Most of the Southern Bantu languages exhibit a phonological process known as "Palatalization" whereby sequences of labial consonant plus \( w \) are replaced by labialized (pre)palatal fricatives or affricates, e.g. \( p + w \rightarrow \tilde{t}jw, b + w \rightarrow d\tilde{z}w \). Similar alternations also occur before front vowels and the labiality of the palatals cannot be attributed to an underlying \( w \). Stahlke [1976] treats these alternations as cases of segmental fusion in which the labiality of the palatals is derived from the labiality of the original stop consonant, e.g. \( b + i \rightarrow d\tilde{z}w \). After a brief examination of Stahlke's analysis, it is suggested that these alternations are not to be treated within the domain of phonological fusion but as morphophonological, i.e. morphologically conditioned, alternations. This suggestion is viewed in the light of various criteria put forward by Linell [1976] and Dressler [to appear] for determining rule status. The analysis of Southern Bantu palatalization is then set in a general discussion of a possible constraint on the theory of segmental fusion.

1. Introduction

In a recent article appearing in this journal, Stahlke [1976] takes issue with the segmental discreteness postulate of American structural linguistics, i.e. the notion that phonological segments are linearly discrete. This notion has, as Stahlke points out, a much longer history, and it has been formally incorporated into the theoretical framework of generative phonology insofar as the form of phonological rules forces the

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1A working version of this paper appeared in Wiener Linguistische Gazette 14:12-40 (Working Papers of the Institut für Sprachwissenschaft der Universität Wien). I am grateful to Herbert Stahlke, Robert J. Jeffers, and Professor Wolfgang Dressler for their comments on an earlier version of this paper which was presented in a seminar conducted by Prof. Dressler at Ohio State University, Winter 1977. Naturally, all oversights and analytical errors are my own responsibility.
linguist to think in terms of segments alone. Stahlke considers several cases where a purely segmental treatment of data is inadequate on both formal and explanatory levels. In these cases, he claims, it is necessary to recognize a phonological phenomenon whereby two adjacent segments fuse into a single unit, which unit segment shares properties of both.

Certainly the notion of fusion (unification, coalescence) has long been recognized within the domain of suprasegmental phonology. For example, a sequence of tones may be compressed onto a single segment. In this manner, a sequence of high tone plus low tone, if realized as a unit, becomes a single falling tone. Suprasegmental fusion is symmetrical in many systems so that the reverse sequence, low plus high, is realized as a rising tone. In the case of sequences of identical tones which are realized as a single unit, whether we need to make reference to fusion or deletion is really a moot question. Similarly, although perhaps more problematic from a formal viewpoint, there are numerous cases of vocalic fusion or coalescence which are cited in the descriptive literature whereby, for example, /a+i/-/+[ε], /e+u/-+[o], /i+u/-+[y]. Bell [1971] provides a useful survey of processes which shape syllable structure. Three clearly related processes are subsumed under the general heading of Nuclear Fusion. These processes involve the collapse of two nuclei into one; the resultant nucleus may be long or short, have the quality of one of the original vowels or a compromise between the two, or maintain both qualities as a diphthong, e.g. Susu combinations of vowel-final nouns with suffix -i:

(1) a. /i, e, ε/+/-i/ → [i, e, ε]
   b. /a/+/-i/ → [ε]
   c. /u, o, ɔ/+/-i/ → [ui, oε, ɔε] alternating with [i, e, ε]

Alternations between sequences of vowel plus nasal consonant and nasalized vowels are also cited by Stahlke as examples of segmental fusion.

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2 The formalism provided by generative phonology does not adequately allow for cases of segmental fusion. In general, a transformational rule of the form AB → C is posited in such cases or else it is necessary to posit two independent rules which are formally coupled in some manner.
Consonantal fusion, i.e. coalescence involving two consonants or one consonant plus another segment which results in a surface consonant, occurs much more rarely than either vocalic or suprasegmental fusion and has played a much lesser role within the theory. There are, however, convincing cases of such fusion, which are of two main types: i) those in which the resulting segment presents a sequence of articulatory events corresponding to an original sequence of segments, e.g. prenasalized consonants, affricates, etc.; ii) those in which the resulting segment presents a superimposing of articulatory events, e.g. certain voiceless or murmured nasals which can be attributed to sequences of nasal plus h.

