have the same three series of stops as in Mbatto. Next we have two rules which we have already proposed elsewhere (Stewart 1989b): Progressive Consonant Nasalization (PCN; BPT-B.2 in Table 17b), whereby the voiced stops, whether implosive or not, become nasals after nasalized vowels; and Stop Epenthesis (SE; BPT-B.3 in Table 17b), whereby a

[5]Where the reference number of a comparative series in Appendix A is enclosed in brackets, that series is not one of those cited in the 1973 study in support of the pPT-pB correspondence in question. The numbers in the row marked Appx B refer to groups of Common Bantu-Akan pairs in Appendix B which display the correspondence; the number of pairs in the group is indicated in brackets below the number of the group. Where a reconstructed consonant is marked (73), it differs from the one reconstructed in the present study and cited in Appendices A and B. The 'lenis stops' of the 1973 study are retranscribed as implosives.

plain voiced stop is inserted between a nasal (resulting from PCN) and a following oral vowel. As a result of PCN, the stem-initial contrast between implosives and plain voiced stops is neutralized wherever the nearest prefix ends with a nasalized vowel: synchronically, after both PCN and SE have applied diachronically, the voiced stop which occurs in the absence of a preceding nasalized vowel is replaced by a prenasalized plain voiced stop or a simple nasal according to whether the following vowel is oral or nasal. For a discussion of PCN and SE from the point of view of (i) the origin of the pB prenasalized voiced stops and (ii) the explanation of Meinhof's Law, as well as for references to earlier discussions, see Stewart (1989b:76-9).

It is not until after PCN and SE that we posit a merger of the plain voiced stops with their implosive counterparts where no homorganic nasal precedes (BPT-B.4 in Table 17b). Although this is a much more limited merger of plain stops with implosives than that proposed in the 1973 study, it still calls for comment as mergers of implosives with plain stops are much commoner. We suggest that what happened was that the stem-initial neutralization which at first took place only after nasalized vowels was extended to the remaining contexts by analogical processes; that the implosives occurred considerably more frequently than the plain voiced stops stem-initially before PCN and SE applied, that this greater frequency was gradually enhanced by back-formations from forms with prefixes ending with nasalized vowels, and that finally the plain voiced stops and the implosives were made complementary by substituting implosives for the few remaining instances of plain voiced stops not preceded by homorganic nasals.

The validity of this suggestion depends largely, of course, on the validity of the suggestion that the implosives occurred more frequently than the plain voiced stops at the outset. This latter suggestion is in fact strongly supported by the observation that of the 75 Common Bantu-Akan pairs identified in Appendix B, 19 illustrate a stem-initial correspondence derived from a pBPT voiced implosive, while only ten illustrate one derived from a pBPT plain voiced stop; and that voiced implosives were thus perhaps about twice as frequent as plain voiced stops in pBPT.

The pBPT non-sonorants now reconstructed at C1, together with their main reflexes in pPT and pB after oral vowels, are as in Table 16; note in particular that whereas in the 1973 study we confined ourselves to the reconstruction of labials, alveolars and simple velars, we now reconstruct four labiovelars.

The reflexes in the two daughter protolanguages as shown in Table 16 are now derived as in Table 17. Also included in Table 17 are the pB reflexes after nasalized vowels. Note that much of the increase in complexity over the corresponding derivation in the 1973 study is attributable to the inclusion of the four pBPT labiovelars; all three of the BPT-to-PT rules as well as the fifth and sixth of the eight BPT-to-B rules affect labiovelars only.

By BPT-PT.1 of Table 17, the non-implosive labiovelars become rounded velars. By BPT-PT.3, the voiceless implosive labiovelar ***ɓp** becomes voiced, displacing the existing voiced implosive labiovelar ***'gb**; the latter becomes ***'g^{w}** by BPT-PT.2, and thereby reinforces the new order—or rather half-order —of rounded velars created by BPT-PT.1 at the expense of the labiovelar order. By BPT-B.1, the voiceless implosives merge with their non-implosive counterparts. By BPT-B.2 (Progressive Consonant Nasalization), the voiced stops, whether implosive or non-implosive, become nasals after nasalized vowels. By BPT-B.3 (Stop Epenthesis), a plain voiced stop is inserted between a nasal and a following oral vowel. By BPT-B.4, the non-prenasalized voiced non-implosive stops merge with their implosive counterparts. By BPT-B.5, ***'gb** becomes ***w** before non-ATR vowels (i.e. before vowels other than ***i,*u** (Guthrie's ***ị,*ụ**)). By BPT-B.6, the labiovelars, including ***w**, become non-labial, merging with their non-labial counterparts where these exist; note however that the velar/labiovelar distinction is not lost without trace even where BPT-B.5 has not applied since, by a BPT-to-B rule which applies before BPT-B.6, non-round vowels become round after labiovelar consonants (see [A3a,c; A9e; A14b,d; A18c]). By BPT-B.7, a nasal is inserted between a nasalized vowel and a following (voiceless) stop. By

BPT-B.8, ***ɗ** becomes ***l** before non-ATR vowels.

Appx A	1	2	3-4	5	6	8	9	10	11	12	14	15	16	18
	(4)	(4)	(7)	(2)	(3)	(5)	(2)	(1)	(1)	(1)	(2)	(4)	(5)	(3)
Appx B	1a	1b	1d	2a	2b2	2c	2d	3a	3b	3c	3d	4a	4b	4d
	(10)	(10)	(6)	(2)	(5)	(8)	(4)	(1)	(5)	(1)	(3)	(5)	(11)	(3)
pBPT	p	t	kp	'p	't	ƙ	ƙp	b	d	g	gb	ɓ	ɗ	'gb
pPT	p	t	k^w	'p	't	ƙ	'gb	b	d	g	g^w	ɓ	ɗ	$'g^w$
pB	p	t	k	p	t	k	k	ɓ	ɗ,l	'g	y	ɓ	ɗ,l	'g,y
cf. CB	p	t	k	p	t	k	k	b	d	g	y	b	d	g,y

Table 16.The main non-sonorant correspondences across proto-Potou-Tano and proto-Bantu.

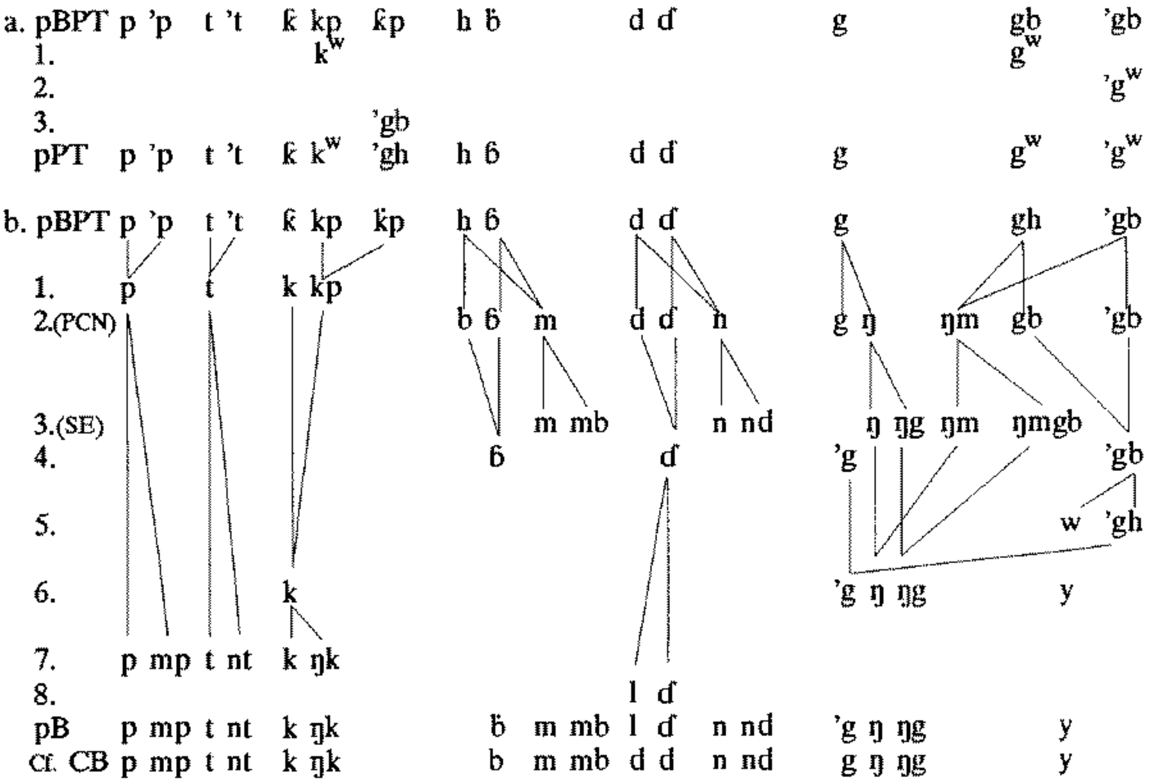

Table 17. A derivation of the reflexes of the pBPT non-sonorants in the two daughter protolanguages.

BPT-B.8, whereby ***ɗ** becomes ***l** before non-ATR vowels, accounts for what, in phonemic terms, is an allophonic variation within pB. Guthrie (1967-71 vol.1:62) admits the possibility that his CB ***d** had a lateral variant:

> The reflexes of ***d** . . . are **l** over a large part of the field with a relatively small variety of other sounds on the margins. Moreover in no known language is there **d** in the reflex of ***da** in initial position. On the other hand the reflex of ***nd** usually contains **d**, while that of ***jd** does so in languages . . . far apart [from each other]. In addition many languages have **di** as the reflex of ***di**. It is therefore impossible to infer that the source-consonant was not ***D**, although it may well have been ***L** when between vowels. On the other hand if the sound in the source-patterns represented by ***d** actually was ***D**, this presumably became **l** very soon after sound-shifting began.

