Bantu Reconstruction and the Stops Versus Continuants Controversy*

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Introduction

In Bantu diachronic studies, continuants *B, *l, *G were proposed by Meinhof 1910 (1899), and stop *b, *d, *g, by Homburger[1] (1914) and Guthrie (1967-71) as Proto-Bantu segements. Meinhof based his proposal on two principles: frequency of occurrence and analogical symmetry (1929; 1932:28-31). Guthrie also used the principle of frequency of occurrence, but added another principle: probable direction of sound-shifting (1971. Vol. 1:61-2). These two conflicting recosntructions may be referred to as the 'stops versus continuants' issue in Bantu reconstruction.

Although the 'stops versus continuants' issue may have been present in the field of Bantu historical phonology since 1914, when Homburger reconstructed Proto-Bantu stops instead of using Meinhof's (1910 (1899) continuants, there hasn't been any principled discussion of the differences between the two solutions. Grounds for preferring one set of reconstructions over another have never been argued in an explicit and systematic way. Most researchers in this field have been satisfied with using either the continuant or stop reconstructions without commenting at all on the validity of their choice. For instance Tucker 1929), Tucker and Ashton (1942) and Baucom (1974, 1975) use Meinhof's continuant reconstructions; and Meeussen (1955), Coupez (1954), de Rop (1958), Jacobs (1965-66), and others use stop reconstructions without even mentioning the problem. Meinhof himself, in the 1932 English edition of his (1910 (1899) important work on Bantu historical phonology, does not even mention the problem.

More recently, the stop versus continuant problem has been discussed or commented on by Nurse (1979b), Hinnebusch (1973), Mould (1977) and Hinnebusch et. al. (1981), who think that continuant reconstructions are the proper ones. The arguments given are: continuants occur more frequently in Eastern Bantu languages, and the Meinhof solution is more economical than the Guthrie one. Also, Mould (1977), discussing Dahl's Law and other sound shifts in the phonological history of Luyia, constructs a complicated argument to the effect that these changes can be explained if, and only if, continuants are posited and a diachronic conspiracy to preserve the redundancy of [voice] assumed.

However, in the brief and superficial discussions and commentaries which are given this problem by these workers, the methodological principles and their implications are barely touched upon. Thus Hinnebusch's observation that the. "...question of continuants versus stops has not been fully argued in the literature" (1973:8) still holds.

This paper deals with the 'stops versus continuants' problem in Bantu reconstruction. Arguments that have been used in support of each side will be considered against the background of some assumptions concerning the well-formedness of reconstructions, how sounds change, the strength hierarchies of segments, etc. A number of solid considerations lead to the conclusion that stop reconstructions result in more plausible and economical derivations than continuant ones.

The paper discusses three reconstruction principles: the methodological principle of frequency of occurrence, Meinhof's principle of analogical symmetry, and the princi-

ple of simplicity. Considerations from the theory of strength and lenition hierarchies are also brought to bear upon the issue, and a critique of Mould's "conspiracy" argument is presented.

The Principle of Frequency of Occurrence

Sometimes known as the "majority vote principle" (Zwicky 1973:408) it states that, other things being equal, "....if the majority of the daughter languages agree in having a certain feature, then that feature is to be attributed to the proto-language" (Zwicky, op. cit.). In internal reconstruction it is the more frequent alternant that is presumably attributed to the pre-language. The problem here, as we will see later, is that other things may not be equal in some cases.

Frequency of occurrence is undoubtedly the most important principle used by proponents of continuant proto-segments. The argument based on this principle goes back to Meinhof (1929, 1932) who reconstructs *p, *t, *k, *B, *l due to the apparent fact that they occurred more frequently than other sounds which correspond to them in the languages he investigated. This position has been supported by Mould (1977:389) and Hinnebusch et. al, (1981:16).

Problems with the argument

As far as Bantu is concerned, the argument based on frequency of occurrence has two problems. In the first place, the claim that the continuants B, l, G are more frequent than stops b, d, g is apparently not wholly supported by the facts. According to Guthrie (1967, Vol. 1:62), the distributions of the bilabial voiced stop (plain voiced and implosive/glottalic) and the continuant are very similar (See also Guthrie's Topogram 6:71). Also, the velar voiced stop (plain voiced and implosive/glottalic) is distributed over a larger area than the corresponding continuant (op. cit., p. 62; see also Topogram 10, p. 75).

The only continuant that can be said to be more frequently attested than the corresponding stop in Bantu is l (op. cit., p. 62; see also Topogram 8, p. 73). Here, d has a clearly restricted distribution. The general situation has been stated thus: "...the reflect of *nd usually contains d, while that of jd does so in languages as far apart as Ganda E.15, Ngazidya G.44a, Nyanja N.31 and Venda S.21. In addition many languages have di as the reflect of *di" (opp. cit., p. 62). If these distribution statements are correct, then the "majority vote" principle would not automatically rule out b or g as proto-segments. Only *d would need some justification on other than this principle.

The second problem with the argument based on the "majority vote principle" as it has been applied to Bantu by proponents of the continuant solution is that it has been used without regard to other constraints on the well-formedness of reconstructions. These constraints or principles include simplicity, and phonetic and typological plausibility. The simplicity criterion requires that a description be as concise and utilize as few constructs as possible while the criterion of phonetic plausibility requires that the sound changes or rules posited should reflect what is physiologically probable. On the other hand, typological plausibility requires that well-formed reconstructions reflect the structural types, rule types and sound shifts that are in the daughters, and also agree in important ways with the types that are usually found in languages around the world (cf. Lass 1978:272).

Consequences of phonetic change in relation to frequency of occurrence

Why should the principle of frequency of occurrence not be given precedence without exploring the other possibilities? The reason is simple and commonplace to every linquist who has worked with phonological evolution: it has to do with the consequences

of long-term phonetic change. Given the necessary consequences of long-term phonetic change, the original or input segment might come to represent the minority vote. This can be exemplified, first, from languages with written traditions: Spanish and Greek. Ferguson (1978) reports two interesting cases of the historical spirantization of *d in Spanish and Greek. In both languages, *d changed to the labio-dental continuat D except mainly postnasally. In Spanish, the continuant is "...a little more than twice as frequent as the phone [d] in text occurrence..." (p. 410), while in Greek, the "frequency of /D/ is close to three times that of /d/" (p. 414).

Another example may be taken from Rimi, a Bantu language. All Bantuists are agreed that the proto-voiceless stops are: *p, *t, *k . Rimi has the alternations: p/f, t/ʃ, and kx/x (Note that the facts are more complex in the case of the reflexes of *k, cf. Olson 1964; Kahigi 1988: 132ff). Diachronically, *p>f, *t>ʃ; *k>kx>x. Synchronically, the distribution of stops is very restricted: in the case of p and t, they only occur postnasally; k occurs mainly before j, i, and ɥ. (kx occurs postnasally). The continuants are overwhelmingly more frequent. Here again, what is taken to be uncontroversially "original" has been overtaken by the historically derived segment in terms of frequency of occurrence.

It is clear that the Spanish, Greek and Rimi examples speak for themselves. Frequency of occurrence cannot always stand as proof of the direction of a change, i.e the most frequent is not necessarily the 'original' segment. In some cases the less frequent alternant or segment in a correspondence set may represent the original segment, if all other things are equal.

The Principle of 'Analogical' Symmetry

Meinhof refers to this principle as 'analogy'. The principle may be defined as follows. If the majority of the segments (or features) in a series (e.g. stops) are reconstructed on solid evidence, the remaining segment (or feature) may be posited on analogy with the others even if there is no sufficient evidence to support such a reconstruction. It should be noted here that the synchronic counterpart of this principle, known as "pattern congruity" in structuralist literature, has been criticized (cf. Hyman 1975:94).

This principle was used by Meinhof to reconstruct *G. He reconstructed this segment 'hypothetically', i.e. it was not present in the data he was using; he did so on 'analogy' with the continuants *B, *1, which he had reconstructed on the basis of the "majority vote" principle. One methodological objection here is that Meinhof does not say why he uses 'analogical symmetry' rather than 'frequency of occurrence' in the reconstruction of the voiced velar. When one adopts a new method the least one should do is say why. This was in fact necessary in the case of Meinhof since if he had used the 'frequency of occurrence' principle he would have ended up with the voiced velar stop instead of the continuant. This is because the former is more frequent than the latter in the languages listed on his map (facing p. 248). (Meinhof's map includes many of Guthrie's zone D, E, F, G, N, and P languages which have the voiced velar stop — cf. Guthrie, Vol. 1967:75, Topogram 10).

In objecting to Meinhof's use of analogical symmetry we are not claiming that symmetry should never be used in reconstruction. After all, symmetry is a common characteristic of linguistic systems (cf. King 1969:62, 191-9), although it is also not uncommon to find asymmetries in languages. However, methodological decisions in reconstruction, as elsewhere in the social sciences, should be based on data, and should always be justified in a principled way. Undoubtedly, Meinhof's approach leaves a lot to be desired.