Sasse [1976] examines several types of consonantal fusion involving two input consonants in the setting of a general discussion of multi-columned matrices in phonological representation. Among the examples cited are long consonants which arise from a sequence of two identical consonants or two non-identical consonants, prenasalized consonants, glottalized consonants, aspirated consonants, etc. Of course, the problem here is that segments which may be phonetically identical are sometimes underlying units, and in other languages these same surface units represent underlying clusters which are fused; the differentiation of the two types is often arbitrary in analysis.

Although cases of fusion between a consonant and non-consonant are cited in the literature, these cases are much less convincingly argued than those involving two like-input segments. Stahlke's most dramatic example of consonantal fusion of this type is that of root-final palatals in Tswana, a Southern Bantu language. In this paper, we propose to examine this case in greater detail and to provide a reanalysis of these data which does not make any reference to segmental fusion. The implications of this reanalysis will be discussed in Section 5.

2. Stahlke's Analysis of Tswana

The data concerning the root-final palatals in Tswana are as follows.

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3The example of nasalized vowels does not fit this schema for two reasons. First, the purely segmental status of nasality has recently been called into question. Second, the resulting segment is a vowel, not a consonant.
The passive and causative verb stems are formed by suffixing the extensions -iwa and -isa or -ya respectively to the root. For many verb stems, alternate passive forms are possible: a form in which the full suffix occurs and a form in which -i has been deleted:

(2)  
-boniwa/-bonwa  (< - bona)  'be seen'
-ratiwa/-ratwa  (< - rata)  'be loved'
-rokiwa/-rokwa  (< - roka)  'be sewn'

The interesting forms are those which have root-final labial consonants; in the i-deleted forms, a complex series of consonant alternations occurs:

(3)  
-bopiwa/-botʃwa  (< - bopa)  'be moulded'
-robiwa/-rodʒwa  (< - roba)  'be broken'
-bofiwa/-boʃwa  (< - bofa)  'be bound'

These alternations include the following: 4

(4)  
p > tʃ
pʰ > tʃʰ
b > ʒ or dʒ
f > f or tʃʰ
m > n or ŋ

Stahlke considers, but rejects, an analysis which palatalizes labials and then deletes i by a general rule which, he claims, the grammar must have to account for the forms in (3), i.e.:

(5)  
bop + iwa
botʃ + iwa  palatalization
botʃ + wa  i-deletion

4Two points need to be noted here. There is apparently rather free variation in certain cases in the realization of the palatal alternate of b, which may be a fricative ʒ or affricate dʒ. In fact, the verb ja may be [dʒa, ʒa, ja, djə, ja]. The variants of ʃ are morphologically determined: ʃ occurs in the passive and some diminutives, tʃʰ in the causative and certain front vowel diminutives. This distinction is discussed in later sections. The output alternations in other Southern languages which we cite are similar, though not identical, to these Tswana alternations.
Among the problems with such an analysis is the fact that the palatalization process leaves intact those segments which we expect to be first palatalized, viz. alveolars and velars. Further, there is the formal problem posed by the fact that l-deletion, normally an optional rule, is obligatory only after palatalization has applied.

Similar palatalizations also occur in the causative verb form and the diminutive of nouns. In these cases, the consonant which results is also labialized, but the labialization cannot be attributed to a following w, as in the passive. The diminutive suffix is -ana/-ane, which historically began with a palatal glide *y or a palatalized velar fricative *y'. Stahlke attributes to the historical palatal the alternations:5

(6)  
| kolobe  | kolodʒwane    | 'pig/piglet' |
| tshi'pi | tshitʃwana    | 'iron/sm. piece of iron' |
| lesapo  | lesatʃwana    | 'bone/small bone' |
| tseph'e | tsetʃw'ana    | 'springbok/springbok kid' |
| sefɛfu  | sefɛtʃw'ana   | 'blind person/sm. blind person' |

These alternations are formally schematized by Stahlke as:

5 The transcription used by Stahlke is that of the official orthography; it has been modified to conform more closely with I.P.A. and that found in the standard reference works on these languages to facilitate comparison. Apart from the simple substitution of symbols, e.g. ŋ for ŋ; ŋ, e for ŋ, e, etc., we have reordered the symbols used by Stahlke for labialized palatals with aspiration. Thus, tsėtšwana will be transcribed as tsetʃw'ana in this paper. This reordering is in agreement with Tucker (1929) and others who note that the use of w in conjunction with consonant symbols represents a unit articulation, not a sequence of events. Labialization runs throughout the consonant whereas aspiration, which is unrounded, clearly follows it. Thus, the I.P.A. transcription [tʃʰ] is probably the most accurate representation; it is not employed here for typographical reasons. Similarly, for typographical reasons, ŋ is used to indicate the palatal nasal (I.P.A. [ŋ]) and q represents the palatal-alveolar click. In other cases, we follow the transcriptions used by authors, occasionally modifying them to fit this general scheme. This paper is primarily a work of library research. All errors of interpretation of data are my own responsibility.
Palatalization always involves the deletion of the vowel or glide which conditions it, but labialization is not always attributable to a following w, e.g. /tʃʰipi + ana/ → tʃʰitʃwana. Stahlke claims, therefore, that the labial consonant itself must be postulated as the source of labialization. Palatalization is not an assimilation process in Tswana; rather, it represents the fusion of two segments so that certain distinctive articulatory properties of both original segments are still present in the fused unit.