However, as I have already pointed out elsewhere (Stewart 1989h:53-4), his CB ***d** has a third source in pBPT in addition to pBPT ***d** and ***ɗ**, namely pBPT ***l** (which, as

a sonorant, falls outside the scope of the present study), and once it is recognized that this is the case, the balance of probability moves strongly in favour of [*l] as the main realization of his CB *d in contexts in which no homorganic nasal precedes. The derivation in Table 17b as it stands accounts already, at no extra cost, for the additional merger in those contexts in which no nasal precedes and no ATR vowel follows: when the *ɗ from pBPT *d or *ɗ becomes *l before non-ATR vowels by BPT-B.8, it merges with an existing *l from pBPT *l.

The erosion of the voiced implosive series by BPT-B.6 and BPT-B.8, whereby *'gb and *ɗ become the sonorants *w and *l respectively before non-ATR vowels, may be compared with the erosion of the voiced implosive series brought about in Potou-Tano-to-Potou by PT-P.3 of Table 13, whereby the voiced dorsal implosives *'g^{w},*'gb become non-implosive, and PT-P.9 of Table 13 (PT-P.3 of Table 11a), whereby *ɗ becomes l before non-ATR vowels. PT-P.9 of Table 13, which is discussed in §3 under Table 11a, is of special interest as it is identical to BPT-B.8.

It was noted at the beginning of this section that the pBPT *k,*d reconstructed in the 1973 study for the correspondences in [A4d] and [A6d] respectively are now replaced by *kp,*'t. The complementary distribution of the correspondences in [A3] and [A4], both of which are now derived from pBPT *kp, has already been indicated under Table 12 and accounted for under Tables 13 and 14. It has already been noted under Table 10 that the correspondence in [A6d] is complementary with that in [A6b,f,g], which is derived from pBPT *'t, but it still remains to indicate its distribution and to explain how, in [A6d] 'pull out' (CB *-dụ̀t-), pBPT *'t becomes not *t but *ɗ in pB (and is thus *d in CB). It is now assumed that pBPT *'t becomes *ɗ before *u at a stage of BPT-to-B before that at which *'t becomes *t. There is then at first no *'tu sequence, but a new one is subsequently created by a rule whereby *ʊ becomes *u after *'t; this is illustrated not only by [A6f] 'roast' (CB *-tụ̀mb-) but also by CB *-tụ́d- 'forge' in [B2b2].

The apparently irregular *p in CB *-pụ̀k- in [A10g] 'dig up' may perhaps similarly result from a rule whereby pBPT *b becomes *p before *u, and the apparently irregular *b in CB *-bòmb- in [A5c] 'get wet' from a rule whereby pBPT *'p becomes *ɓ before nasalized vowels, though we know of no supporting evidence in either case. Note, however, that the rules are plausible to the extent that they each replace the marked value of the feature [Voiced] with the unmarked value; the unmarked value is of course assumed to be minus in non-implosive non-sonorants and plus in implosives.

The above reconstruction of proto-Bantu with the same three series of stops as Mbatto but with the two voiced series in complementary distribution offers as a bonus what would appear to be the most plausible historical explanation yet of the NW Bantu consonant harmony first posited by Van Leynseele and Stewart (1980) to account for reflex agreement across C1 and C2 in Tunɛn (Nɛn, Guthrie's A.44 Banɛn). The scenario envisaged is presented in outline in the tentative derivation in Table 18 of what are tentatively assumed to be the main reflexes in proto-NW Bantu (pNWB) of the proto-Bantu stops, including prenasalized stops, in Table 17.

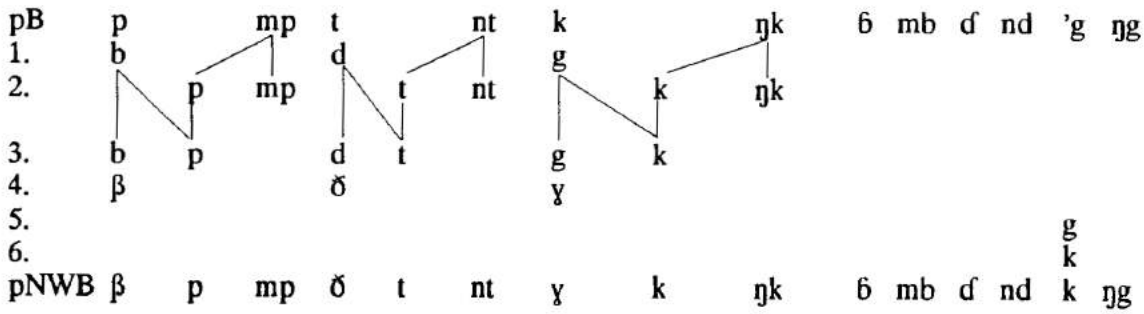

Table 18. A tentative derivation of the main reflexes of the pB stops in proto-North-West Bantu.

By B-NWB.1 of Table 18, the non-prenasalized voiceless stops become plain voiced stops contrasting with the existing implosives. Since the stops in question appear to have been intervocalic in at least the great majority of cases, the voicing is not unexpected. Moreover, the change brings about a change in the phonological system which is not unexpected; it removes a highly marked property of the pB system, namely the occurrence of voiced implosives to the exclusion of plain voiced stops wherever no homorganic nasal precedes. It should be noted, however, that over most if not all of the Bantu area outside the north-west the same result would appear to have been achieved by the simpler expedient of merging the implosives with the plain voiced stops, with which they were already in complementary distribution, and thereby finally reducing the three-stop system to a two-stop system.

B-NWB.2, whereby prenasalized voiceless stops lose their prenasalization in initial position, reintroduces non-prenasalized voiceless stops. The nasals which are lost are generally prefixes derived from earlier VN prefixes.

B-NWB.3, whereby a non-prenasalized plain voiced stop is devoiced if the nearest consonant before it is a non-prenasalized (plain) voiceless stop, not only introduces the consonant harmony but also increases the frequency of occurrence of the new non-prenasalized voiceless stops. Note that B-NWB.3 has the effect of expanding the morphological role inherited by the voiceless/plain voiced contrast on the loss of initial nasal prefixes by B-NWB.2; it results in the consonant mutation being displayed at C2 as well as at C1 wherever both consonants are non-sonorants and neither is implosive or prenasalized.

By B-NWB.4, the non-prenasalized plain voiced stops become (redundantly voiced) non-strident fricatives. This change is not unexpected since, as we have already noted under B-NWB.1, the stops in question appear to have been intervocalic in the great majority of cases.

PNWB ***β,*ɣ** have the direct reflexes **β,ɣ** in several present-day NWB languages, but ***ð** appears never to have the direct reflex **ð**. ***ð** is however a plausible source for the various reflexes that do occur; the most common reflex is **l**, but **r,d** and **t** are also found.

By B-NWB.5, ***'g** becomes ***g**, and by B-NWB.6 this ***g** becomes ***k**, merging with the existing ***k**.

Note that in the above treatment we follow Guthrie (1967-71) in positing a consonant split to account for the extra series of consonants found in the NW Bantu languages, but reject Guthrie's conditioning of the split by the length of the first vowel of the stem in favour of Janssens' (1991) conditioning by homorganic nasal prefixes. Janssens, referring to Van Leynseele and Stewart's (1980) suggestion that the extra series of consonants might perhaps be better accounted for by the retention in proto-Bantu of the four-stop system of proto-Volta-Congo than by Guthrie's consonant split, argues convincingly that the consonant mutation displayed by some of the stems in question presents a difficulty for any retention hypothesis and strongly favours his new consonant split hypothesis.

5. COMPARISON WITH GRIMM'S LAW

We have elsewhere (Stewart 1989a:238-9) compared an earlier formulation of the Tano consonant shift(s)—the earliest in fact to take account of the reconstruction of voiceless non-strident fricatives in proto-Tano—with a formulation of the Germanic consonant shift (Grimm's Law) which tentatively assumes, in place of the controversial traditional proto-Indo-European three-stop system **t,d,dh**, the **t,ɗ,d** system found in present-day Mbatto:

(3) **a. The Tano consonant shift (1989a)**

1. All the plain stops become fricatives (***t,*d** become ***θ,*ð**).
2. All the 'lenis stops' (now reconstructed as implosives not only where voiced but also where voiceless) become plain stops (***'t,*ɗ** become ***t,*d**).
3. The voiceless fricatives become strident (***θ** becomes ***s**).
4. The voiced fricatives become voiceless (***ð** becomes ***θ**).

b. The Germanic consonant shift

1. All the plain stops beeome fricatives (***t,*d** become ***θ,*ð**).
2. The (redundantly voiced) implosives become plain stops (***ɗ** becomes ***d**).
3. The redundantly voiced plain stops become voiceless (***d** becomes ***t**).
4. The redundantly fricative non-strident voiced obstruents become stops under certain circumstances (***ð** becomes ***d**).