The Principle of Simplicity

The importance of simplicity or economy in description was stated by Halle:

> Given two alternative descriptions of a particular body of data, the description con-

taining fewer.....symbols will be regarded as simpler and will, therefore, be preferred over the others" (1962:55).

In diachronic description, it is a measure of alternative solutions in terms of the number and complexity of the proto-segments, diachronic rules and mechanisms of change posited. It should however be noted that simplicity is meaningful only when applied with due regard to considerations such as phonetic and typological plausibility. That is, the segments, rules, and the mechanisms posited should be based on a reconstruction — projection and mapping — methodology guided by the simplicity criterion and plausibility considerations. In this view, the simpler solution should also be the more plausible, phonetically and typologically.

The issue of simplicity in Bantu diachronic description has been broached by Hinnebusch (1973:8-9), who claims that the continuants reconstructed by Meinhof have an advantage over Guthrie's stop reconstruction as far as the Kenyan Coastal languages are concenred since

> the type sof changes that have occurred historically in the Kenyan Coastal languages are more easily predicted in terms of Meinhof's reconstructions than Guthrie's, in that an extra step would be required, using Guthrie's forms, in getting from the deep forms to the surface forms (p. 8).

Hinnebusch gives as an example the following mapping to support his claim':

(1) Meinhof's reconstruction: *B>w>ø

Guthrie's reconstruction: *b>B>w>ø

Here Meinhof's reconstruction appears simpler since it has fewer steps. However, it is easy to see that these mappings, in isolation from related mappings and other parts of the 'historical grammars' of the languages in question can not prove the claim of relative simplicity. In order to demonstrate that a solution is simpler than another, the competing solutions have to be assessed in terms of the 'whole grammar' vis-a-vis the constrains of phonetic and typological plausibility. For as King (1969:193) states: "...simplicity...is a systematic measure applied in principle to grammars and not to individual rules".

In discussing the relative simplicity of Meinhof's (continuant) and Guthrie's (stop) solutions it is necessary to know what mechanisms and rules each one would need to account for the relevant data. But first, we should identify, in a general way, the type of relevant data which each solution is supposed to account for. Both solutions are faced, inter alia, with the problem of explaining how and why the following occurred:

(2)

Meinhof	Guthrie
(i) voiced occlusives and affricates	(i) voiced continuants and affricates
(ii) further weakening of continuants	(ii) loss of segments
(iii) strengthening of the Kongo type Kongo type *G>k	(iii) devoicing, e.g. Kongo *g>k ('a type of strengthening'),
(iv) implosion, e.g. *ɓ>ɠ	(iv) implosion, e.g. *g>ɠ

With the exception of cases of weakening and loss (which appear to be 'natural'), it can be said that the Meinhof solution relies heavily on the mechanism of strengthening, and may be referred to as the strengthening solution. As formulated by Meinhof (1932:31), this solution proceeds on the assumption of the 'half-plosivity' of the posited continuants and their 'inherent tendency to become plosive'. There is context-sensitive and context-free strengthening: the former takes place before the close vowels i and u, after i, and postnasally; the latter occurs in cases of e.g. implosion as in the Kongo case noted above. Examples of strengthening before/after the high close vowels are : Before i: *G>Sotho di (dental d); *l>dzi (Nyamezi, Shona); before u: *l>Sotho du (retroflex

d); *Gy, *ly>Venda bvu (Meinhof, 26-7). After j: *-GjB>Swahili -ib- 'steal' (with loss of *G) (Meinhof, 121). Postnasally, *NB>Nb, NI>Nd, *NG>Ng. In addition, Meinhof posits another mechanism, analogy. This mechanism is supposed to account for certain occurrences of voiced stops, e.g. *-Gongo>-gongo 'back of body' (Sumbwa, Sukuma Nywamwezi). The *G>g change here was supposed to have occurred in analogy with the postnasal stop. In sum, Meinhof's continuant reconstructions give rise to the following mapping rules:

(3) (i) *B>b, G, bv, B, w, v, ∅
(ii) *l>d, ɗ, dz, dž, bv, l ... v, z, ∅
(iii) *G> g, G, ɠ, bv, dz, k, ...v. z, ∅

As noted above, in this solution, the stop and affricate reflexes result from strengthening, while the rest of the reflexes are either retentions or results of different types of sound changes.

In contrast to Meinhof, Guthrie's solution heavily relies on the mechanicsm of weakening, and may be referred to as the weakening solution. To account for the occurrence of continuants and affricates or loss Guthrie (1967:55-80; 1971:30-64) posits weakening rules of the type: *b>w, *b>v, *d>∅, *d>l, *d>dz, *g>y, *g>∅, etc. Some of the rules posited by Guthrie can be summarized as the following lenition chainshifts:

(4) (i) (a) *b > B>w>∅ (b) * b>bv>v
(ii) (a) *d>dz>z (b) *d>l>y>∅
(iii) (a) *g>G>∅ (b) *g>gy>dz>z

The output of each shift can be found in some Bantu languages(s), and can be regarded as a stage in the phonological development of Bantu. In this view, different languages in Bantu can be seen as reflecting varying time depths. Examples of some of the data that led to the position of *b, *d, *g are:

5(a) C.S. 5a *-babud- 'singe' v.t. Bobangi *-babol-*, Lega —*babul-*, Nyankore —*BaBul-*, Ganda *-babul-*, Sumbwa —*BaBul-*, Luchazi —*Baul-*, Luba-Kasai *-babul-*, Luba-Katanga —*babul-*, Bemba —*BaBul-*, MaNanja *-waul-*, Herero —*Baur-*, Zulu —*ɓaɓul-* (Guthrie Vol. 3, p. 18, except Sumbwa example, which is from Kahigi 1988).
(b) C.S. 591 *-dį "root' Ombo *-bo-li*, Rundi *umu-dzi*, Ganda *omu-zi*, Kikuyu *mo-ri*, Kamba *mo-į*, Sukuma *(n) dži*,[2] Hungu *mu-ži*, Mbunda *mu-Di*, Kwanyama *omu-di*.
(c) C.S. 771 *-gambo 'affair' Tetela *di-kambo*, Rundi *i-dzambo*, Nyoro *eki-gambo*, Tongwe *e-Gambo*, Sumbwa *i-gambo*, Swahili (Unguja) *ki'gambo*, Luchezi *ts-ambo*, Luba-Kasai *di-ambu*, Kahonde *c-ambo*, Ila *k-ambo*, Matengo *li-gambo* (Guthrie Vol. 3, p. 205, except Sumbwa example which is from Kahigi 1988).

Examples in 5(a) illustrate some of the reflexes of *b, 5(b) those of *d, and 5(c) those of *g. In 5(a) C.S. 5a has the following correspondences; b/B/w/ɓ root-initially, and b/B/∅/ɓ root-medially. In Guthrie's view, *b. is the most probable proto-segment not only because it occurs in many Bantu languages, but also because shifts like *b>B>w>∅ are more probable than B>b. Frequency of occurrence and the probable direction of sound shifting[3] also motivate the positing of *g in 5(c) (C.S. 771). Here the correspondence are: k/dz/g/ɠ/G/∅. g occurs more freguently than G (in this and other comparative series) and also the direction of the shifts- *g>G>∅ (weakening) and *g>dž (palatalization -a weakening process) is more probable than the Meinhof alternative.

Now, turning to *d in 5(b) the correspondences here are: l/dž/r/ž/∅/dz/z/d/D (C.S. 591). Arguments to reconstruct *d instead of a liquid are:

(a) d (and relevant environment) can account for affricates dž, dz, spirants D, ž, z and the liquids l, r, in the most economical and phonetically plausible way[4].
(b) The widespread occurence of d postnasally, which, as will be shown in section 3.4. is generally a position of retention in Bantu. The retention of d corresponds with the retention of b and g in this position; these, in turn, parallel the widespread postnasal retention of *p, *t, and *k[5].

(c) The parallelism between *d>l, r.. and *t>l, r... in Bantu. All Bantuists who have dealt with phonological reconstruction have at least reconstructed *t>l, r... This sonorantization of *t, though not as widespread and far-reaching as that of *d, occurs in 10 of the 15 Bantu zones set up by Guthrie (cf. Vol. 2; 30-64).6 It is no doubt an important shift in Bantu. What is interesting about the parallelism of *t>l, r and *d>l, r is that the former implies the latter. That is, if a language has shifted *t to l or r, it will also have shifted *d to l or r etc. This implicational relationship suggests that the shift involving *d antedated that of *t7

In addition to lenition shifts, Guthrie posits devoicing (which is a 'strengthening' -cf. section 3.0) to take care of cases such as those affecting his *g in some languages (eg. Tetela in 5(b) above), i.e. *g>k. (For more examples see Guthrie 1970, Vol. 3).