3. Additional Background Data

In addition to the language internal types of alternation considered by Stahlke, our reanalysis will make reference to the process of palatalization within the framework of the Southern Bantu language group as a whole. Thus, in addition to determining the synchronic status of these consonant alternations within Tswana, our secondary goal is a preliminary reconstruction of the phonetic stages responsible for these alternations historically. In fact, it will be shown that Tswana palatalization is

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6Reference to phonetic processes in various other Southern Bantu languages, e.g. Pedi, is not intended to validate the analysis of Tswana alternations which will be proposed. Rather, comparative evidence is cited here only to point to the historical naturalness of the developments which we propose insofar as intermediate stages are attested in closely related
closely related to processes of labialization and velarization in other languages of the group.

3.1. Tucker's analysis of passivization. In his *Comparative Phonetics of the Suto-Chuana Group of Bantu Languages*, Tucker [1929] notes that palatalization in Tswana is a very old process related to labialization of consonants in other contexts. He distinguishes labialization of non-labial consonants and labialization of labial consonants. The former process, also known as "back labialization", gives rise to consonants which are produced with rounded lips and the back of the tongue raised somewhat more than usual. Back labialized consonants are phonetically identical in most cases with consonants occurring before back rounded vowels. Front labialization is a more complex phenomenon. In Pedi, a Northern Sutho dialect, it affects labial consonants and effects their being produced with rounded lips and the middle of the tongue raised more than is usual. Tucker uses the I.P.A. symbol [y] to indicate this front labiality, although he notes that it is not so palatal as the French semi-vowel [ɥ] as in lui. Also, it is important to remember that in both cases the semi-vowel symbols w and y do not represent separate semi-vowels pronounced after the consonants, but w- or y-like elements running throughout the articulation.

The corresponding process to Pedi front labialization is palatalization in S. Sutho and Tswana, i.e. front labialization is carried one step further in these languages. Instead of [fy, hy, py, pyh], we find [setw, 3w, tfw, tfwh]. Tucker cites the following comparative forms showing these correspondences [1929:79-80]:

---

languages. While we claim that these stages do not occur in Tswana synchronically as the alternations are no longer phonological in character, they do lend some credence to what appears initially to be a rather suspect phonetic development. Comparative evidence also points to the natural development of phonological rules into morphophonological and morphological rules which is discussed in Section h.

Tucker's work is very useful insofar as the consonants are concerned, but his interpretation of vowels is less reliable.
Unlike Stahlke, Tucker attributes palatalization of labial consonants in the formation of the passive to the extension -wa directly. Although he notes that the passive may also be formed by suffixing -iwa, the two are synchronically unrelated, i.e. one form does not derive from the other. Tucker's analysis might be schematized as:

(9)  
\[
\begin{align*}
\text{bop} + \text{wa} \\
\text{bop} + \text{wa} \\
\text{botf} + \text{wa}
\end{align*}
\]  

i.e. back labialization becomes front labialization after labial consonants, as in Pedi. The front-labialized consonant, in which a η-like element is superimposed on the consonant, is palatalized and therefore receives surface back labialization in Tswana and S. Sutho.

3.2. Diminutives. Accepting for the moment the phonetic plausibility of an analysis such as the above, we still need to explain exactly those forms which lead Stahlke to his fusion analysis, i.e. those in which no underlying labial glide can account for the labialization of the palatalized consonants. The diminutivization of nouns is phonetically more transparent in Pedi than in either S. Sutho or Tswana. The general suffix is -ana/-ane, which functions in three processes to form the diminutive, varying with the final vowel of the noun:

(10) a. Ca + -ana/-ane → Cana/Cane
\[
\begin{align*}
\text{nɔγa} & \quad \text{nɔγana} \quad \text{'snake'} \\
\text{leβa} & \quad \text{leβana} \quad \text{'dove'} \\
\text{mpʃa} & \quad \text{mpʃana} \quad \text{'dog'}
\end{align*}
\]

b. Ci, Ce, Cɛ + -ana/-ane → Cjana/Cjane
\[
\begin{align*}
\text{lenti} & \quad \text{lentjana} \quad \text{'string'} \\
\text{mo4oki} & \quad \text{mo4okjana} \quad \text{'poor man'}
\end{align*}
\]
more commonly, however, palatalization occurs:

<table>
<thead>
<tr>
<th>Tswana</th>
<th>Pedi</th>
<th>S. Sutho</th>
<th>Tswana</th>
</tr>
</thead>
<tbody>
<tr>
<td>moriʃana</td>
<td>moriʃana</td>
<td>moriʃana</td>
<td>moriʃana</td>
</tr>
<tr>
<td>βo4aʒana</td>
<td>βo4aʒana</td>
<td>βo4aʒana</td>
<td>βo4aʒana</td>
</tr>
<tr>
<td>tʃweɲana</td>
<td>tʃweɲana</td>
<td>tʃweɲana</td>
<td>tʃweɲana</td>
</tr>
<tr>
<td>lenoɲana</td>
<td>lenoɲana</td>
<td>lenoɲana</td>
<td>lenoɲana</td>
</tr>
<tr>
<td>leʃupi</td>
<td>leʃupi</td>
<td>leʃupi</td>
<td>leʃupi</td>
</tr>
<tr>
<td>mo4apse</td>
<td>mo4apse</td>
<td>mo4apse</td>
<td>mo4apse</td>
</tr>
<tr>
<td>leyoʃi</td>
<td>leyoʃi</td>
<td>leyoʃi</td>
<td>leyoʃi</td>
</tr>
<tr>
<td>koloʃe</td>
<td>koloʃe</td>
<td>koloʃe</td>
<td>koloʃe</td>
</tr>
<tr>
<td>leʃapu</td>
<td>leʃapu</td>
<td>leʃapu</td>
<td>leʃapu</td>
</tr>
<tr>
<td>kololoʃana</td>
<td>kololoʃana</td>
<td>kololoʃana</td>
<td>kololoʃana</td>
</tr>
<tr>
<td>leyatswana</td>
<td>leyatswana</td>
<td>leyatswana</td>
<td>leyatswana</td>
</tr>
</tbody>
</table>

In Tswana and S. Sutho, front vowel nouns exhibit palatalization of stem-final consonants:

Back vowel stems, which receive back labialization in Pedi, are also back labialized in Tswana and S. Sutho, but front labialization is again carried a step further.
It is important to note here that the labiality of palatals derived from labial consonants can be attributed to a stem-final u, o, o. The treatment of labial consonant stems in the diminutive thus parallels exactly the treatment of labials in the passive. Such an analysis is not possible for the forms in (11). However, note that the process of front-vowel labialization is much more pervasive: it affects not only labial consonants, but all stem-final consonants. Thus, alveolars and velars are palatalized before i, e, e, but labials are palatalized before all vowels except a. The process of palatalization in the causative behaves similarly. This is an important distinction to which we shall return below.

4. Reanalysis in the Setting of Southern Bantu

The analysis which we shall propose for palatalization in Southern Bantu passives is that it is a morphophonologically conditioned process synchronically. That is, we agree with Tucker's analysis of two suppletive extensions -wa and -iwa.8 The -wa extension has, through the course of time, come to be associated with a series of complex consonant alternations. There is a great deal of evidence which suggests, however, that these alternations are no longer fully phonological in character as Stahlke claims, but rather are conditioned by category membership and juxtaposition with a particular morpheme.

Doke [1967] points out that "palatalization" is actually a misnomer since prepalalals are used in most languages, although Xhosa exhibits

---

8Meinhof [1932:45] also treats the two passive extensions as independent. He notes, however, that -wa is probably derived historically from *-iywa. We assume that the original distribution of -wa/-iwa among the Southern languages was that -iwa occurred with monosyllabic stems. Its use with vowel-initial stems in Zulu is probably an innovation.
The Southern Bantu Languages
(after Doke [1967])

Nguni Group
Sutho Group
Tsonga Group
Venda
Shona Group
Inhambane
both palatals and prepalatals. There is no doubt that palatalization arises historically from a general incompatibility of labial consonants and $w$. Comparative forms such as the following show the far-reaching effects which this incompatibility has had among the Southern languages:

(13) Xhosa S. Sutho Shona Venda Tsonga Lenge

*mu-ana uñana ñana mñana ñana ñana mwanana 'child'
*imbwa iñdzi a tʃa imb ya mb ya mbjana imbwa 'dog'
*bu-ala ucwala dʒwala byabə (halwa) bjala wadwa 'beer'

Lenge, a Chupi dialect, conforms rather closely to the reconstructed forms in all cases. Xhosa exhibits palatalization in all three cases whereas S. Sutho has palatalization in the last two, but velarization of $m$ in the first as does Tsonga. Shona and Venda have velarization throughout. The Tsonga forms mbjana and bjala show palatalized labials which recall Tucker's analysis proposed in Section 3.1. We note that, on its own merit, a process of "palatalization by $w$" would be extremely unnatural and suspect.