It is in fact only the first part of this version of the Tano shift, consisting of (3a.1-2), that is directly comparable with the Germanic shift (3b.1-4), and the only differences here, namely those between (3a.2) and (3b.2-4), have their origin in a difference in the input: proto-Indo-European lacks the voiceless implosive series of proto-Potou-Tano. The redundantly voiced plain stops resulting from (3b.2) are devoiced by (3b.3); this is a natural drag-chain change since, as we have seen already, the unmarked value of the feature [Voieed], although plus in implosives, is minus in non-implosive non-sonorants. The [+Continuant] specification of the non-strident voiced fricatives is redundant after the devoicing of the voiced stops by (3b.3), and under certain circumstances which will not be discussed here it is replaced by [–Continuant] by (3b.4); this is a natural drag-chain change if we assume that the unmarked value of the feature [Continuant] is minus in non-strident obstruents.

The displays in Tables 19 and 20 represent graphically the above conception of the Tano and Germanic shifts as consisting basically of the abandonment of the [αImplosive] distinction in favour of the [–αCont(inuant)] distinction.

The purpose of the above comparison with Grimm's Law was to demonstrate that pIE **t,ɗ,d** was superior to the traditional pIE **t,d,dh** not only in that a case could be cited of a **t,ɗ,d** system in a present-day language, namely Mbatto, but also in that **t,ɗ,d** permitted a less costly derivation of the **θ,t,ð,d** of pGmc: in the first place, IE-Gmc.1-2, the rules substituting the [–αContinuant] distinction for the [αImplosive] distinction, were essentially identieal to rules strongly motivated within Potou-Tano, a genetic group containing Mbatto, and in thc second place the devoicing rule IE-Gmc.3 was cost-free as it filled an inadmissihle gap in the most expected way.

	+Implosive –Cont	–Implosive –Cont	–Implosive +Cont –Strident	–Implosive +Cont +Strident
pPT	't ɗ	t d		
after PT-T.1-2		t d	θ ð	
after PT-T.3-4/pT		t d	θ (< ð)	s (< θ)

Table 19. Graphical representation of Stewart's 1989a Tano consonant shift.

	+Implosive –Cont	–Implosive –Cont	–Implosive +Cont –Strident	–Implosive +Cont +Strident
pIE	ɗ	t d		s z
after IE-Gmc.1-2		d	θ ð	s z
after IE-Gmc.3		t	θ ð	s z
after IE-Gme.4/pGme		t d	θ ð	s z

Table 20. Graphical representation of the Germanic consonant shift (Grimm's Law).

This cost-free devoicing rule has an implication for our formulation of the Tano consonant shift which we overlooked at the time: our (1989a) devoicing rule PT-T.4 (3a.4) is suspeet in that, unlike IE-Gme.3 (3b.3), it bas no obvious motivation. Under our revised formulation presented in this paper there are two separate Tano consonant shifts, and it is the second of the two that invites comparison with the Germanie consonant shift; the output of tbe first shift displays a tbree-stop system identical to that of pIE, and the input to the seeond shift is thus closely comparable with the input to the Germanic consonant shift. The revised devoicing rule (4b.3) is now the third rule of the second shift, and is now comparable with its Germanic counterpart, and equally cost-free, even though it does not apply to the reflexes of the same original consonants:

(4) **a. The first Tano consonant shift**
1. The plain voiceless stops become (redundantly non-strident) fricatives (***t** becomes ***θ**).
2. The voiceless implosives become plain stops (***'t** beeomes ***t**).
3. The (redundantly non-strident) fricatives become strident (***θ** becomes ***s**).

b. The second Tano consonant shift
1. The plain voieed stops become (redundantly voiced) non-strident fricatives (***d** becomes ***ð**).
2. The (redundantly voiced) implosives become plain stops (***ɗ** becomes ***d**).
3. The (redundantly voiced) non-strident frieatives become voiceless (***ð** becomes ***θ**).

Tbe display in Table 21 represents graphically the revised coneeption of the Tano shifts as two successive abandonments of the [αImplosive] distinction in favour of the [–αContinuant] distinction.

The main difference between the Germanic shift and the second Tano shift is that whereas under the Germanic shift all the plain stops, both voieeless and voiced, become fricatives, under the second Tano shift it is only the plain voiced stops that become fricatives. A direct consequence of this difference is that whereas under the Germanic shift it is the new plain stops that find themselves without voiceless eounterparts and become voiceless themselves, under the second Tano shift it is the new fricatives that find themselves without voieeless counterparts and become voiceless themselves.

The revised formulation not only explains the devoicing in terms of the unmarked value of the feature [Voiced] but also explains the stridentization in terms of the unmarked value of the feature [Strident]; this of course is plus in non-sonorant continuants (fricatives). Whereas under the first Tano shift the new voiceless fricatives find themselves without strident counterparts and become strident themselves, under the second Tano shift the new voiceless fricatives do not find themselves without strident counterparts and remain non-strident.

Note that whereas in the 1973 study we assumed that all the 'lenis stops', both voiceless and voiced, became plain stops simultaneously not only in Potou-Tano-to-Tano but also in Bantu-Potou-Tano-to-Bantu, we have now found ourselves obliged to abandon this in each case, and to posit an intermediate stage with a three-stop system identical to that of present-day Mbatto.

	+Implosive −Cont	−Implosive −Cont	−Implosive +Cont −Strident	−Implosive +Cont +Strident
pPT	't	t		
	ɗ	d		
after (4a) (i.e.		t		s
after 1st shift)	ɗ	d		
after (4b.2)		t		s
		d	ð	
after (4b.3) (i.e.		t	θ	s
after 2nd shift)/pT		d		

Table 21. Graphical representation of the second Tano consonant shift.

In positing the **t,ɗ,d** system of present-day Mbatto in place of the traditional **t,d,dh** system of pIE we differ significantly from Emonds (1972) and Hopper (1973) only in that we posit **ɗ** in place of the traditional **d**; we follow both of these writers in positing, in place of the traditional **t,dh**, two segments distinguished from each other primarily in terms of the feature [Voiced], the two segments being **th,dh** in the case of Emonds, **t,d̤** (where **d̤** is murmured **d**) in the case of Hopper, and plain **t,d** in our own case.

In place of the traditional plain **d**, Emonds posits the voiceless non-tense segment **t** without making any specific claim about the phonetic nature of the feature [Tense] (p.109), and Hopper posits the voiceless checked (i.e. glottalic) segment **t'** found in Georgian (Caucasian) and Hausa (Afro-Asiatic). Neither writer, however, explicitly rejects the possibility of positing the voiced implosive **ɗ** found in Mbatto; rather, each restricts himself to considering the voiceless candidates on the assumption that any voiced segment would be typologically implausible at best. Emonds merely claims that it is a merit of his proposal that it "avoids having two series of voiced stops with only one voiceless" (p.110), but Hopper goes so far as to claim that "a typologically plausible triple stop system should have only one voiced stop" (p.141); he writes as follows (p.149):

> Obstruent systems in which two voiced stops are opposed to a single voiceless stop at each point of articulation are not unknown, but they are very rare, and of course such a system has not survived in any of the Indo-European daughter-languages, although this fact alone would not exclude it from the proto-language.

If, of course, we posit a pIE with no so-called aspirates, we have to account for the origin of the so-called aspirates of languages such as Sanskrit, Greek and Armenian. This does not however appear to present any great difficulty. Greek and Armenian would appear to be accounted for by shifts differing from the second Tano shift and the Germanic shift respectively primarily in that the new sounds created are not fricatives, defined in terms of the feature [Continuant], but so-called aspirates, defined, like those of Ebrié (see §2), in terms of the feature [Heightened Subglottal Pressure]. In the Greek shift as in the second Tano shift the original voiceless stops are unaffected, with the result that it is the newly created sounds (i.e. the [+HSP, +Voiced] sounds in the case of the Greek shift or the [+Continuant, +Voiced] sounds in the case of the second Tano shift) that find themselves without voiceless counterparts and become voiceless themselves, while in the Armenian shift as in the Germanic shift the original voiceless stops are not unaffected, with the result that it is the ex-implosive plain voiced stops that find themselves without voiceless counterparts and become voiceless themselves. The only other difference that need be noted is that whereas by the IE-Gmc.4 of (3b) the non-strident voiced fricatives revert to stops in certain circumstances only, by what would be the parallel IE-Arm.4 the so-called voiced aspirates revert to plain stops unconditionally.

We can go on to posit an Indic shift which differs from the Greek shift only in that when the newly created [+HSP, +Voiced] sounds find themselves without voiceless counterparts, the unacceptable [+HSP, –Voiced] gap is filled in some way other than by the contextually unconditioned devoicing of the [+HSP, +Voiced] sounds, just as in the Germanic shift, the unacceptable [–Strident, +Voiced, –Continuant] gap is filled in some way other than by the contextually unconditioned despirantization of the [-Strident, +Voiced, +Continuant] sounds.

The second Tano, Greek, Indic, Germanic and Armenian shifts posited above are summarized in Table 22; **th,dh** are HSP stops.

All the shifts in Table 22 can be seen as implementing an innovatory segment structure condition which disallows [+Implosive] segments; in each case the proscribed implosives are replaced by plain stops which displace existing plain stops. In the branches of IE such as Slavic and Celtic in which the two pIE series of voiced stops have merged, the merger is by this view an alternative implementation of the same

proscription: when the implosives are replaced by plain stops, the new plain stops simply merge with the existing plain stops instead of displacing them.

If of course implosives have been wiped out by a wave of proscription over a wide area, it is not surprising that they should be virtually or totally absent in the daughter languages of a protolanguage which had them. In the IE languages they have been totally wiped out. In the Kwa languages they have come close: they are known to occur in only four languages out of about 35, namely Ebrié, Mbatto, Ega and Avikam, which together account for only about one per cent of the speakers (figures based on Stewart 1989a).

shift	2nd Tano	Greek	Indic	Germanic	Armenian
input	t ɗ d	t ɗ d	t ɗ d	t ɗ d	t ɗ d
after displacement	t d ð	t d dh	t d dh	θ d ð	th d dh
after devoicing	t θ d	t th d	t th d dh	t θ ð	t th dh
after reversion to plain stop				t θ d ð	t th d

Table 22. Summary of the 2nd Tano, Greek, Indic, Germanic and Armenian shifts.