Guthrie also posits rules of implosion, i.e. *b>ɓ, *d>ɗ, *g>ɠ, which take care of developments in Swahili and other Bantu languages.8

Now given these considerations, which solution or analysis is simpler? For our purposes, the following should be noted.

First, Meinhof's notion of the 'half-plosivity' of continuants and their 'inherent tendency to become plosive' (1932 p. 31) is highly questionable. It is evidently posited so as to trigger some strengthenings. Thus, *G changes into ?g in Kinga due to its "....tendency to become plosive" (p. 31). However, all that is known about sounds and their dynamic tendencies does not support the idea of a continuant or non-continuant having an "inherent tendency" to become some other sound. Sounds have been noted to change due to structural, physiological, psychological, language-aquisitional, and contact factors. A sound does not, in and of itself, have any tendency to become some other sound; the activating factor of a sound change has to come from somewhere else.

In addition to this problematic aspect of Meinhof's solution, there is the issue of the satus of strengthening as a mechanism of sound change. Strengthening, according to Meinhof, occurs before i̯ and u̯ after i̯, postnasally, and in other environments. It should, however, be noted that strengthening before and after high close vowels is difficult to defend, in view of known history and other Bantu-internal facts. Known history tells us that the environment of high vowels (especially i̯) is generally, a weakening environment. Taking i as an example, this is, universally, a palatalizing environment (Foley 1977:90-106). Palatalization is commonly followed by assibilation. These two processes are the usual historical sources of dy, dʒ, dz, ʒ, z; ty, tʃ, ts, ʃ, s, etc. Bantu-internal evidence also supports this position. According to Meinhof (1932:26ff), Guthrie (1971, Vol. 2:30-64), and others, there occurred, in Bantu prehistory, widespread weakenings before i̯ and u̯ in the voiceless stop series. These weakenings gave rise to a lot of palatal sounds and spirants. In some cases, however, this environment has not caused any palatalization or assibilation, e.g. in Makua, *pi̯phi, *pu̯phu (Meinhof, p. 27). These few facts about the diachronic evolution of the voiceless stop series point to the fact that weakening (or no change), not strengthening, is the solution that makes more phonetic and typological sense in the environment in question. This, in turn, points to the validity of Guthrie's stop reconstructions. In Guthrie's view, weakening may or may not occur in the environment before i̯ and u̯ or after i̯. This, however, does not mean that strengthening does not occur in this environment. What it means is that, if it occurs at all, it should somehow be the exception, not the general rule.

A related consideration concerns Meinhof's 'analogy' part of his solution. In this case, the posited continuants become stops on 'analogy' with postnasal stops. Thus, in Swahili *G>g "by analogy with it change after a nasal, viz. n + G>ng" (p. 31). What Meinhof means by 'analogy' here is vague, but his move to resort to this 'mechanism' in this case is quite understandable: after all, he has to account for such cases of non-

postnasal 'strengthening'. The move is necessitated by the very analysis he adopts. But analogy (whether phonetic or morphological) operates on the basis of the sameness/similarity of the relevant elements and environments. The cases supposed by Meinhof to have been affected by analogy lack the necessary condition on which this mechanism is based: the sameness/similarity of environments. Guthrie's approach is of course simpler and more plausible: to him this is simply a case of retention. Retentions of this sort are widespread all over the Bantu area (c.f Guthrie's vol. 3).

Although this discussion does not exhaust the problem of simplicity in Bantu projection and mapping, it has shown that Meinhof's solution is very problematic since it gives rise to mappings which are not in line with phonetic and typological plausibility. Guthrie's solution, however, makes sense phonetically and typologically, and is, on the evidence, simpler.

Weakening and Strengthening of Segments

It was noted in the foregoing that Guthrie used the principles of the probable direction of sound shifts and frequency of occurrence to posit PB stops, both voiceless and voiced, from which the current reflexes are derived. His solution has been referred to as the 'weakening' solution, represented by the chainshifts below:

(6) (i) (a) *b>B>(v)>w>∅ (b) b>bv>w
(ii) (a) * d>dž>z (b) d>l>(y)>∅
(iii) (a) *g>G>y (b) *g>gy>dž>z

As is evident in these chainshifts, the shifting is in the direction of the wedges. On the other hand, Meinhof's continuant reconstructions result in rules which have a reverse direction to some of Guthrie's rules, e.g. *B>b, *l>d, *G>g etc. This type of solution has been referred to as the 'strengthening' solution.

Strength hierarchies

Strengthening and weakening have been defined within the theory of strength hierarchies (cf. Zwicky 1972; Lass and Anderson 1975; 148-187; Hooper 1976:195-242; Foley 1977, and Lass 1984:177-183). Briefly, this is a theory according to which segments, environments of the word (initial, medial, final), and positional classes (labial, alveolar, palatal, velar) are characterized in terms of relative strength in relation to synchronic and diachronic processes in language. For our purposes here, we shall concern ourselves with segmental and environmental hierarchies; we shall not deal with positional hierarchies.

Some relations holding among segments are schematized as follows:

(7) (i) zero>vowel>glide>liquid>nasal>fricative>{aspirate / affricate}>stop

(ii) voiced obstruent>voiceless obstruent

(iii) S>SS or S_iS_j (where S = Segment; SS = geminate, and Si Sj = cluster)

In these schemata, the direction of the wedges shows increasing strength. In (i), stops are the strongest segments, and vowels the weakest. Here it should be noted that the notion 'strength' is associated with the phonetic parameters of openness and sonority. The most open and sonorant segments, (i.e. vowels) are the weakest, while the least open and sonorant (i.e. voiceless stops) are the strongest (cf. Lass and Anderson 1975:151; Hopper 1976:198). In (ii) voiceless obstruents (e.g. t, ts, s) are stronger than voiced ones (e.g. d, dz,z). In (iii), a geminae (SS) or a cluster (Si Sj) is stronger than a single segment. Thus, in terms of strength, a voiceless geminate stop is stronger than its single-segment counterpart, which in turn is stronger than its voiced counterpart, and so on. Now, if a segment's rank changes in the direction of the wedges, the process is called

strengthening; if its rank changes in the reverse direction, it is a weakening. These are key notions in the theory of strength hierarchies. An important task of the theory is to specify the contexts in which these processes take place.

Segments commonly weaken or strengthen in specific environments. Such environments have been referred to as weak and strong environments, respectively, and will be considered from two angles: the environments of the word, i.e. initial, intervocalic, and final, and other specific phonological environments, e.g. the pre-C or post-C environment.

Initial, intervocalic and final environments

Word-initial environments are assumed to be strong. This assumption is supported by the universal fact that all contrasts of consonants in a language may occur initially, while contrasts in the final position are fewer and tend to be neutralized (cf. Hooper 1976:200). Furthermore, apparent strengthenings have been observed to occur in this environment, e.g. Sp(anish) huevo 'egg' has two pronunciations: [weBo]~[gwebo]; huerto 'garden' is pronounced as [werto] or [gwerto]; L(atin) vita [wita] 'life' Sp. vida [biDa]; Sp. Vivo [biBo] 'alive'.

The intervocalic position is the preferred one for weakening. It is a weak environment; here, consonants take on some of the qualities of the surrounding vowels — for example voicing and continuancy. In their development from Latin, Spanish and French segments have undergone weakening in specific intervocalic environments:

Latin	Spanish	French	
agua	agua [aGua]	eau [o]	'water'
amica [amikə]	amiga [amiGa]	ami	'friend'
legere	leer	lire [li:r]	'read'
credere	creer	croire [krwa:r]	'believe'

In these examples, the 'input' intervocalic stops are: *g, *k, and *d. The diachronic (weakening) rules are: *g>G (Spanish), *k>g>G (Spanish), *g>G>Ø (Spanish and French), and *d>D>Ø (Spanish and French).

The word-final environment is regarded as the weakest since loss, the logical conclusion of weakening, has been observed to occur here (in closed syllables) before occurring in the other environments. The reason for the weakness of the word-final environment is that final segments are more often pronounced weakly. The weakening of consonants in this environment typically proceeds by devoicing, then glottalization, which gives way to total loss eventually. Examples: weakening and loss of final *p, *t, *k in French, Maori, and Chinese; also, in many dialects of English, final voiceless occlusives, especially t and k, are being replaed by a glottal stop, which is just one step from total loss (cf. Aitchison 1981: 32-33).

Therefore, hierarchically, word-initial positions are strong, intervocalic ones weak, and final ones the weakest.

The concept of 'protection'

We now turn to the consideration of strong and weak environments as they relate to the concept of 'protection'. One key assumption in the theory of strength hierarchies is that when strengthening occurs, strong segments are affected first "and most extensively and preferentially in strong environments," while weakening occurs to weak segments first "and most extensively and preferentially in weak environments" (Foley 1977:107). We have already noted that the intervocalic and the final positions in a word are weak. The initial environment is strong. Additional environments which have been observed to behave as strong ones are pre-C, post-C, and after a stressed vowel (cf. Anttila 1972:66; Meinhof 1932:29, 59; Foley 1977:91). One characteristic of strong environments is that they tend to resist weakenings which commonly occur in weak environments.