Doke [1967:40] describes the complementary process of velarization as "an abnormal raising of the back of the tongue towards the soft palate (velum) instead of the usual slight raising effected in pronouncing the velar semi-vowel $w$." Velarization actually involves three sub-components as the following examples from Shona demonstrate:

(14) a. the substitution of a velar fricative or plosive for $w$ after labial consonants: [pʃa, bɣa, mŋa]
b. the insertion of a velar fricative or plosive between post-labial pre-velar consonants and $w$: [tʃwa, sʃwa, rɣwa]
c. the maintenance of $w$ after velar and post-velar consonants: [kwa, gwa, ɬwa, ɣwa].

The processes are similar, but less regular, in Venda. This pervasive velarization must be distinguished from what Doke terms "Velarization by Substitution", which is more widespread and effects the replacement of $m$ (and occasionally $n$) by $ŋ$ in passives, noun diminutives, and the prefix of some Class 1 and 3 nouns, e.g. S. Sutho:
The patterning of nasals within the system of consonant alternations is discussed in Section 4.4.

Dressler [to appear] makes a four-way distinction among rule types which are appropriately represented on a scale:

<table>
<thead>
<tr>
<th>phonetic</th>
<th>phonological</th>
<th>morphophonological</th>
<th>morphological</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

This contrasts with other theories which recognize only phonological and morphological components of a grammar. Phonetic rules are treated as a subcomponent of phonology, and morphophonology as part of phonology or morphology proper. Linell [1976], as a reaction to the widespread use of phonological formalism for morphophonological and morphological purposes, proposes that morphophonology is part of morphology. This follows earlier structuralist theories. The absolute distinction is difficult to maintain, however, as there are no unambiguous criteria which can be used to distinguish between the two.

In very broad terms, we shall follow Dressler in distinguishing between phonological, morphophonological, and morphological rules as follows: phonological rules are of the form \( A \rightarrow B/C \) in which both the change and the environment in which it occurs are phonetically plausible whereas morphological rules often involve quantal leaps and implausible environments. Morphological rules are often context-free in the sense that the rule can be stated without reference to any phonological environment although it occurs systematically within a category such as [PLURAL]. Morphophonological rules share characteristics of both phonological and morphological

---

9Phonetic rules are the "automatic rules" of generative phonology.
rules in that although they serve morphological functions, they may be (partially) plausible phonological rules. These distinctions are not absolute. We cite below some types of evidence which are conveniently used to argue for the assignment of a rule to any one particular category.

4.1. Evidence for morphophonologization: Passive. There are several types of evidence which could be cited in defense of a morphophonological analysis of palatalization in Southern Bantu. Among those criteria discussed by Linell [1976] and Dressler [to appear] is the phonetic non-naturalness of the synchronic alternations. That is, although it is possible to recover the intermediate stages of palatalization, which stages are attested in various languages and dialects, synchronic alternations of the sort $p + i \rightarrow tʃw$ $f + i \rightarrow tʃh$, etc. are phonetically radical and unnatural. Also, although the historical effects of palatalization and velarization are evidenced throughout the lexicon, the fact that they are synchronically associated with particular grammatical categories makes them good candidates for morphophonologization. That there are many exceptions and idiosyncrasies in the workings of palatalization also points to non-phonological conditioning. There is further a tendency among some speakers to use alternate suffixal forms which avoid palatalization. For example, Tucker [1929:81] noted an increasing tendency among younger speakers of Tswana for passives with -$iwa$ rather than -$wa$ plus palatalization. The same tendency is exhibited in the formation of diminutives where a suffix -$nana$ replaces -$ana$. In some languages, e.g. Tsonga, the -$iwa$ passive has replaced -$wa$ almost completely. It is important to note that -$iwa$ replaces -$wa$ in all contexts, not only after labial consonants.10

Another important type of evidence which points to non-phonological conditioning of palatalization is the association of the alternations