6. CONCLUSION

In each of the shifts summarized in Table 22 the redundantly voiced implosives of an Mbatto-type three-stop system become plain voiced stops, displacing either the existing plain voiced stops or all the existing plain stops, whether voiced or voiceless; and the consonants of the resulting unpaired voiced series, which represent the original plain voiced stops where only these have been displaced but the original voiced implosives where all the original plain stops have been displaced, become voiceless, though not necessarily in all contexts. Since the shifts are five in number, it is reasonable in each case to regard the hypothesis consisting of the reconstructed Mbatto-type three-stop system and the shift in question taken together as low in cost for the purposes of comparison with alternative hypotheses which might be proposed to explain the same sound correspondences.

Comparably low in cost are hypotheses whereby the voiced implosives of an Mbatto-type three-stop system, instead of displacing the plain voiced stops, simply merge with them. As was noted in §4, such hypotheses would explain the situation in branches of IE such as Slavic or Celtic. They would also explain the situation in those parts of the Bantu area where our pB ***ɓ,*ɗ** have the reflexes **b,d**.

Our earlier proposals to reconstruct 'lenis stops' in pB (Stewart 1973, 1989b; see also §4 above) are retained only in a modified and more constrained form in our present revised reconstruction of the non-sonorants of pB; we no longer reconstruct any voiceless lenis stops, and we now reconstruct the voiced implosives, which take the place of the earlier voiced lenis stops throughout this study, only in contexts in which plain voiced stops do not occur. Our revised pB still obliges us to assume that our pB voiced implosives have merged with their plain voiced counterparts, with which they are in complementary distribution in the revised pB, over the greater part of the Bantu area; however, when account is taken of the considerations just outlined in the two preceding paragraphs, this is by no means a costly assumption. Compare the merit in this respect of our pB segment ***ɓ** with that of Guthrie's CB phoneme ***b**, which he considers to have had the phonetic value ***b** in all contexts in pB; Guthrie, who does not discuss the matter even though he does report the reflex **ɓ** (see §4 above), would be obliged to

make what must surely be a very costly assumption, namely that *ɓ has become **6** in certain circumstances in a language with no existing implosives.

Comparative work by Endresen (1992) on Nizaa, a language of the Mambiloid group (the 'Suga (Nyamnyam)' language in Blench and Williamson's (1987) classification of the Northern Bantoid languages as reproduced by Hedinger (1989:425)), strongly supports our hypothesis that the voiced implosives of the four-stop system which we reconstruct in pBPT survived in pB in certain contexts. Endresen (1992:188-9) notes that at C1, the pB phoneme */d/ corresponds to both */ɗ/ and */l/ in pre-Nizaa B (which he arrives at by internal reconstruction from present-day Nizaa), and pB */b/ corresponds to pre-Nizaa B */ɓ/. As he points out, the correspondence of pB */d/ to the two pre-Nizaa B phonemes */ɗ/ and */l/ "can be interpreted as a Proto-Bantu innovation: merger of two phonemes kept apart in Nizaa" (p.191). Compare this innovation with BPT-B.8 of Table 17b, the last of our rules for deriving the pB reflexes of the pBPT non-sonorants: the voiced implosive *ɗ becomes *l before non-ATR vowels (i.e. before vowels other than *i,*u (Guthrie's *ị,*ụ)), merging with an existing *l from pBPT *l. It will be seen that it seems possible that the proto-Bantoid situation will eventually be identified with the situation at one of the intermediate stages of our Bantu-Potou-Tano-to-Bantu derivation.

It will also be seen that the traditional phonemic approach, which allows our pB implosives and lateral to be dismissed as subphonemic and thus excluded from starred forms, is at a serious disadvantage when compared with a feature-based approach such as that adopted here. Anttila (1972:66) makes a similar point in connection with the three traditional steps of Grimm's Law (**t > θ, d > t, dh > d**): "So far nothing much has happened, because all three series are still distinct; but this is the nucleus of Grimm's Law. (Such "mere phonetic" changes seem much less trivial from the point of view of distinctive feature analysis, which concentrates exactly on this level of phonology . . .)"

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ABBREVIATIONS

Ab	Abouré	C1/C2	the C in 1st/2nd position	Mb	Mbatto
Ak	Akan	CB	(Guthrie's) Common Bantu	Nk	Nkonya
Am	Akuapem	Cont	continuant	NWB	North-West Bantu
An	Anyi	CS	comparative series	P	Potou
[A*n*]	[*n*] in Appendix A	CT	Central Tano	PCN	Progressive Consonant Nasalization
Appx	Appendix	Eb	Ebrié		
ATR	advanced tongue root	Eo	Eotilé	PT	Potou-Tano
Aw	Awutu	Gmc	Germanic	px	proto-x
B	Bantu	Gu	Guang	SE	Stop Epenthesis
Ba	Baule	HSP	heightened subglottal pressure	T	Tano
[B*n*]	[*n*] in Appendix B	IE	Indo-European	WT	WEstern Tano
BPT	Bantu-Potou-Tano	Kr	Krachi	x- to -y	the language from px to (p)y
C	consonant	La	Larteh		

APPENDIX A

Comparative series displaying the correspondences which support the reconstruction of stem-initial non-sonorants in proto-Tano, proto-Potou-Tano or proto-Bantu-Potou-Tano.

The Akan (Ak) entries, except for the one in [17a], which is from tbe Fante (Fa) dialect, are from the Akuapem (Am) dialect; all are retranscribed from Christaller's dictionary (1933). Where Christaller's transcription of the stem-initial consonant is different from ours, it will in most cases be found in Appendix B between single quotes and parentheses, thus: **ɕ** ('hy'). His transcription of the vowels is basically the same as ours except that he usually bas **e,o** for the [+High, –ATR] vowels **ɪ,ʊ**. His transcription of the low and high tones is likewise basically the same as ours, but whereas we have a raised exclamation mark for downstep, he marks "high tones abating by one step or successive steps" as high tones and leaves tones unmarked where they show no change from the preceding tone. He does not show the foot boundary, which is unpredictable before a sonorant segment; we write it as a raised dot in that context, thus: **g^{wu}à·rí** 'batbe'. We have omitted the tone marks in the case of all the one-foot verbs, which invariably have low tone, and in the case of all tbe alienable nouns with one-foot stems, which invariably have high tone on the stem and low tone on any prefix.

The entries for the present-day languages other than Akan are from the writer's own field notes or, in the case of the four Guang languages, from Stewart's wordlists

(1966). The Common Bantu (CB) entries are from Guthrie (1967-71) and are cited in Guthrie's own transcription.

Tones are not shown for any of the present-day languages other than Akan, primarily because the tone systems are inadequately understood but also because we have not in any case found any consonant correspondence to be tonally conditioned. The surface tones of the nominals of the four Guang languages, however, are to be found in Stewart's wordlists (1966).

A tilde ~ written over the first vowel or **l** or **r** of any sequence not containing any other segments indicates that the sequence is nasalized throughout.

A superscript $^{\text{i}}$ or $^{\text{u}}$ after an Akan stem-initial consonant indicates that the stem selects the [+ATR] variant of a prefix containing a vowel (see [14g], [17c,e], and [18a-c]).

Y is a cover symbol for **y** before oral non-round vowels, **w** for oral round, **ỹ** or **ɲ** before nasalized non-round, or **w̃** or **ŋ^{w}** before nasalized round. **ạ** is a cover symbol for any [+ATR] counterpart of **a**.

In many of the languages the stem-initial consonant varies according to whether or not a nasal or nasalized segment precedes. The post-nasal variant is shown in noun stems where the prefix selects it (see [2f-g], [4c], [6a], [11d,g], [14d-e], [16c], and [18f]), but is never shown in verb stems.

Anyi and Baule display a mutation of **k** to **h** (An) and **Y** (Ba) (see above) in circumstances which cannot be specified in purely phonological terms. The mutation is shown in noun stems in which it occurs (see [8c,e,h]), but is never shown in verb stems.

An entry enclosed in brackets displays some deviation from what, at this stage, we assume to be the regular stem-initial consonant correspondence.