In other words, they tend to 'protect' the relevant segments from phonetic attrition for as long as possible. For example, consider the evolution of Proto-Indo-European voiceless stops which spirantized in all environments except when they occurred in a post-C environment, e.g. Latin *captivus* 'captive'; Old High German *spiwan* 'spit'; Gothic *fisks* 'fish' (Anttila 1972:66) The only probable reason why there was no change in this environment is that the segments were protected from weakening by the first consonant in the cluster. An additional example of a protective environment is the Bantu postnasal environment. This can be said to have protected segments from weakening or further weakening. Examples have already been given of diachronic shifts which have occurred in Rimi, a sister of Sumbwa. In Rimi, * p and *t have weakened intervocalically, including the initial position, but not postnasally. Examples are: ɸeɸo/mpeɸo 'cold, wind' (PB *-pepo), -ɟik-/mpiko 'arrive/arrival' (PB *-pik-). Additional examples are from Haya (E. 22; from research notes) and Kongo (cf. Meinhof 1932:158-9); in this case, Proto-Bantu*p lenited to h in Haya and B in Kongo, except in the postnasal environment. Haya examples:-h- 'give', (mpa) 'give me' (PB *-pa-); —hulil- 'hear', (mpulile) 'that I may hear' (PB *pudid-); Kongo examples: -Ban- 'give', (mpeni) 'I have given' (PB *-pa-), -Bol- 'be cold,' and (mpolo), 'cooling' (PB *-pod-).

It is important to note that weak and strong environments only constitute "preferred" environments for the respective processes (Lass and Anderson 1975:159ff; Foley 1977:107ff). Segments need not weaken or change at all in a weak environment, nor need they strengthen in a strong environment. In other words, weak and strong environments do not constitute the necessary and sufficient conditions for the respective processes.

The theory of strength hierarchies and Bantu reconstruction

Having clarified some aspects of strength hierarchies, we will now related the theory to Bantu reconstructions.

One way to find out which environments are relatively strong or weak in language or group of languages is to consider reconstructed history with a view to pinpointing the weakenings, retentions or strengthening. In Bantu, this can be done by considering the diachronic shifts of some proto-segments on which all Bantuists are agreed upon, i.e., *p, *t, *k, which, according to the theory of strength hierarchies, are strong segments. In Proto-Bantu they were the strongest, regardless of whether one adopts Meinhof's or Guthrie's reconstructions. Given their relative strength, massive weakenings affecting them in many languages would be highly diagnostic of the weakness of the environments involved. Thus a weak environment would be one which, on the basis of internal and comparative evidence, could be shown to have induced extensive weakenings of *p, *t, and *k in many Bantu languages. A strong environment would be one which could be shown to have either induced strengthenings or protected segments from phonetic attrition. After identifying the weak and strong environments for the voiceless stops, we shall apply this consideration to the issue of Meinhof's and Guthrie's reconstructions.

First, however, a few facts about Bantu should be clarified. In general, Bantu languages tend to favor open syllables, and consequently Proto-Bantu has been reconstructed thus. This means that, for the data we are dealing with, there are only two consonant environments in the word: the initial and the intervocalic. The former is represented by Guthrie as C_1 and the latter as C_2. Although the distinction between these two environments may be regarded as unimportant in very many languages due to the openness of their syllables, we shall, for our purposes, maintain it. Another relevant fact to note here is that, apart from NC clusters, there were no other structural CC sequences in Proto-Bantu.

The reflexes of *p, *t, *k in relations to weak and strong environments

The reconstructed histories of these segments indicate that they have weakened in various environments. For example, two of the five languages used in Meinhof (1932) (Pedi and Kongo) show weakening of voiceless stops in C_1 and C_2 positions, while all of them show weakening before high close vowels. Some examples are given below:

Pedi (pp. 58-81): weakening in C1 and C2, and also before high close vowels. *p>ɬ: -ɬa (<PB *-pa) 'give', -ɬiɬ- (<PB *-pic-) 'hide' (ɬ = voiceless lateral fricative); *t>r: -raro (<PB *-tatu) 'three', —phiri (<PB *-pɨtɨ) 'hyena'; k>x: -xam- (<PB *-kam-) 'milk', -xura (<PB *-kʊta); *k>s: mosi (PB *-okɨ) 'smoke', mo-siɬa (<PB -kipa) 'sinew.

Zulu (pp. 82-110): weakening before high close vowels. Before *ɨ: *p>f:u-bufifi (<PB *-pɨpɨ) 'darkness', —fig- (<PB *-pɨk-) 'arrive'; *t>s: -p'isi (PB *-pɨtɨ) 'hyena', ubu-siga (PB *-tika) 'winter'; *k>s: umu-si (PB *-okɨ) 'smoke'; before *ʊ: *p, *t, *k>f: -fu (PB *-pʊ 'stomach') 'stomach of cattle', -fund- (PB *-tʊnd- 'teach') 'learn', -fuy- (PB *tʊg-) 'own cattle'; fuba (PB *-kʊba) 'chest', -safun (PB *takʊn') 'chewed'.

Swahili (pp. 111-33): weakening before high close vowels. Before *ɨ: *p>f: -fik- (<PB *-pɨk-) 'arrive', -fic- (PB —pic-) 'hide'; —t>s: -fisi (PB *-pɨtɨ) 'hyena', -sima (PB *-tima); *k s: mosi(PB *-okɨ) 'smoke', -siba (PB *-kipa) 'vein'. Before *u: *p, *t, *k>f: -fanan- (PB -pʊan—) 'resembe', -fug (PB *tʊg-) 'keep domestic animals', -fum- (PB *-tʊm-, 'sew'; -futa (PB *-kʊta) 'fat, oil', -tafun- (PB *takʊn-) 'chewed'.

Konde (pp. 134-54): weakening before *ɨ: *p>f: -fis- (<PB *-pic-) -hide', -fik- (<PB *pɨk-) 'arrive'; *t>s: -siku (PB *-tiku) 'night', *k>s: ily-osi (PB *-okɨ); before *ʊ, *p, *t, *k>f: -fum- (PB *pʊm-) 'come from', -fund- (PB *-tʊnd-) 'instruct,' —futha (PB *-kʊta) 'oil'.

Kongo (pp. 155-75). Weakening of C_1 and C_2: *p>B: -Ban- (<PB *-pa) 'give'. Before *ɨ: *p>f: —fik- (PB *-pic-) 'hide'; *t>s: —sima (PB *-tima) 'pool'; *k>s: mw-isi (<PB *-okɨ) 'smoke'. Before *ʊ: *p, *t, *k>f: -fukul- (PB *pʊkul-) 'dig out', -fuku (PB *tʊku) 'night', -futa (<PB *-kʊta) 'fat'.

In addition, Guthrie's Vol. 2 (1971:30-64) displays sound shifts including numerous weakenings of *p, *t, *k in C_1 (initial) and C_2 (intervocalic) environments, and before high close vowels *ɨ, and *ʊ. Other Bantuists have posited these same weakenings (cf. Meeussen 1955; Jacobs 1965-6; etc;). What all these data seem to indicate is the weakness of the three environments: C_1, C_2, and before the high close vowels *ɨ and *ʊ, although the relative strength of each seems to differ from language to language, e.g. while all three seem to have induced weakenings in Pedi, only the high close vowels appear to have caused extensive weakenings in Zulu or Swahili). Moreover, the C_1 (initial) environment seems to be stronger than the C_2 (intervocalic) environment in some languages, as the following examples show. In Ngazidya (G. 44a), *-piko>piho/ma-biho 'wing/s, *-paka >paha/ma-baha 'cat/s', *-koko>koho/ma-hoho' 'crust/s, and in Nzwani (G. 44b), *-pi>pi/ma-vi 'palm/s of hand/s', *-topɛt^{r}ove/ma-rove 'earth', *-kojo>kozo/hozo 'urine'. In these examples, *p weakens intervocalically to B in Ngazidya and to v in Nzwani, *k weakens to h. In Nzwani, *t weakens to r intervocalically, but only to t^{r} initially. The distribution of the initial and medial variants indicates that the medial position has historically induced weakening more readily; the occurrence of stronger variants initially indicates that the initial position is more resistant to weakening. (For a more reliable statement, a deeper investigation of the internal and comparative evidence needs to be carried out — a task beyond

the scope of this study.)

Another important environment to be considered here for our purposes is the postnasal environment. As noted earlier, this position seems to be very strong in that it is an environment of retention in very many languages. Rimi, Haya and Kongo examples were given above in which Proto-Bantu *p is assumed to have changed to ɸ, h and B, respectively, except in the postnasal environment. Additional examples of languages which show weakening of *p and retention after N are: E.13 Nyankore and Chiga, E.15 Ganda, E.21 Nyambo, D. 62 Rundi, D. 66 Ha, F. 32 Rimi, G. 23 Shambala, and many other Bantu languages. *p is of course not the only stop that weakens in non-postnasal environments while being retained postnasally in very many languages, *t, *k, and other stop reconstructions behave in a similar manner (cf. Guthrie 1971, 30-64. Nurse 1975; Meeussen 1955, and others).