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10The spread of -$iwa$ and -$nana$ at the expense of -$wa$ and -$ana$ follows Kuryłowicz' general principle that the longer of two competing forms tends to replace the shorter. There are clearly other factors operating here which also contribute to an explanation of the extension/origin of the longer forms.
with particular categories, i.e. the alternations are indexical and act as a semiotic signal of category membership.\textsuperscript{11} There are two subtypes of this sort. First, there are examples where the palatalized consonant is added to the labial consonant rather than replacing it. Tucker, in his 1969 addenda to the 1929 edition, notes that there is a growing preference among Lesutho for forms such as \textit{bof\textsc{wa}}, \textit{lef\textsc{wa}}, \textit{th\textsc{op\textsc{wa}}}, \textit{top\textsc{wha}}, etc. over older \textit{bo\textsc{fa}}, \textit{le\textsc{wa}}, \textit{th\textsc{ot\textsc{fa}}}, \textit{top\textsc{wha}} (< -\textit{b\textsc{fa}}, -\textit{le\textsc{fa}}, -\textit{th\textsc{op\textsc{ha}}}, -\textit{top\textsc{ha}}). That is, transparency of derivation is increased by suffixing \textit{\textsc{wa}} to the verb stem directly. In some Northern Sutho dialects (Ziervogel 1960), the morphologization of palatalization is demonstrated by the fact that \textit{W} never occurs with the palatalized alternants: \textit{ba}, \textit{pa}, \textit{ph\textsc{a}}, \textit{fa} become \textit{b\textsc{a}}, \textit{p\textsc{a}}, \textit{p\textsc{ha}}, \textit{f\textsc{a}}, i.e. \textit{\textsc{a}} or \textit{\textsc{a}} are suffixed directly to labial stems although non-labial consonants show \textit{\textsc{wa}}: \textit{bopa}, \textit{bop\textsc{a}}; \textit{bofa}, \textit{bof\textsc{a}}; \textit{rata}, \textit{rat\textsc{wa}}.\textsuperscript{12} The bilabial nasal does not follow this pattern as \textit{ma} > \textit{q\textsc{wa}}: \textit{roma}, \textit{ro\textsc{wa}} (cf. Section 4.4). Similarly in Tswana \textit{b} becomes \textit{bj} even before \textit{\textsc{iwa}}, e.g. \textit{lab\textsc{a}}, \textit{lab\textsc{jiwa}} 'see, be seen'.

Second, there are examples where the labial consonants are palatalized even when they are no longer stem-final. Doke [1926:140] cites the following forms from Zulu:

\begin{align*}
(16) & \quad \text{bop\textsuperscript{h}ela} \quad (< \text{bop\textsuperscript{h}a}) \quad \text{bo\textsc{fi\textsc{wa}}} \quad \text{\textquoteleft tie for\textquoteright} \\
& \quad \text{bub\textit{isa}} \quad (< \text{bub\textit{a}}) \quad \text{bud\textit{j\textit{is\textit{wa}}}} \quad \text{\textquoteleft kill\textquoteright} \\
& \quad \text{lum\textit{is\textit{isa}}} \quad (< \text{luma}) \quad \text{lun\textit{\textit{i\textit{sis\textit{wa}}}}} \quad \text{\textquoteleft bite hard\textquoteright}
\end{align*}

That is, even when other extensions intervene between the bilabial and the palatalizing \textit{\textsc{wa}} suffix, palatalization occurs. Obviously, it is not possible to salvage a phonological conditioning in these cases with-

\textsuperscript{11}Hooper [1976:89] notes that the morphologization tendency is in part motivated by a desire to establish a one-to-one correspondence between sound and meaning, especially when there is an accidental close correspondence between an alternation and a particular grammatical category.

\textsuperscript{12}Cole [1955:xix] notes a similar tendency in N. Tswana dialects. These tendencies not only increase derivational transparency, but they also more closely mirror historical forms, e.g. \textit{nt\textsc{a}} 'dog' (*\textit{mb\textsc{wa}}) is \textit{mps\textsc{a}}, \textit{mp\textsc{fa}}; \textit{nt\textsc{h\textit{e\textit{ob\textit{trich}}}'} is \textit{mp\textsc{ha}}, \textit{mps\textsc{ha}} in these dialects.
out an otherwise unmotivated appeal to rule ordering. The other alternative is to treat passive stems as synchronic suppletives, an analysis which is not altogether unattractive.