1. The correspondences and the protoconsonants

CS group	1	2	3	4	5	6	7	8	9
pBPT	*p	*t	*kp	*kp	*'p	*'t		*ƙ	*ƙp
pB	*p	*t	*k	*k	*p	*t,*ɗ		*k	*k
CB	*p	*t	*k	*k	*p	*t,*d		*k	*k
pPT	*p	*t	*k^{w}	k^{w}	*'p	*'t		*ƙ	*'gb
pP	*p	*t	*f	*k	*'p	*'t		*ƙ,*'c	*gb
Eb	ph	th	f	kh	p	t		k,c	gb
Mb	p	t		k	ɓ			'g,'j	gb
pT	*f	*s	*h^{w}	*w	*p	*t	*c	*k	*gb
pWT	*f	*h		*w	*p	*t	*c,*s	*k	*gb
Ab	f	Y		w	p	t	c,s	h	b
Eo	f	h		w	p	t	s	k	gb
pCT	*h	*s	*h^{w}	*w	*f	*t	*s	*k	*kp
An	Y	s		w	f	t	s	k	kp
Ba	Y	s	f	w	f	t	s	k,c	kp
Ak	h,ɕ,h̃	s	ɕ^{w}	w	f	t	s	k,c	p
pGu	*f	*s	*f	*w	*p	*t,*c	*c	*k	*kp
Aw	f	s,š	f	w	h	t,c	c	k	p
La	f	s	f	w	h	t,ts	ts	k,c	kp
Nk	f	s	f	w	p	t,ts	ts	k	kp
Kr	f	s	f	w	p	t,c	c	k	kp

CS group	10	11	12	13	14a-e	14f-h	15	16a-e	16ĺ	16g	17a-d	18
pBPT	*b	*d	*g		*gb		*ɓ	*ɗ	*ɗ	*ɗ		*'gb
pB	*ɓ	*ɗ	*'g		*y		*ɓ	*ɗ,*l	*ɗ	*l		*'g,*y
CB	*h	*d	*g		*y		*b	*d	*d	*d		*g,*y
pPT	*b	*d	*g	*g	*g^w	*g^w	*ɓ	*ɗ	*ɗ	*ɗ		*'g^w
pP	*b	*d	*j	*h	*b	*b	*ɓ	*ɗ,*l		*l		*g(u)
Eb	b	d	j	b	b	b	ɓ	ɗ,l				g(u)
Mb	p	d	j	h			ɓ	ɗ,l		l		g(u)
pT	*ɸ	*θ	*k	*χ	*k^w	*k^w	*h	*d	*d	*ð	*j	*g^w
pWT	*ɸ	*θ	*k	*w			*b	*d	*n	*ð	*j	*g^w
Ab	f	s,c	h	w			v	l	l̃	d	j	gb
Eo	f	s	c	w			b	d	n	d	j	
pCT	*f	*s	*k	*w	*k^w	*k^w	*b	*d	*d	*θ	*j	*$g^{(w)}$
An	f	s	k,c	w	k		b	d	n		j	g,b,j
Ba	f	s	k,c	w	k(ʊ)	kʊ	b	l	n	s	j	g,b,ju
Ak	f	s	c	w	k^w,c^w	cw	b	d	d	f	$j^{(w)}$,d	$g^{(w)}$,j^w
pGu	*f	*t,*c	*k	*k	*kp	*g^w	*b	*d	*d		*j	*g^w
Aw	f	t,c	k	k	p	h,$j^{(w)}$	b	d			j	b
La	f	t,ts	k,c	k	kp	b,j^w	b	d,j			$j^{(w)}$	b
Nk	f	t,ts	k	k	kp	b,j	b	d,j	d		j	b
Kr	f	t,c	k	k	kp	j	b	d,j	d		j	j

2. Selected comparative series displaying the correspondences identified

	1a hundred	1b moon	1c stranger	1d burn	1e squeeze	1f boil	1g blow	1h close
pBPT				*p	*p	*p	*p	
pB				*p	*p	*p	*p	
CB				*-pí-	*-pi̯n-	*-pu̯d-	*-pu̯d-	
pPT				*p	*p	*p	*p	
pP					*p		*p	
Eb					-phi		-phu	
Mb					-pi		-pu	
pT	*f	*f	*f	*f	*f	*f	*f	*f
pWT		*f	*f	*f	*f	*f	*f	*f
Ab				-fɪ	-fie	-fu	-fu	
Eo		ɛ-fɛ	a-fɔ-pʊ		-fikɛ	-futu	-fu	-fĩ
pCT	*h	*h	*h	*h	*h	*h	*h	*h
An	e-ya		(ɛ-ɔ-fʊɔ)			(-hu)		-ɲĩ
Ba	ya		(a-u-fʊɛ)			-ŋ^{w}ũ		-ɲĩ
Ak	ɔ̀-hà	ɛ-ɕɛŋ	ɔ̀-hɔ́-$^!$hú	-ɕɪ	-hĩŋ	-huru	-huw	-hũnĩ
pGu	*f	*f	*f			*f	*f	*f
Aw	ɔ-la-fa		o-fɔ			-fũ	-furi	-fɔ̃
La	ɔ-lɛ-fɛ	o-fenĩ	o-fwe			-fũ	-furi	-fũ
Nk	la-fa		ɔ-fɔ-ɔ			-fu	-fwi	-fĩ
Kr	kɛ-lɛ-fɛ	ɔ-fɔrɪ	ɔ-fɔ			-fwi	-fũ	

	2a war	2b father	2c under	2d on	2e ear	2f three	2g ashes	2h weep
pBPT	*t				*t	*t	*t	
pB	*t				*t	*t	*t	
CB	*-tá	(*-cí)	(*-cì)		*-tú(ù)	*-tátù	*-túé	
pPT	*t	*t	*t	*t	*t	*t	*t	*t
pP	*t	*t	*t	*t			*t	*t
Eb	a-tha	n-the	a-the	a-tho			n-thu	-thɔ̃
Mb	o-ta	tɛ̃	tĩ				ũ-tũ	-tũ
pT	*s	*s	*s	*s	*s	*s	*s	*s
pWT		*h		*h	*h	*h		*h
Ab		ɛ-yɛ		wɔ	ɔ-wɔ	(ɛ̃-ŋa)		-ŋ^{w}ũ
Eo		e-he			ɔ-ho	a-hã		-hũ
pCT	*s	*s	*s	*s	*s	*s	*s	*s
An		sɪ		sʊ	sʊ	n-zã	n-zɔ̃	-sũ
Ba	sa	si		su	su	(n-sã)	n-zʊ̃ɛ	-sũ
Ak	ɔ-sa	ɔ̀-sí	à-sí	sʊ̀	à-sʊ́	è-sã̀	n-sʊ̃	-sũ
pGu	*s	*s	*s	*s	*s	*s	*s	*s
Aw	e-sa	se	a-in-se	e-so	a-sʊ	e-sã	n-sɔ̃	-sũ
La		ɔ-sɪ	a-sɪ	sʊ	sʊ	sã	n-sɔ̃	-sũ
Nk	ɪ-sa	ɔ-sɪ	a-ya-sɪ	sʊ	e-sõ	a-sa	n-suo	-su
Kr		sɪ	kɛ-sɪ	sʊ-sʊ	kʊ-sʊ	a-sɛ	n-sɔ	-su

	3a bale out (water)	3b scratch	3c sugar-cane	3d you s.	3e snatch	3f whistling
pBPT	*kp		*kp	*kp		
pB	*k		*k	*k		
CB	*-kúp-		*-kùùgú	*-kú		
pPT	*k^{w}	*k^{w}	*k^{w}	*k^{w}		
pP		*f				
Eb		-fɛ̃				
pT	*h^{w}	*h^{w}	*h^{w}	*h^{w}	*h^{w}	*h^{w}
pCT	*h^{w}	*h^{w}	*h^{w}		*h^{w}	*h^{w}
Ba					-fɛ̃	
Ak	-ɕ^{w}ɪw	-ɕ^{w}ɪ̀tí	à-ɕ^{w}í·!ríw		-ɕ^{w}ĩm	ò-ɕ^{w}ì-rè-má
pGu		*f		*f	*f	*f
Aw					-fĩ	
La						o-fori
Nk				fʊ		ɔ-fʊlɪ
Kr		-fɪtɛ		fʊ		m-fʊrɪ

	4a	4b	4c	4d	4e
	cough v.	cough n.	snail	die	death
pBPT	*kp		*kp	*kp	*kp
pB	*k		*k	*k	*k
CB	*-kódud-		*-kódá	*-kú̱-	*-kú̱
pPT	*k^w	*k^w	*k^w	*k^w	*k^w
pP	*k	*k		*k	*k
Eb				-khu	a-khu
Mb	-krɔ	kɔgu		-ku	
pT	*w	*w	*w	*w	*w
pWT			*w	*w	*w
Ab			e-weve	-wu	o-we
Eo			o-wobe	-wu	ɔ-wu
pCT		*w	*w	*w	*w
An				-wu	
Ba				-wu	y^wüe
Ak		ɔ-waw	ŋ-ŋ^{w}aw	-wu	o-wu
pGu	*w	*w	*w	*w	*w
Aw		(e-hɔle)		-wu	la-u
La		ɔ-wa		-wu	lo-wu
Nk	-wata	ɔ-wɛ		-wu	ɩ-lo-wu
Kr	-wɛtɛ	ko-wɛtɛ	kɔ-wa	-wu	lo-wu

	5a	5b	5c	5d	5e	5f
	take	guilt	get wet	-person	new	belly
pBPT	*'p					*'p
pB	*p					*p
CB	*-pát-		(*-bòmb-)			*-pṳ̀
pPT	*'p	*'p			*'p	*'p
pP	*'p	*'p			*'p	
Eb	-pa†				m-pɔ-pɔ	
Mb		ɓɔ				
pT	*p	*p	*p	*p	*p	*p
pWT	*p			*p	*p	*p
Ab	-pa			-pʊɛ	pʊ-plɔ	
Eo				-pʊ	pu-pu	o-pu
pCT	*f	*f	*f	*f	*f	*f
An		fʊɔ		-fʊɔ	fʊ-flɛ	
Ba	-fa	fɔ		-fʊɛ	fu-flɛ	fle
Ak	-fa	ɛ-fɔ	-fɔw	-fʊ́	fʊ́-!fúrʊ	ą́-fùru
pGu		*p	*p	*p	*p	*p
Aw		hɔ	-hɔle	-ho	e-hɔ-hɔ	e-hu
La		hwe	-hɔlɛ	(-wʊ)	o-hwe	
Nk		ɩ-pɔ̃		-pʊ	ɩ-pɔ-pwɛ	i-pu
Kr			-pʊɔ	-pʊ	ɔ-pʊ-pwɛ	ku-pwi