To say that the postnasal environment is relatively strong does not, of course, mean that change does not occur in this environment. For instance, in Dawida (E.74a) and Shaghala (E. 74b), *p>ɸ,f, s, in various environments and *Np>Nb (Shaghala and Dawaida) (cf. Slavikova 1975:36, 53). Here the postnasal *p gets voiced (i.e. weakens one step), but the environment itself is still stronger in relation to other environments. Other changes in the postnasal environment include the so-called Meinhof rule by which *Nb, *Nd, *Ng>NN, i.e. the stop acquires the nasalization of the adjacent nasal, if the following syllable consists of nasal + voiced stop. This has applied in Sukuma, Ganda, and other Bantu language (Meinhof 1932:183-4). Other weakenings affecting stops in the postnasal environment are: *Np, *Nt, *Nk>Nh in Nyamwezi and Sukuma; affrication in Pedi, e.g. *Nk>Nkx^{h}; aspiration, deocclusivization, and voicing in some Southern Bantu languages, e.g. Tswa *mp>mph>mh.

From the above evidence and considerations, the following inferences are in order:

1. The preferred process intervocalically and before high close vowels is weakening. The initial environment behaves like the intervocalic in very many languages (probably due to the open-syllable character of Bantu languages), although in some languages, e.g. Ngazidya, it appears to be stronger than the intervocalic.

2. The postnasal environment is relatively strong. Here, segments get retained which weaken in other environments (cf. Haya and Kongo examples above). However, as noted above, postnasal segments are not immune to sound change.

Some implications for reconstruction of the voiced series

Recall that the reconstructions in dispute are voiced stops and continuants. Note further that these segments are weaker than the uncontroversial voiceless stops considerd above from the point of view of weakening and strengthening. Now, if. "....weaker elements weaken first and most extensively and preferentially in weak environments" as is assumed in the theory of strength hierarchies (cf. Foley 1977:107), then the following further inferences are in order:

1. If stronger segments (in this case the Proto-Bantu voiceless stops) weaken in an environment, weaker segments should also weaken in this environment. That is, in principle, such an environment cannot be a weakening one for strong elements, and a strengthening one for weaker elements. This is in accord with what is known about the weakening of segments in general.

2. Since the postnasal environment is a strong one for stronger segments, it snould also be a strong one for weaker segments.

These typological statements may be used in the attempt to make a decision as to which solution is the proper one, Meinhof's or Guthrie's. Apart from stating weak and strong environments, they also state the direction of change in these environments. A proper solution would be one which would be in line with these typological statements (if all other things are equal, of course). In what follows, Meinhof's and Guthrie's solutions will be considered in the light of these inferences of weakenings and retentions in Bantu prehistory.

First, in Meinhof's solution, voiced continuants are posited and then mapped on to the various reflexes in modern Bantu languages, including voiced stops and affricates. Strengthenings occur postnasally, before *j, *ɣ, after *j, stem-initially and intervocalically. However, some initial strengthenings e.g. *Gongo > -gongo back of body' (in Sumbwa, Nyamwezi, Swahili, etc.) are supposed to be explained by what Meinhof calls 'analogy'.

The following rules summarize these changes:

1. [+ cnt] > [-cnt] / { n— ; j ; —ɣ }
2. [+ cnt] > [−cnt ; + implosion]
3. [+ cnt] > [-cnt] / —VNCV

Now, postnasal strengthening is, phonetically, a plausible process, since the conditioning environment is strong. But strengthening in the intervocalic environment and before *j and *ɣ, and after *j (and also stem-initially in many languages) seems to be unmotivated, typologically and phonetically, given inference (1) above and preceding considerations. Continuants, being weak consonants, are not expected to strengthen in weakening environments. If anything, they are expected to weaken further in such environments (cf. Foley 1977:107). In effect, Meinhof's solution has some unnatural consequences as far as the theory of weakening is concerned.

Guthrie, on the other hand, posits voiced stops *b, *d, and *g. As noted earlier, Guthrie takes into account two considerations: (1) frequency of occurrence, and (2) the probable direction of sound shifts. It is the second consideration, that of the principle of the direction of change, that makes Guthrie's solution agree with the conclusions based on the theory of strength hierarchies.

The typological perspective of strength hierarchies, then, favours Guthrie's voiced stop reconstructions rather than Meinhof's continuant reconstructions.

Mould's 'conspiracy' argument

Before concluding we need to address Mould's (1977) argument for reconstructing continuants for the voiced series, especially since Hinnebusch, Nurse and Mould (1981:16) refer to it as an additional argument why Meinhof's reconstructions are the proper ones.

Mould's aim is to adduce evidence to the effect that, firstly, the feature [voice] was redundant in PB; and secondly, there has been a 'diachronic conspiracy' which has functioned to preserve the redundancy of this feature in some Bantu languages. A conspiracy is a situation whereby two or more seemingly independent rules/changes appear to work towards a particular structural effect or target (Kisseberth 1970). An example is two Sumbwa rules, devocalization and vowel assimilation (cf. Kahigi 1988, chapter 3),

which may roughly be written as:

(13) V ⟶ (-syl)/---V (14) Vi + Vj ⟶ Vj
[+hi] [hi] [+long]

These rules may be said to 'conspire' against VV-sequences in phonetic representations in the language. This is, of course, a 'synchronic conspiracy'. In a diachronic conspiracy, an additional variable, that of time, is involved, and here the rules/changes are pressumed to work toward maintaining a specific situation, or as in Mould's case, the supposed redundancy of [voice]. Mould's evidence for the [voice] redundancy and the conspiracy "consists of motivating and explaining subsequent phonological changes in various Bantu languages" (p. 389).

Mould proceeds on the presupposition that three categories of phonological phenomena need to be explained as far as Bantu prehistory is concerned: assimilations, dissimilations, and chainshifts (similar to Grimm's Law). To him, assimilations pose no problem: "ease of articulation is motivation enough" ((p. 389). However, dissimilations (such as Dahl's Law) and chain shifts (such as ones that presumably occurred in Luyia) are more difficult to explain. In order to explain these changes, Mould (assuming Meinhof's reconstructions) proposes a redundancy of [voice] in PB and to consider the changes in question as constituting a "conspiracy to preserve the predictability of [voice]"(p. 389). According to Mould, the conspiracy was "most thoroughly carried out" in Luyia (p. 390).

Mould's evidence for the redundancy of [voice] in PB concerns Dahl's Law. This is a law (or rule) whose original formulation by Edmund Dahl was that the first of two voiceless aspirates in two neighbouring syllables dissimilated by losing the aspiration and getting voiced (cf. Meinhof 1932:181). Mould thinks ease of perception is "weak and insufficient" as an explanation of such a dissimilation; to him there is a much important factor:

> ...what is more important is what made Dalh's law possible, and that is that there were no voiced stops already present, and therefore there was a lot of phonological space encouraging free variation, which, together with the motivation for perceptual ease led to phonologization (p. 390).

Now, since Dalh's law is supposed (in Mould's view) to presuppose the absence of voiced stops in the system (that is, its basic motivation) it is easy to see why it would supposedly support the redundancy of [voice], thus endorsing Meinhof's reconstructions.

But Mould's 'explanation' of Dahl's law poses a problem which stems from, inter alia, the fact that his explanation depends on the supposition that the variation that gave rise to dissimilation depended on the absence of one of the members (the voiced member) from the phonemic inventory. Linguists and other students of language have known for a long time that variation is an immanent quality of language on all levels. As far as the sound level is concerned, it is known that articulatory, perceptual, and other factors (cf. Essen 1964, Jeffers 1974, Ohala 1974a, 1974b; Labov 1981, 1982) are responsible for the variation that occurs. In view of this, it is too strong a claim to say, as Mould does, that free variation in respect to a feature, in this case, [voice], presupposes the absence of contrast involving the feature. To be sure, the absence of distinctiveness of a feature, i.e. its redundancy, makes it available for variation, but so does the presence of distinctiveness of a feature. Unless there is independent evidence pointing to the absence of distinctiveness of a feature being the motivating factor of variation, it is safer to avoid such a supposition, especially in prehistoric reconstruction.

Moreover, Mould's supposition that Dahl's Law was possible due to the absence of voiced stops is contradicted by what is known about dissimilations in general. Considerations of known cases of dissimilation from Neogrammarian times to the present have consistently shown that dissimilations are "changes by phonemes," i.e. the dis-

similated segment becomes an instance of a different phoneme (Bloomfield 1933:390), and do not produce sounds that are not already in the phonemic inventory (Hoenigswald 1978:177-81). In other words, dissimilations constitute phonetic mergers (cf. Bennett 1967:137). On this point, one student of language categorically states: "*...la dissimilation ne crée pas phonemes nouveaux...*" (Grammont 1933:270; cf. also Vendryes 1925:62). All known dissimilations seem to have obeyed this principle. As Hoenigswald (1978:177) notes, such a generalization "must ...be taken as typological in nature and hence as subject to empirical confirmation..." The opposite claim, that dissimilations give rise to new phonemes, must also be supported by evidence, which, in the case of Bantu prehistory, may not be forthcoming.