The tendency to associate these consonant alternations with particular grammatical categories is demonstrated in several languages. For example, in Venda velarization is an active process only in the formation of passive stems. The pattern of diminutive formation is no longer by suffixation; even in the few forms with -ana which do survive, there is no consonant alternation.

To summarize our analysis of passivization to this point: there are certain alternations between labial and palatal (or prepalatal) consonants which occur when the extension -wa is suffixed to a verb stem, but not when an alternate suffix -iwa is used. The alternate suffixes are analyzed as formally independent units synchronically, i.e. -wa is not derived from -iwa via a rule of i-deletion. Further, there are numerous facts which point to the morphophonological status of these consonant alternations in many languages, including Tswana. It may be that conditioning is fully morphological in some languages, e.g. Zulu. Therefore, we do not feel that Stahlke's fusion analysis of these alternations can be accepted. Morphophonologization of the passive alternations appears to have occurred in the Nguni group, the Sutho group, and in Venda. In the Tsonga group, these alternations have generally been lost through the spread of passivization with -iwa. The situation with respect to velarization in Shona, which is not strictly speaking Southern Bantu, is

\[13\] Stahlke [personal communication] has pointed out that the demonstration of the non-relatedness of -wa/-iwa is crucial to the arguments and analysis proposed in this paper. There are a number of factors which can be used to argue for such a formal independence. First, the patterning with monosyllabic stems mirrors other phonological developments which are directly conditioned by stress considerations. Evidence for the spread of an unrelated -iwa suffix is supplied by the parallels with the spread of the -nana diminutive suffix (see below) which cannot be derived by general rule. Further, there are cases where consonant alternations cannot be derived by general rules of i-deletion, e.g. *imwa > ŋtja in Sutho. There is also the more formal problem that i-deletion, a phonological rule, applies only at a morpheme boundary in certain grammatical categories. We believe that a morphophonological analysis of the alternations is more plausible than a fusion analysis which attempts to make them natural phonological phenomena.
less clear, especially in the Zezuru, Karanga, and Ndau dialects where either explosive \( [pka, bga, m\tilde{a}] \) or fricative velarization \( [pxa, bya, m\tilde{a}] \) occurs. In Manyika and Korekore dialects, the process is sharply diminished, to the extent of practically disappearing in certain areas where \( [pwa, bwa, mwa] \) occur. These facts are summarized in Table 1.

4.2. **Noun diminutiveization.** The second most frequent category in which the consonant alternations under discussion occur is the diminutive of nouns and adjectives. We have already mentioned, however, that in some languages, e.g. Venda, the typically Southern Bantu suffixation of \(-\text{ana}\) does not occur. As in the passive \(-\text{wa}/-\text{w}a\) alternation, several languages also exhibit \(-\text{ana}/-\tilde{\text{n}}\tilde{\text{a}}\) alternations in which the suffixation of the latter avoids the series of consonant alternations. The historical development of these alternations in the diminutive forms parallels their development in the passive. The problematic cases discussed in Section 2 were those nouns which do not end in a back round vowel and which therefore have no source for the triggering of the palatalization process, e.g. Zulu:

\[
\begin{align*}
\text{uphapho} & \quad \text{upha\text{jana}} & \quad \text{'feather'} \\
\text{inkabi} & \quad \text{inkat\text{jana}} & \quad \text{'ox'} \\
\text{inta\text{ba}} & \quad \text{intat\text{jana}} & \quad \text{'hill'} \\
\text{intsumpa} & \quad \text{intsu\text{n}\text{jana}} & \quad \text{'wart'}
\end{align*}
\]

The important fact here is that palatalization of labials occurs irrespective of the final vowel. Rather than arguing for a synchronic analysis which postulates an initial glide \(*-\text{yana}\), these forms point again to the morphological status of palatalization in Zulu. At the point where the phonetic conditioning was lost, the pattern of alternations was extended to include all diminutive forms. Whereas the

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14In most languages, the two diminutive suffixes are completely synonymous. However, in Tswana they are different in nouns referring to animals. \(-\tilde{n}\tilde{a}na\) indicates an animal of small size whereas \(-\tilde{\text{n}}\tilde{\text{a}}\) refers to a young, immature animal, e.g. podi 'goat', podi\tilde{n}ane 'small goat', potsana 'kid'.
### Table 1