†'touch'

	6a twin	6b bow	6c throw	6d pull out	6e become straight	6f roast	6g vein	6h wake up
pBPT		*'t	*'t			*'t	*'t	
pB		*t		*ɗ		*t	*t	
CB		*-tá		*-dụ̀t-		*-tụ̀mb-	*-tɪ́ŋgà	
pPT		*'t		*'t		*'t	*'t	
pP				*'t				
Eb				-ti				
pT	*t	*t	*t	*t	*t	*t	*t	*t
pWT	*t	*t		*t	*t	*t		
Ab	n-ta	ɛ-tã		-tu	-tĩŋɛ	-tʊ-tʊ̃		
Eo	ɛ̃-tã	ɛ-tã		-tu	-tɪŋɛ	-tʊ̃-tʊ̃		
pCT	*t	*t	*t	*t	*t	*t	*t	*t
An	n-da	ta	-tʊ	-tu	-tɛ̃ŋgɛ			-tĩŋge
Ba	n-da	ta	-to		-tĩŋgɛ	-tɔ̃		-tĩŋge
Ak	a-ta	ɛ-ta	-tʊ	-tu	-tɪ̀-é	-tʊ̃	n-tĩnĩ	
pGu	*t	*t	*t	*c	*t	*t	*c	*c
Aw	n-ta		-tu	-cuki			(n-tĩnĩ)	(-šĩŋkĩ)
La			-tʊ	-tsu		-tɔ̃	n-tsĩnĩ	-tsĩɲcĩ
Nk	ta-bi	ɪ-ta			-tɪŋkɪ	-tɔ	e-tsĩ	-tsiŋki
Kr		ke-tɛ	-tʊ			-tɔ	ke-cinĩ	-cinĩ

	7a dance	7b cure	7c room	7d bean	7e peck	7f be big, numerous
pT	*c	*c	*c	*c	*c	*c
pWT		*s		*s		*s
Ab		-sã		ɛ-sɪ		-sʊ
Eo		-sã				-sʊ̃
pCT	*s	*s	*s	*s	*s	*s
An		-sa				-sɔ̃
Ba			sa			
Ak	-saw	-sa	a-sa	a-sɛ	-sɔw	-sʊ̃
pGu	*c	*c	*c	*c	*c	*c
Aw	-ca	-ca			-cɔ	
La	-tsa	-tsɛ	tsa		-tsɔcɪ	
Nk	-tsa	-tsa		a-tse	-tsy^{w}ɛ	
Kr	-ca	-cɛ			-cy^{w}ɪɛ	-cɔ

	8a headpad	8b neck	8c hunger	8d eagle	8e husband	8f dawn	8g fight	8h heart
pBPT	ƙ	*ƙ		*ƙ		*ƙ		*ƙ
pB	*k	*k		*k		*k		*k
CB	*-kátà	*-kòtị		*-kódị̀†		*-kí-		*-kódò
pPT	*ƙ	*ƙ	*ƙ	*ƙ		*ƙ	*ƙ	*ƙ
pP			*ƙ			*'c	*ƙ	
Eb			a-ko			-ci	-ku	
Mb			(o-gɔ̃)			-'jū	-'gṹ	
pT	*k	*k	*k	*k	*k	*k	*k	*k
pWT		*k	*k	*k	*k	*k	*k	*k
Ab		(-kɔ)	ɔ-hɔ̃vɛ̃	hṹlɔvɛ̃	-hi	-hɛ̄	-hṹ	a-hṹrʊvɛ̃
Eo					o-ku		-kṹ	
pCT	*k	*k	*k	*k	*k	*k	*k	*k
An		kɔmɛ̄	e-ho		hṹ		-kɔ̃	a-hɔ̃rɔ
Ba		kɔmī	a-we		ŋ^{w}ṹ	-cɛ̄	-kū	a-ŋ^{w}ʊ̄rɛ
Ak	ká-$^{!}$híri	è-kóŋ	ɔ-kɔm	ɔ̀-kɔ́-$^{!}$rí	ò-kṹnṹ	-cī	-kʊ̄	kʊ̀·mấ
pGu	*k	*k	*k	*k	*k	*k	*k	*k
Aw	e-ka	kɔnī	a-kɔ̃		kuri	-kɛ̄	-kɔ̃	
La	kɛ	kʊ̃nā	ɔ-kɔ	kore	o-kuru	-kɛ̄	-kɔ̃	
Nk	ɪ-ka		a-kʊ̄		o-kulu	-kɛ	-kɔ	kʊ̄mʊ̄
Kr	ke-ka		a-kʊ̄	ɔ-k^{w}ɛrɪɛ	kuri	-kɛ	-kɔ	

† 'kind of hawk'

	9a take off	9b sweep	9c knot,bump	9d scrape	9e pull	9f door	9g bend
pBPT				*ƙp	*ƙp		
pB				*k	*k		
CB				*-kómb-	*-kùd-		
pPT	*'gb		*'gb	*'gb	*'gb	*'gb	
pP	*gb		*gb			*gb	
Eb	-gbɔ̃		ŋm-gbɔ			a-gbo	
Mb						o-gbo	
pT	*gb	*gb	*gb	*gb	*gb		*gb
pWT		*gb	*gb	*gb	*gb		*gb
Ab		-ba-bʊa	ɔ-bɔ	-bʊ-bʊ	-blɛ̄		
Eo		-gba-gbra	ɛ̃-gbɔ			(ɔ-bɔ)	-gbṹrʊ
pCT	*kp	*kp	*kp	*kp	*kp	*kp	*kp
An	-kpro	-kpra-kpra	kprɔ				
Ba	-kpa		kpɔlɛ				
Ak	-pa	-pì-rá	ɛ-pɔw	-pɔw	-pīŋ	ɔ-pʊ̄ŋ	-pʊ̃nʊ̃
pGu	*kp		*kp				
Aw	-pɔ		e-pɔ				
La			kpɔ				
Nk	-kpa		ɪ-kpʊ̃				
Kr	-kpɛ		ko-kpɔ				

	10a mix	10b buy/credit	10c pierce	10d white	10e dirty	10f hunchback	10g dig
pBPT					*b		
pB					*ɓ		
CB					*-bi̱ndù		(*-pu̱k-)
pPT					*b		*b
pP							*b
Eb							-bɔ̃
Mb							-pʊ̃
pT	*ɸ	*ɸ	*ɸ	*ɸ	*ɸ	*ɸ	*ɸ
pWT	*ɸ	*ɸ		*ɸ		*ɸ	
Ab	fa-fla	-fri		fu-fue		ɛ-fū-pʊɛ	
Eo		-fri		fu-fu			
pCT	*f	*f	*f	*f	*f	*f	*f
An		-fli	-fiti	fu-fuo	e-fĩɛ		-fū
Ba	-flã		-fiti		fĩɛ		-fū
Ak	-fi·rá	-fi·rí	-fĩtí	fú-fú	e-fĩ	a̱-fū	-fūnū
pGu	*f	*f	*f	*f	*f	*f	
Aw		-firi		e-fu-furi		a-fū-ho	
La	-fɪra	-firi		o-fu-furu	fĩ	a̱-fū	
Nk	-fra	-fuli	-futi	fu-tutu			
Kr		-firi	-foti	o-fu-furi	e-fi		

	11a story	11b worm	11c stop up	11d water	11e piece	11f become used up	11g liquor	11h tear
pBPT			*d					
pB			*ɗ					
CB			*-di̱h-					
pPT			*d	*d			*d	
pP				*d			*d	
Eb				n-du			n-dɛ	
Mb				ʊ̃-du				
pT	*θ	*θ	*θ	*θ	*θ	*θ	*θ	*θ
pWT		*θ		*θ		*θ	*θ	*θ
Ab		ɔ-sɔ		ɲ-cue		-sā	ɲ-cā	-sē
Eo		ɛ-svɛyi		ɛ̃-su			(ɛ̃-zā)	
pCT	*s	*s	*s	*s	*s	*s	*s	*s
An				n-zuo	sĩ	-sā		
Ba				n-zue	sĩ	-sā	n-zā	
Ak	a-sɛm	ò-sùn-sóŋ	-siw	n-su	e-sĩŋ	-sā	n-sā	
pGu	*t	*t	*t	*c	*t	*t	*t	*t
Aw	e-tɛ̃	n-tìn-trɔ̃mĩ	-ti	ɲ-cu			n-tā	-tɛ̃
La			-ti	n-tsü	tĩ	-tɛ̃	n-tɛ̃	
Nk	-tɛ		-tĩ	n-tsü	i-tĩ	-ta	n-ta	
Kr	-tɛ	ke-tɔn-taŋ	-ti	ɲ-cu	ki-tĩ	-tɛ	n-tɛ	-tɛ

	12a beside	12b show	12c fry	12d bind	12e abstain	12f back, behind
pBPT					*g	
pB					*'g	
CB					*-gi̯d-	
pPT	*g	*g	*g	*g	*g	*g
pP	*j	*j	*j	*j	*j	*j
Eb	ɲ-jɛ		-je	-ju	-ji	ji
Mb		-jrɛ̃	-jɛ̃†			
pT	*k	*k	*k	*k	*k	*k
pWT			*k	*k		
Ab				-hɪ		
Eo			-co			
pCT	*k	*k	*k	*k	*k	*k
An		-kre	-cɛ̃-cɛ̃	-cɪ-cɪ		
Ba		-kle	-kɛ̃-ɛ̃	-ci-ci	-ci	
Ak	ɲ̀-cέŋ	-cì·rέ	-cɪw	-cì-círɪ	-ciri	ą́-cìri
pGu	*k		*k		*k	
Aw	ŋ-kaŋ-ke				-kī	
La					-cī	
Nk					-kisi	
Kr	ke-keri		-kɪ		-kisi	