The rest of Mould's evidence consists of shifts which he thinks support the conspiracy to preserve the redundancy of [voice]. These include: (1) the shift of * c to the alveolar area (afterwhich it spirantized) in response to the supposed phonemicization of *j (<*G); (2) the devoicing of *j in Gusii and most of Luyia dialects; (3) the spirantization of voiceless stops and the devoicing of voiced ones (Luyia Law), supposedly motivated by the need to level out a contrast that had begun to occur in the velar area (where, presumably, the reconstructed *G had already shifted to j, y, Ø, and g, thereby causing a contrast between k (<*k) and g (<*G); (4) postnasal neutralization of [voice], and (5) devoicing of strident fricatives, i.e. *v, *z>f, s.

Since Dahl's Law does not appear to support Mould's theory of redundancy of [voice] in PB, the hypothesis of a diachronic conspiracy going all the way back to PB seems to be baseless. Besides, the above shifts will have to be accounted for in terms of either the processes affecting Eastern Bantu, e.g. *c>s, spirantization of voiceless stops, etc., or those having to do with the diachronic phonology of Luyia (and neighbouring languages such as Kikuyu), e.g. postnasal neutralization of [voice] (cf. Guthrie 1971, Vol. 2:30-64). It should be noted that Bennett (1967) provides an account of Dahl's Law which takes into account the above shifts (for the Kikuyu group, Luyia and Gusii); the account is consistent with Guthrie's reconstructions. This account, very plausible and consistent with the simplicity criterion, cannot be passed over in silence in favor of an unmotivated and unprovable conspiracy.

Mould's conspiracy hypothesis could be considered from a different angle. As an "explanation", it is teleological. A teleological explanation differs from a causal one in that instead of the causal structure: "y because of x" it has the structure: "y in order that x" (Vincent 1978:409). For instance, in Mould's conspiracy, some changes supposedly occur in order to preserve the redundancy of [voice]. There are two types of teleology: functional and purposeful. A functional teleology refers to the function of an element in a system (Anderson 1973:789). As far as the phonologic system is concerned, the element may be a distinctive feature, a phoneme, or rule. As an example, consider the Sumbwa rule of devocalization referred to earlier, roughly stated as:

$$\begin{matrix} V \\ [+hi] \end{matrix} \rightarrow [-syl] / \begin{matrix} - V \\ [-hi] \end{matrix}$$

A functional teleological explanation of the addition of this rule to Pre-sumbwa phonology would take into account at least two things: first, the new relationship that will be introduced between the phonologic representations /u-V, i-V, o-V/ and their phonetic representations [wV, yV, wV]; second, the relationship of this rule to other rules in the system — for instance, the vowel assimilation rule, which, together with the rule in question, function to eliminate VV-sequences in the phonetic representations in the language.

A purposeful teleology refers to the intentionality and goal-directedness evident in the attainment of a target, or in our case, in the implementation of change (Vincent

1978:409-10, Andersen 1973:780-1, 789-90). An example of this is the adaptation of one's speech habits to new norms (cf. Labov's investigations, e.g. 1972). This is both a goal-directed and goal-intended process; when it happens the norms are regarded as the 'final cause' of the change(s) in one's speech habits (Andersen, op. cit, 790), and one is said to have changed his speech habit(s) intentionally, whether consciously or unconsciously.

Returning to Mould's conspiracy, we note that it is purposefully teleological. Mould attributes the 'conspiracy' to the proto-system he reconstructs. Thus the system supposedly activates some sound shifts in order to maintain the predictability or redundancy of [voice]. It has been observed that such a teleology is objectionable in reference to language since it "....ascribes to language a will of its own, a sort of conscious control over its own future..." (Vincent 1978:414). It has also been noted that to accept the existence of conspiracies (such as Mould's) would "so enormously extend our conception of what sort of things qualify as human languages.." (Vincent, p. 427). This is no doubt a problem, especially in view of continuing attempts in linguistic theory to 'constrain' the power of grammars. Investing language with a 'will' which cannot be demonstrated or proved would be a step backward in our attempts to define 'language'.

Finally, Mould's hypothesis could be considered in relation to projection and mapping in the context of Bantu as a whole. It is to be noted that as a projection, a diachronic conspiracy, even as 'metaphor', would be difficult to verify in prehistory. Mould notes that the conspiracy was (apparently) "most thoroughly carried out" only in Luyia (p. 390), and the 'evidence' used is from Luyia, with a few comparisons with Gusii and Luganda, where, apparently, the conspiracy failed. However, he remains silent on the crucial issue of how the supposed conspiracy is to be mapped on to the synchronic states of the remaining Bantu languages. Given the shifts posited by Guthrie 1971 (30-64) and other Bantuists, the mapping of the conspiracy on to the synchronic states of Bantu languages would, of course, result in uneconomical, phonetically and typologically implausible mappings such as we have argued against in the above sections. This consideration is an important one against such an unmotivated conspiracy.

Conclusion

This discussion of the 'stops versus continuants' controversy in this paper has dealt with the criteria or considerations used by Meinhof (frequency of occurrence and analogical symmetry), Guthrie (frequency of occurrence and probable direction of sound shifts), Hinnebusch (simplicity or economy criterion), and Mould (redundancy of [voice] in PB, and the conspiracy to preserve it). An additional consideration, the theory of strength and lenition hierarchies, has also been used to identify the probable environments for weakenings/strengthenings/protecton, i.e. weak and strong environments, and their general behaviour synchronically and diachronically. The discussion has led to the conclusion that the assumptions underlying the continuant solution lead to very complicated and unnatural mapping rules, while those underlying the stop solution lead to well-motivated mapping rules which are phonetically as well as typologically plausible.

In conclusion, one or two relevant questions could be raised and discussed in relation to the considerations and results of this investigation.

One of these has to do with the rarity of a stop system without continuants. Specifically, the assumptions discussed here (and followed -implicitly or explicity- by proponents of stop reconstructions) result in the symmetrical system: */b, d, j, g, p, t, c, k/ (cf. Meeussen 1967:83). A pertinent question here is: how can this system remain valid in view of the fact that phonological systems lacking continuant are not very common? (cf. Ruhlen 1976:153-299). In discussing this problem, one may also have to deal with the problems of the reductionism of the reconstruction methods and the limitations of the available data, and their roles in producing a system without continuants. For in-

stance, reconstruction methods and limited data (synchronic correspondences and internal alternations only) do not allow for reconstruction of unconditional mergers that might have taken place in prehistory. An example: if an *l were present in Proto-Bantu and later merged with *r/*d/*t, it is quite likely that there would be no evidence to show that such an *l existed at all. Or if Bantu had *s at some point in prehistory, and this segment later merged with some *s from *c or some other source (e.g. borrowing), there would be no evidence at all to show that *s existed independently as a phoneme at some earlier stage. The question has, of course, to do with the difference between 'reconstructed' and 'real' systems, and its discussion in relation to Bantu and time-honoured principles of typological and phonetic plausibility would help clarify the status of the stop reconstructions.

In effect, the 'stops versus continuants' issue is still an open one.

Notes

* An earlier version of this paper was presented tothe Annual Michigan Linguistic Societ Meeting, Michigan State University, E. Lansing, USA (cf, Kahigi 1984). Another version appeared as a chapter in Kahigi 1988. I am grateful for comments and encouragement from Dr. Grover Hudson Dr. David Dwyer (Michigan State University) and Dr. Herman Batibo (University of Dar es Salaam).

The following symbols have been used: B = voiced bilabial fricative, D = voiced dental fricative, G = voiced velar fricative.

[1]It should be noted that although Bantuists today refer to 'stop reconstructions' as Guthrie's, it is more accurate to call them Homburger's since he was the first, to my knowledge, to reconstruct voiced stops. In this study I will follow the usage of Bantuists and continue to refer to the reconstructions as Guthrie's.

[2]Herman Batibo, a native speaker of Sukuma, says that the Sukuma form for root' is (n)ɟi, not (n)dʒi as recorded here by Guthrie (personal communication).

[3]This will be discussed in detail in a section below in terms of the weakening and strengthening of segments.

[4]Given that *dɗʒ (ɗz), (ɗʒ)ɓz is the usual path of diachronic derivation, it is easy to see that the affricates (dʒ, dz) point back to their source, i.e. d, and the spirants also point back to their ultimate source, through the intermediary, the affricates. Likewise since *dɓD and *dɓl/r are natural shifts, the continuants can plausibly be assumed to point back to *d.

[5]Weakening of *d in non-postnasal environments has already been noted to have occurred in Spanish and Greek in a section above. This type of weakening (i.e. sonorantization of *d or its voiceless counterpart *t) is not uncommon; it has been reported to have occurred in other languages, e.g. Tagalog (Schachter and Otanes 1972:25) and other Austronesian languages (cf. Dahl 1976:55-69); in some dialects in England, t and d have become r intervocalically (Wright 1905:230, 232); in Dravidian languages *t and d* have changed to either l or one of 'r' -type sounds (Caldwell 1961:153, 154 ff); also, in Mande *d has changed to l intervocalically while being retained postnasally (personal communiction from David Dwyer).

[6]The zones in question are: A, B, C, E (Msaba-Luhya group, Chaga group), F (F.32 Rimi, a sister of Sumbwa), G (G.44a Ngazidya, g. 44b Nzwani), H. (H.13 Kunyi, Zaire), K(K.21 Lozi), P (P.30 Makua group), S (S.20 Venda group, S. 30 Sotho-Tswana group, S. 50 Tswa-Ronga group, S.60).

[7]According to some assumption in the theory of strength hierarchies d is weaker than t in the alveoler region, and thus it is expected to "....weaken first and most extensively and preferentially in weak environments" (Foley 1977:107).

[8]There are two theories that have been proposed in connection with the rise of Bantu implosion: (1) the theory of external origin proposed by Doke 1931, and (2) the theory of 'internal evolution' proposed bv Greenberg (1970). According to Doke 1931:48 Bantu Implosion"... owes its origin

to Indian influence." This theory is unacceptable as there is no known intense contact between Bantu and Indian languages. The theory of "Internal evolution' proposed by Greenberg 1970s: 134 ff proceeds by assuming that one of the ways implosion may originate in a language is through the acquisition of the feature [+ implison] by plain voiced stops. On this view imploded variants must have occurred in free variation with plain variants before the feature [+ implosion] got phonologized. This seems to be a plausible explanation of the rise of implosion in Bantu languages.

References

Aitchison, J. 1981. *Language Change.* Fontana Books.
Andersen, H. 1973. 'Abductive and Deductive Change,', *Language* 49, 4· 765-793.
Anderson, J.M. and C. Jones, eds., 1974. *Historical Linguistics.* 2. vols. Amsterdam: North-Holland Publishing Company.
Anderson, S. 1974. *The Organization of Phonology.* New York: Academic Press.
Anttila, R. 1972. *An Introduction to Historical and Comparative Linguistics.* New York: Macmillan.
_____1977. *Analogy.* The Hague: Mouton.
Ashton, E.O. 1947. *Swahili Grammar.* London: Longmans
Augustiny, J. 1929. 'Laut-und Formenlehre der Sukuma-Sprachen'. In: *Mitteilungen der Seminar fur Orientalischen Sprachen,* Berlin: pp. 93-157.
Baucom, K.L.1972. 'The Wambo Languages of South West Africa and Angola'. *Journal of African Languages* 11,2:45-73.
_____ 1975. The Phonology of Proto-Wambo'. *African Studies* 34, 3: 477-495.
Bennett, P. 1967, 'Dahl's Law in Thagicu', *African Language Studies* 8:127-159.
Bloomfield, L. 1933. *Language.* New York: Holt.
Bruck, A., R.A. Fox, and M.W.La Gally, eds., 1974. *Papers from the parasession on Natural Phonology.* CLS, Chicago.
Byarushengo, E. 1977:On the phonological status of p/h and d/l'. In: *Haya Grammatical Structure, Scopil* 6:17-34. Los Angeles: University of Southern California.
Bynon, T. 1977. *Historical Linguistics.* Cambridge: CUP.
Caldwell, R. 1961 (1856). *A Comparative Grammar of the Dravidian or South-Indian Family of Languages.* 3rd Edn. Madras: Univ. of Madras.
Capus, A. 1898. *Grammaire de Shi-Sumbwa.* In: *Zeitschrift fur Afrikanische und Oceanische Sprachen,* VOl. 4. Berlin, pp. 1—123.
Chafe, W. 1959. 'Internal Reconstruction in Seneca'. *Language* 35: 477-495.
Chen, M. 1972. 'The Time Dimension. Contribution toward a Theory of Sound Change.' *Foundations of Language* 8..457-498
_____1976. 'Relative chronology: three methods of reconstruction'. *Journal of Linguistics,* 12:209-58.
_____ and S. -Y. W. Wang 1975. 'Sound Change: Actuation and Implementation'. *Language* 51:255-81.
Chomsky, N. and M. Halle. 1968. *The Sound Pattern of English.* New York: Harper and Row.
Coupez, A. 1954. *Études sur la langue luba.* Tervuren.
Dahl, E. 1904. 'Die Tone und Akzente im Kinyamwesi' in Mitteilungen des Seminars fur orientalische Sprachen, pp. 106-126.
_____. 1915. *Nyamwesi Wortebuch.* Hamburg.
Dahl, Otto C. 1976. *Proto-Austronesian.* London: Curzon Press.
Dempwolff, O. 1914-16. 'Beitrage zur.Kenntnis der Sprachen in Deutsch-Ostafrika', in *Zeitschrift fur Kolonialsprachen,* Vol. V: 227-253, 270-298; VOl. VI: 1-27, 102-23.
Doke, C.M. 1963. *Textbook of Zulu Grammar.* Cape Town: Longmans.
Dwyer, David 1969. *Consonant Mutation in Mende.* M.A. Thesis. East Lansing: Michigan State University.
Ferguson, C. 1978. 'Phonological Processes. In Greenberg, ed., 1978: 403-442.
Fisiak, J., ed., 1978. *Recent developments of historical phonology.* The Hague: Mouton.
Foley, J. 1977. *Foundations of theoretical phonology.* Cabridge: CUP;
Grammont, M. 1933. Traite de phonetique. Paris: Delagrave.
Greenberg, J. 1948. 'The tonal system of proto-Bantu,' *Word* 4, 3: 196-208.
_____ 1966. 'Synchronic and diachronic universals in phonology.' *Language* 42, 2:508-17.
_____. 1970: 'Some generalizations concerning glottalic consonants, especially implosives', *International Journal of American Linguistics* 36:123-145.
_____. ed., 1978. *Universals of Language.* Vol. 2: *Phonology.* Stanford: Univ. of California Press.