† 'roast'

	13a bear (child)	13b honey	13c dream
pPT	*g		
pP	*h		
Eb	-ho		
Mb	-he		
pT	*χ	*χ	*χ
pWT	*w	*w	*w
Ab	-wʊ	ɔ-wɔ†	
Eo		o-wo†	-wu
pCT	*w	*w	
An	-wʊ	ɛ-wʊ	
Ba	-wu		
Ak	-wʊ	ɛ-wʊ	
pGu	*k	*k	*k
Aw	-ko-ke	e-kɔ̃	-ku
La	-kʊ-cɪ	ɔ-kɔ̃	-ku
Nk	-k^{w}ɪɪ	ɔ-kwɛ̃	-kū
Kr	-kʊ	ɔ-kwɛ	-kʊ

† 'bee'

	14a path	14b frog	14c buffalo	14d life	14e nine	14f wait	14g cut	14h pull
pBPT		*gb		*gb				
pB		*y		*y				
CB		*-yùdá		*-yònyò				
pPT		*g^w		*g^w	*g^w	*g^w		
pP					*b	*b		
Eb					a-brɔ	-bo		
pT	*k^w	*k^w	*k^w	*k^w	*k^w	*k^w	*k^w	*k^w
pWT		?						?
Ab		(krɔ -pʊkɔ)						
Eo								(-cũ)
pCT	*k^w	*k^w	*k	*k^w	*k	*k^w	*k^w	*k^w
An		ɛ-klɛ			ŋ-gũnã			
Ba				ŋ-gũa	ŋ-gũnã			-kŭɛ
Ak	ɔ-k^waŋ	a-c^wɛrɪ	ɛ-kʊ	ŋ-k^wã	à-kű́nű́ŋ	-c^wɛŋ	-c^{wi}a	-c^wĩ
pGu	*kp		*kp	*kp	*kp	*g^w	*g^w	*g^w
Aw	e-pa		e-po	m-pã	e-panɔ̃	-jo	-bia	-j^{w}ete
La	ɔ-kpɛ		ɪ-kpʊ	ŋm-kpɛ̃	kpũnɔ̃	-j^{w}ɔ	-bia	
Nk	ɔ-kpa			ŋm-kpa		-jʊ	-bia	-bɪtɪ
Kr	ɔ-kpɛ			ŋm-kpɛ	a-kpʊnɔ̃	-jo	-ja	-jete

	15a come	15b break	15c become cooked	15d stone	15e hit	15f faeces	15g ask	15h cut down
pBPT			*ɓ	*ɓ	*ɓ	*ɓ		
pB			*ɓ	*ɓ	*ɓ	*ɓ		
CB			*-bìd-	*-bùè	*-búd-	*-bi̩dò†		
pPT	*ɓ	*ɓ	*ɓ	*ɓ	*ɓ	*ɓ	*ɓ	*ɓ
pP	*ɓ	*ɓ	*ɓ	*ɓ		*ɓ	*ɓ	*ɓ
Eb	-ɓa	-ɓɔ	-ɓe	a-ɓu		a-ɓi	-ɓi	
Mb		-ɓɔ	-ɓe	o-ɓu		o-ɓu	-ɓli	-ɓu
pT	*b	*b	*b	*b	*b	*b	*b	*b
pWT	*b	*b	*b	*b	*b	*b	*b	*b
Ab	-va	-vo	-vɪ	-vʊɛ	-vʊ	(ɛ-mĬi)	-vie	-vu
Eo	-ba			o-bo		(ɛ̃-mi)	-bie	-bi
pCT	*b	*b	*b	*b	*b	*b	*b	*b
An	-ba	-bo	-bɛ̃	yɔ-bʊɔ	-bʊ	e-bĩ	-bisa	-bu
Ba	-ba	-bo	-be	yɔ-bʊɛ		bi	-bisa	-bu
Ak	-ba	-bɔ	-bĩŋ	ɔ-bʊ	-bʊrʊ	e-bĩŋ	-bisa	-bu
pGu	*b	*b	*b	*b		*b	*b	
Aw	-ba	-bɔ	-ble				-bisa	
La	-bɛ	-bwe	-bre	bu		bĩnĩ	-bisɛ	
Nk	-ba		-blɪ	i-bwi		m-bi		
Kr	-bɛ	-bɔ	-bɪrɪ	ku-bu			-bisɛ	

† 'dirt'

	16a	16b	16c	16d	16e	16f	16g
	lie down	old	today	eat	ten	extinguish	stick to
pBPT	ɗ		*ɗ	*ɗ		*ɗ	*ɗ
pB	*l		*l	*ɗ		*ɗ	*l
CB	*-dáád-		*-dèèdó	*-dí-		*-dį́m-	*-dàm-
pPT	*ɗ	*ɗ	*ɗ	*ɗ		*ɗ	*ɗ
pP	*l	*l		*ɗ			*l
Eb	-la	lɔ-lɔ		-ɗĩ		(-nɔ̃)	
Mb				-ɗĩ			-la
pT	*d	*d	*d	*d	*d	*d	*ð
pWT		*d		*d	*d	*n	*ð
Ab		labɛ		-li		-l̃uɛ	-da
Eo				-di	e-di	-nũ	-da
pCT	*d	*d	*d	*d	*d	*d	*θ
An	-da	da		-di		-nũa	
Ba	-la			-li		-nʊ̃a	-sã
Ak	-da	dí-ꜜdɑ̃w	ǹ-nɛ́	-di	è-dú	-dũm	-fãm
pGu		*d	*d	*d	*d	*d	
Aw		da-da	n-nɛ	-di	e-du		
La		ɔ-dɩ-dɛ	ne	-ji	du		
Nk		ɩ-da-da	n-dɛ	-ji	i-du	-dũ	
Kr		ɔ-dɩ-da	n-dekɛ	-ji	ku-du	-dũ	

	17a	17b	17c	17d	17e	17f	17g	17h
	yam	song	fire	reach	Cf. God	eye	two	mother
pT	*j	*j	*j	*j	*ɲ	*ɲ	*ɲ	*n
pWT		*j		*j	*ɲ	*ɲ	*ɲ	*n
Ab		o-jovɛ̃		-ju	ɲãmĩɛ	ɛ-ɲɛ̃	o-ɲũ	e-l̃iɛ
Eo		jo				ɛ-ɲĩmã	a-ɲʊ̃	e-nĩ
pCT	*j	*j	*j	*j	*ɲ	*ɲ	*ɲ	*n
An		e-jʊ		-ju	ɲãmĩɛ	ɲɛ̃-ba	ɲɔ̃	nĩ
Ba	brɔ-jʊ*	jue		-ju	ɲãmĩɛ	ɲĩ	ɲɔ̃	nĩ
Ak		e-jʷom	o-jia	-duru	ò-ɲⁱȁ·mɪ̃́	ą̀-nɪ̃́	è-nʊ̃̀	ò-nɪ̃́
Ak.Fa	ɛ-jʷʊ							
pGu	*j		*j			*ɲ	*ɲ	*n
Aw	e-jo		e-ja				e-ɲɔ̃	nĩ
La	jʷo		o-jɛ				ɲɔ̃	o-nĩ
Nk	o-jo		o-ja				a-ɲɔ̃	ɲĩ
Kr	ku-jo		ɔ-jɛ†			ke-ɲəse	a-ɲɔ̃	ɲĩ

* brɔ-jʊ 'sweet potato'; brɔ- 'European' † 'heat'

	18a stool	18b cut up (carcase)	18c bathe	18d sea	18e palm kernel	18f palm oil	18g become soft	18h fall; sow (rice)
pBPT			*'gb				*'gb	*'gb
pB			*y				*y	*'g
CB			*-yóóg-				*-yódub-	*-gù-
pPT			*'g^w	*'g^w			*'g^w	*'g^w
pP			*g	*gu				*g
Eb			-go	gue				
Mb			-gu ndu	o-gue				-gɔ̃
pT	*g^w	*g^w	*g^w	*g^w	*g^w	*g^w	*g^w	*g^w
pWT				*g^w	*g^w	*g^w		*g^w
Ab			(-valɪ)	e-gbefie	e-gbeve	ŋm-gbo		-gbũ
pCT	*g^w	*g^w	*g^w	*g^w	*g^w	*g	*g	*g
An	bia		-bia	jemvie	a-je	ŋ-go		-gua
Ba	bɪa	-bɪa	-bɪa		a-jue	ŋ-go		
Ak	ą-g^{wu}a	-g^{wu}a	-g^{wu}à·rí		a-j^{w}ɪ	ŋ-ŋo	-gù·rów	-gu
pGu	*g^w	*g^w	*g^w		*g^w			
Aw	a-bia	-bĩa	-bira		a-bi			
La	ą-biɛ	-bĩɛ	-biɛ		e-bi			
Nk	e-bia	-bio	-bie		a-bi ofobi			
Kr	kɛ-jɛ	-jɔ	-jie		ke-dą-ji			

APPENDIX B

Common Bantu-Akan pairs displaying the stem-initial consonant correspondences identified in Appendix A.

The 75 pairs listed here are in most cases taken from a list of 100 in Stewart (1983). The drop from 100 to 75 is accounted for mainly by the exclusion of pairs displaying stem-initial consonant correspondences which appear to go back to pBPT sonorants.