Guthrie, M. 1967-71. *Comparative Bantu.*4 vols. Farnborough, Hants: The Gregg Press.
Halle, M. 1962. 'Phonology in Generative Grammer'. *Word* 18: 67-72.
Heffner, R.M.S. 1969 (1949). *General Phonetics.* Madison: Univ. of Wisconsin Press.
Hermann, _____ 1904. 'Lusiba, die Sprache der Laender Kisiba, Bugabu, Kjamtwara, Kjanja, und Ihangiro'. In: *Mitteilungen des Seminars fuer Orientalische Sprachen,* Vol. VII: 150-200; Berlin.
Hinnebusch, T. 1973. *Prefixes, sound changes, and sub-grouping in the coastal Kenyan Bantu Languages.* Ph. D. Dissertation, UCLA: Univ. Microfilms Ann Arbor.
_____, D. Nurse, and M. Mould, 1981. *Studies in the Classification of Eastern Bantu Languages.* Humburg.
Hoenigswald, H. 1960. *Language Change and Linguistic Reconstruction.* Univ. of Chicago Press.
_____. 1964. 'Graduality, sporadicity, and the minor sound change processes', *Phonetica* II, 202-215.
_____ 1978 'Secondary split, typology and universals'. In: Fisiak, ed., 1978:173-181.
Homburger, L. 1914. *Etude sur la phonetique historique du Bantou.* Paris.
Hooper, J. 1976a. *An Introduction to Natural Generative Phonology.* New York: Academic Press.
Hudgins, C.V. and L.M. Di Carlo 1939. 'An Experimental Study of Assimilation between abutting consonants'. In: *The Journal of General Psychology 20:449-469*
Hyman, L. 1975. *Phonology: Theory and Analysis.* N.Y.: Holt
Jacobs, J. 1965 and 1966. 'De reflexen van de Oerbantoe-Consonantfonemen in de talen van de zone C'. In *Orientalia Gandensia* 2: 259-98 (1965); 3: 341-407 1966).
Jakobson, R. 1931. 'Principles of Historical Phonology', in Keiler, e.d, 1972:121-138.
_____ 1958. 'Typological studies and their contribution to historical and comparative linguistics'. In Keiler 1972: 299-305.
Jeffers, R.J. 1974. 'On the notion 'explanation'' in historical linguistics'. In Anderson and Jones, eds., 1974: 231-255.
_____and Ilse Lehiste 1979. *Principles and Methods for Histocial Linguistics.* The MIT Press.
Johnson, M.R. 1974. 'Abstract analysis and Bantu reconstruction: A Luganda example'. *Studies in African Linguistics* 3:325-337
Johnston, H.H. 1919. *A Comparative Study of the Bantu and Semi-Bantu Languages.* 2 vols. Oxford.
Jordan, A.C. 1966. *A Practical Course in Xhosa.* Cape Town: Longmans.
Kahigi, K. 1977. *Sumbwa Phonology.* M.A. Thesis. University of Dar es Salaam.
_____1984. 'Stops or Continuants in Proto-Bantu?' Paper presented to the Michigan Linguistic Society annual meeting, 19 Oct., 1984, East Lansing, Michigan.
_____ 1988. *Aspects of Sumbwa Diachronic Phonology.* Ph.D. Dissertation, Michigan State University, Mi., East Lansing.
Kahler-Meyer, E. 1971. 'Niger-Congo, Eastern Bantu' in Sebeok, T.A. ed., *Current Trends in Linguistics,* Vol. 7: *Linguistics in Sub-Shaharan Africa.* The Hague: Mouton, 307-356.
Keiler, Allan, ed., 1972. *A Reader in Historical and Comparative Linguistics.* New York: Holt.
Kent, R.G. 1936. 'Assimilation and Dissimilation? *Language.* 12: 245-258.
King, R. 1969. *Historical Linguistics and Generative Grammar.* New Jersey: Prentice-Hall.
Kiparsky, P. 1970. 'Historical Linguistics'. In J. Lyons, ed., *New Horizons in Linguistics,* Penguin, 1970:302-315.
Kisseberth, C. 1970 'On the functional unity of phonological rules'. *Linquistic Inquiry* 1: 291-306.
_____ and M. Kenstowicz 1979. *Generative Phonology.* Academic Press.
Koenen, M. ((Rev., W.F.) n.d. *New Kisukuma Grammar of the Diocese of Mwanza.* (mimeo)
Kotey, P.F.A. and H. Der-Houssikian, eds., 1977. *Languages and Linguistic Problems in Africa.*
Labov, W. 1972. *Sociolinguistic Patterns,* University of Pennyslvania Press.
_____1981. 'Resolving the Neogrammarian controversy'. *Language* 57, 2: 267-308.
_____ 1982. 'Building on empirical foundations'. In Lehmann and Malkiel, eds., 1982: 17-92.
Lass, R. 1978, 'Mapping constraints in phonological reconstruction: on climbing down trees without falling out of them'. In: Fisiak, 1978:245-286.
_____ 1980. *On Explaining Language Change.* London: CUP.
_____ 1981. 'Explaining Sound Change: The Future of an Illusion'. In: *Phonologica 1980,* ed. W.U, Dressler, O.E. Pfeiffer, and J.R. Rennison, Innsburck 1981, pp. 257-73.
_____ 1984. *Phonology.* Cambridge Univ. Press.
_____ and J. Anderson . 1975. *Old English Phonology.* CUP.
Lehmann, W.P. and Y. Malkiel, eds., 1968. *Directions for Historical Linguistics.* Austin: Univ. of Texas Press.
_____ 1982. *Perspectivess on Historical Linguistics.* John Benjamins, B.V.
Mann, M. 1973. 'Sound-correspondences and sound-shifts'. *African Languages Studies,* XIV:26-35.

Meeussen, E.A. 1955. 'Les phonemes du ganda et du bantu commun', *Africa* XXV, 2: 170-180.
_____1967. 'Bantu Grammatical Reconstructions', *Africana Linguistica* III, pp. 79-121.
_____ *1973*. 'Comparative Bantu: Test Cases for Method'. *African Language Sudies*, XIV:6-18.
Meinhof, C. 1899. *Grundriss einer Lautlehre du Bantusprachen*. Berlin.
_____ 1929. 'The Basis of Bantu Philology'. *Africa* II, pp. 39-56.
_____and N. van Wamerlo 1932. *An Introduction to Bantu Phonology*. London (Abbreviated Meinhof 1932).
Mould, M. 1977. 'The proto-Bantu voiced consonants and the feature (voice)'. In: Kotey and Der-Houssikian, eds., 1977:389-394.
Nurse, D. 1979a. *Description of Sample Bantu Languages from Tanzania. African Languages/Langues Africaines* Vol. 5, No. 1. International Africa Institute, London. (Earlier Version titled *A Phonological and Morphological Sketch of 15 of the Principal Languages of Tanzania* published by Institute of Kiswahili Research. Dar es Salaam. n.d.)
_____ 1979b. *The Classification of the Chaga Dialects*. Hamburg.
_____and G. Phillipson, 1980. 'The Bantu Languages of East African: A Lexicostatistical Survey'. In Polome and Hill 1980: 26-67.
Ohala, J. 1974a. 'Phonetic explanation in phonology'. In Bruck, et al., 1974: 251-274.
_____1974b. 'Experimental historical phonology.' In Anderson and Jones, eds., 353-389.
Olson, H.W. 1964. *The Phonology and Morphology of Rimi* Ph.D Thesis, Hartford Seminary Foundation.
Paul, H. 1891 (1888). *Principles of the History of Language*. London: Longmans.
Ponelis, Fritz 1974. 'On the dynamics of velarization and labialization: some Bantu evidence' *Studies in African Linguistics* 5, 1:27-58.
Posner, R.R. 1961: *Consonantal Dissimilation in the Romance Languages*. Oxford: Blackwell.
Ralph, Bo 1977. 'Rule Extension in Historical Phonology'. In: *Studia Linguistica* XXXI, II:164-191.
Rehse, H. 1912-13. 'Die Sprache der Baziba in Deutsch-Ostafrika'. In: *Zeitschrift fuer Kolonialsprachen*. Vol. III: 1-33, 81-123, 201-229. Berlin.
Richardson, I. 1966. 'A Vocabulary of Sukuma,' ed. by M. Mann, *African Language Studies* VII: 1-79.
Robinson, O. and F. van Coetsem 1973. 'Review of King 1969' *Lingua* 31: 331-369.
Romaine, S. 1983. 'Historical linguistics and language change: progress or decay? (Review) *Language in Society* 12:223-237.
Rop, A. de 1958. *Elements de phonetique historique du Lomongo*. Leopoldville.
Ruhlen, Merritt 1976. *A Guide to the Languages of the World* Standford University Language Universals Project.
Saussure, F. de 1959 (1916). *Course in General Linguistics*. New York: Philosophical Press.
Schachter, P. and Fe T. Otanes 1972. *Tagalog Reference Grammar*. Los Angeles: Univ. of California Press.
Schregel, W. 1913. 'Abriss einer Grammatik der Kinyaturu-sprache', in *Mitteilungen des Seminars fur orientalische Sprachen*, Vol. XVI. 60-62. Berlin.
Slavikova, M. 1975. *Relationships among Six N.E. Bantu Language* Ph. D. Thesis, Univ. of London.
_____ and M.A. Bryan 1973. 'Comparative Bantu: The Case of Two Swahili Dialects'. *African Language Studies* 14: 53-81. SOAS, London.
Stigand, C.H. 1915. *A Grammar of Dialect Changes in the Kiswahili Language*. Cambridge: At the Univ. Press.
Sturtevant, E.H. 1971. *Linguistic Change*. Chicago. Univ. of Chicago Press.
_____ 1947. *An Introduction to Linguistic Science*. New Haven: Yale Univ. Press.
Taylor, C. 1959. *A Simplified Runyankore-Rukiga-English and English-Runyakore-Rukiga Dictionary*. Kampala: East African Literature Bureau.
Tucker, A.N. 1929. *The Comparative Phonetics of the Suto-Chuana group of languages*. Longmans, Green and Co.
_____ and E.O. Ashton 1942. 'Swahili Phonetics'. Reprint from *African Studies*, Vol. 1, 2:77-103; 3:161-182.
_____and M. Bryan 1970. 'Tonal classification of Nouns in Ngazija' *African Languages Studies*, 11:351-385.
Velten, C. 1901. *Grammatik des Kinyamuesi*. Gottingen: Vandenhoeck und Ruprecht.
Vendryes, J. 1925. *Language*. New York: Knopf.
Vennemann, T. 1972b. 'Phonetic analogy nd conceptual analogy'. In: Vennemann and Wilbur 1972: 181-204.
_____ and T. Wilbur 1972. *Schuchardt, the neo-grammarians and the transformational theory of phonological change*. Frankfurt a.M.

Vincent, N. 1978. 'Is sound change teleological?' In: Fisiak 1978: 409-430.
Whiteley, W.H. and A.E. Gutkind, 1954. *A Linguistic Bibiography of East Africa.* Kampala: East African Swahili Committee and the E.A. Institute of Social Welfare.
Wright. J. 1905. *The English Dialect Grammar.* Oxford.

Zwicky, A. 1972. 'Note on a phonological Hierarchy in English'. In: Stockwell and MacCaulary 1972: 275-301.
_____ 1973. 'Linguistics as Chemistry: The Substance Theory of Semantic Primes'. In: S. Anderson and p. Kiparsky, ed., *A Festschrift for Morris Halle.* New York: Holt, 1973: 467-485.