The Common Bantu (CB) entries are from Guthrie (1967-71) and are cited in Guthrie's own transcription. Where Guthrie's (phonemic) transcription of the stem-initial consonant is at variance with the proto-Bantu reconstruction proposed in the present article, it is indicated in parentheses in the formulation of the correspondence in question, thus: pB ***l*** (CB ***d***). Each CB entry includes Guthrie's gloss followed, where appropriate, by his symbol G[eneral] for dispersion across at least five of his six 'areas' or his symbol GG for dispersion across each of his fifteen 'zones' (see Guthrie 1967-71 vol.1:82-4).

The Akan (Ak) entries, except for two which are shown as being from the Fante dialect, are from the Akuapem dialect; all are retranscribed from Christaller's dictionary (1933). Where Christaller's transcription of the stem-initial consonant is different from ours, it is indicated between single quotes and parentheses in the formulation of the correspondence in question, thus: **ɕ** ('hy'). For more on Christaller's transcription see the introduction to Appendix A.

1. Pairs with stem-initial consonants derived from pBPT plain voiceless stops (cf. [A1-4]).

a. pBPT ***p** > pB ***p** = pPT ***p** > pT ***f** > Ak **h** /—non-front oral V
~ **ç** ('hy') /— front oral V
~ **h̃** ('h') /— nasalized V

***-pí-**	'become burnt' GG	**-çɪ, -çɪw**	
***-pu̱d-**	'froth over (of a boiling or fermenting liquid)' G	**-huru**	'boil, froth'
***-pu̱dù̱, *-pu̱dò, *-pu̱dù, *-pódù̱**	'foam' total dispersion GG	**a-huru**	
***-pu̱d-**	'blow (with mouth)' G	**-huw**	
***-pám-**	'shout; (argue)'	**-h̃ãm**	
***-pémb-**	'blow (nose)'	**-h̃ĩm**	
***-pèdè**	'the itch, crawcraw'	**-hɪ̀nɪ̃**	'itchy'
***-pí**	'where?'	**-h̃ɪ́**	
***-pɪ̀n-**	'squeeze (esp. with fingers)' G	**-h̃ĩŋ**	'get caught in or between'
***-púúm-**	'breathe; rest' G	**-h̃ʊ̀·mɪ́**	

b. pBPT ***t** > pB ***t** = pPT ***t** > pT ***s** > Ak **s**

***-tá**	'war' G	**ɔ-sa**	
***-táp-**	'draw (water)' G	**-saw**	
***-tì**	'that, namely; say' G	**-se**	'say'
***-tín-**	'cut' G	**-seŋ**	'make by carving or cutting'
***-túm-**	'send' GG	**-sʊ̀·mã́**	
***-tút-**	'carry' G	**-sʊ, -sʊ̀·á**	
***-tát-**	'tie up'	**-sã**	
***-tátù**	'three' G	**è-sã**	
***-tú(ù), *-túí** G 'ear'		**à-sʊ̃́**	
***-túé**	'ashes'	**n-sʊ̃**	

d.1. pBPT ***kp** /— front V > pB ***k** = pPT ***k^{w}** > pT ***h^{w}** > Ak **ç^{w}** ('hw')

***-kúp-**	'shake off',	**-ç^{w}ɪw**	'throw off, sweep away,
***-kúp-**	'bale out (water)' (partial series)		bale out (water)'
***-kùùgú/ó**	'sugar-cane'	**à-ç^{w}ɪ́·!ríw**	'sugar-cane',
		ç^{w}ɪ́·!ríw	'wild sugar-cane (a species of grass)'

d.2. pBPT ***kp** /— non-front V > pB ***k** = pPT ***k^{w}** > pT ***w** > Ak **w**

***-kódud-**	'cough' v G	**ɔ-waw**	'cough' n
***-kódá**	'snail'	**ŋ-ŋ^{w}aw**	
***-ku̱-**	'die' G	**-wu**	
***-ku̱**	'death' G	**o-wu**	

2. Pairs with stem-initial consonants derived from pBPT voiceless implosives (cf. [A5-9]).

a. pBPT ***'p** > pB ***p** = pPT ***'p** > pT ***p** > Ak **f**

***-pát-**	'hold' G	**-fa**	'take'
***-pu̱**	'stomach' G	**o-fu, o-furu**	

b.1. pBPT *'t /— u > pB *ɗ (CB *d) = pPT *'t > pT *t > Ak t

*-dụ̀t-	'pull' G	-tu 'pull out'

b.2. pBPT *'t /— other V > pB *t = pPT *'t > pT *t > Ak t

*-tá	'bow' G	ɛ-ta
*-tá	'spittle'	ǹ-tà-sú (sú: 'water')
*-tį́ŋgà	'vein'	n-tĩnĩ
*-tṵ́d-	'forge' G	-tɵ̃nɵ̃
*-tṵ́mb-	'roast' (cf. *-tù̱mb- (*-tù̱ù̱mb-) 'burn')	-tɵ̃

c. pBPT *ƙ > pB *k = pPT *ƙ > pT *k > Ak k /— non-front V ~ c ('ky') /— front V

*-kátà	'headpad' G	ká-ǃhíri
*-kó	'dirt'	ŋ-kɔ, ŋ-kɔɔ (Fante) 'filthiness'
*-kòtį̀	'neck' G	ɛ̀-kɔ́ŋ
*-kódį̀	'kind of hawk' G	ɔ̀-kɔ́·ǃrí 'eagle'
*-kṵ́mb-	'bend' tr	-kɵ̃m
*-kí-	'dawn' GG	-cĩ
*-kédè	'salt'	ɲ-cĩnĩ
*-kódò	'heart'	kɵ́·ǃnɵ̀·nǎ̀, kɵ̀·mǎ́

d. pBPT *ƙp > pB *k = pPT *'gb > pT *gb > Ak p

*-kómb-	'scrape'	-pɔw
*-kónud-, *-kónyud-	'break off' tr	-pɔ̀·ŋ́
*-kùd-	'pull'	-pĩŋ
*-kúb-	'hit' G	-pĩm

3. Pairs with stem-initial consonants derived from pBPT plain voiced stops (cf. [A10-14]).

a. pBPT *ɓ > pB *ɓ (CB *b) = pPT *b > pT *ɸ > Ak f

*-bį̀ndù/ò	'dirt'	e-fĩ

b. pBPT *ɗ > pB *ɗ,*l (both CB *d) = pPT *d > pT *θ > Ak s

*-déd-	'become suspended'	-sɛŋ
*-dį̀b-	'stop up' G	-siw
*-dį́t-	'tie a knot'	-si
*-dį̀ì̀k-	'bury' G	-sì·é
*-dóót-	'dream' G	-sɵ̃

c. pBPT *g > pB *'g (CB *g) = pPT *g > pT *k > Ak c ('ky') /— front V

*-gį̀d-	'abstain' G	-ci, -ciri

d. pBPT *gb /— non-ATR V > pB *y = pPT *g^{w} > pT *k^{w} > Ak k^{w} ('kw') /— non-front non-round V ~ c^{w} ('tw') /— front V

*-yònyò	'life'	ŋ-k^{w}ã
*-yò	'female genitals'	c^{w}ɛ́
*-yùdá	'kind of frog'	a-c^{w}ɛrɪ

4. Pairs with stem-initial consonants derived from pBPT voiced implosivess (cf. [A15-18]).

a. pBPT ***ɓ** > pB ***ɓ** (CB ***b**) = pPT ***ɓ** > pT ***b** > Ak **b**

***-bìd-**	'become cooked'	**-bīŋ**
***-bùè**	'stone' G	**ɔ-bɒ**
***-búd-**	'hit'	**-bʊrʊ**
***-búmbà**	'clay for pottery'	**ɛ-bɒ**
	("Quite probably due to a PB-X item")	
***-bi̩dò**	'dirt' G	**e-bīŋ** 'dirt, excrement'

b.1. pBPT ***ɗ** > pB ***ɗ**,***l** (both CB ***d**) = pPT ***ɗ** >
pT ***d** /— oral or ATR V > Ak **d**

***-dáád-**	'lie down' G	**-da**
***-dáád-**	'sleep' G	**-da**
***-dágù/ò**	'house' (partial series)	**ɔ-daŋ**
***-dèèdó**	'today' G	**ǹ-nɛ́** (**d** → **n** / **n**—)
***-dí-**	'eat' GG	**-di**
***-di̩m-**	'become extinguished' GG, 'extinguish' G	**-dũm**

h.2. pBPT ***ɗ** > pB ***l** (CB ***d**) = pPT ***ɗ** >
pT ***ð** /— nasalized non-ATR V > Ak **f**

***-dàmb-**	'become starved'	**-fãm**
***-dàm(at)-**	'stick to'	**-fãm**
-dànd-** (-dàànd-**)	'follow' G	**-fã** (Fante)
***-dèm-**	'become too difficult for'	**-fĩm**
***-dùb-**	'make a mistake'	**-fʊ̃m**
	("Could conceivably indicate a PB-X item")	

d.1. pBPT ***'gb** /— ATR V > pB ***'g** (CB ***g**) = pPT ***'g^{w}** > pT ***g^{w}** >
Ak **g** /— round V

***-gù-**	'fall' G	**-gu**

d.2. pBPT ***'gb** /— non-ATR V > pB ***y** = pPT ***'g^{w}** > pT ***g^{w}** >
Ak **g^{wu}** ('gu') /— non-front non-round V
~ **g** /— round V

-yóg-** (-yóóg-**)	'bathe' G	**-g^{wu}à·rí**
***-yódub-**	'become soft'	**-gù·rów**