<table>
<thead>
<tr>
<th>Group</th>
<th>Major dialects/ languages</th>
<th>Passivization</th>
<th>Conditioning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nguni</td>
<td>Zulu</td>
<td>-wa with palatalization of labial consonants</td>
<td>morphophonological (morphological Z.)</td>
</tr>
<tr>
<td></td>
<td>Xhosa</td>
<td>-iwa with monosyllabic and vowel-initial stems</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Swazi</td>
<td>-iwa</td>
<td></td>
</tr>
<tr>
<td>Sutho</td>
<td>S. Sutho</td>
<td>-wa with palatalization of labial consonants</td>
<td>morphophonological</td>
</tr>
<tr>
<td></td>
<td>Tswana</td>
<td>-wa</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pedi</td>
<td>-wa with Velarization</td>
<td>morphophonological</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-iwa</td>
<td></td>
</tr>
<tr>
<td>Venda</td>
<td></td>
<td>-wa with Velarization</td>
<td>morphophonological</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-iwa</td>
<td></td>
</tr>
<tr>
<td>Tsonga</td>
<td>Tonga</td>
<td>-iwa</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tswa</td>
<td>(occ. with -wa in Ronga)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ronga</td>
<td>-wa</td>
<td></td>
</tr>
<tr>
<td>Shona</td>
<td>Zezuru</td>
<td>-wa with Velarization</td>
<td>?</td>
</tr>
<tr>
<td></td>
<td>Karanga</td>
<td>-wa</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ndau</td>
<td>-wa</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Manyika</td>
<td>-wa</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Korekore</td>
<td>-wa</td>
<td></td>
</tr>
</tbody>
</table>
bilabial is always affected in the passive, since the underlying \( w \) which conditions the alternation is part of the passive extension, the extension of palatalization in the diminutive is historically unjustified. The extension of pattern clearly indicates, however, the morphological character of these alternations.

Palatalization has been further extended in the formation of diminutives in Zulu. Doke (1926) notes that alveolar consonants are optionally affected:

(18) \( \theta h > \theta h \) or \( s \)
    \( d > d \) or \( d j \)
    \( nd > nd \) or \( nd j \)

and \( t \) and \( n \) are always affected:

(19) \( t > t j \)
    \( n > n \)

(21) \( u t h o \) \( u t h w a n a \) or \( u f w a n a \) 'thing'
    \( i s i k h a t h o \) \( i s i k h a t h a n a \) or \( i s i k h a s a n a \) 'time'
    \( i k a t i \) \( i k a t s a n a \) 'cat'
    \( i m i m i f i n o \) \( i m i m i f i n w a n a \) 'vegetables'

Note that \( w \) is retained even if the alternation occurs as in \( u f w a n a \) and \( i m i m i f i n w a n a \). It is perhaps significant that this extension of palatalization occurs in the diminutive, a category which is associated with palatal consonants in other languages, e.g. some Amerindian languages, some Slavic languages, etc. The alternation also occurs in reduplicated diminutive forms:

(21) \( i n dž a \) 'dog'
    \( i n dž a n a \) 'small dog'
    \( i n dž a n a n a \) 'very small dog'
    \( i n dž a n a n a n a \) 'tiny dog'

This situation must be distinguished from that which obtains in Sutho, Tswana, etc. where another type of pattern extension has occurred. Stems which end in back vowels follow the historical pattern described in Section 3.2, but palatalization has been extended throughout the front
vowel stems. Again, this palatalization differs from that found in the passive in that not only labial consonants are affected:

(22) Sutho S. Sutho Tswana
nare natʃana natʃana 'buffalo'
kxha kxhazana kxhazana 'long ago'
podi potsane potsane 'goat'
lemati lematʃana lematʃana 'door'
tswhe ne tswheñana tʃwheñana 'baboon'
lenoŋ lenoñane lenoñana 'vulture'
lehoʃi lehoʃtswhana lexofwana 'palm of hand'
selepè seletswana selɛʃwana 'axe'
setopha setoph̩tswhana setophewana 'troop'
thebazè thebazana thebazana 'shield'
kolobe (kolobeñana) kolɔzswana15 'wild pig'

These are the same alternations which occur in the causative, in some Class 5 forms with prefix le-, and in a few perfect tense forms. This situation is rather complex as the actual consonant alternations are palatalizations due to front vowel, not to a w as in the passive. This explains why the whole range of consonants is affected, not only the labials. However, we still need to explain the labiality of the palatals which result from labial consonants as in kolɔzswana, lexofwana, etc. It is the labiality of these forms which leads Stahlke to his fusion analysis, i.e. b + i → (d)ʒwa, f + i → ʃw, etc. The explanation for this labiality lies simply in a contamination of the pattern of alternations, induced by front vowel palatalization, with the alternations which occur in the passive and elsewhere. That is, palatalization by w is an older process, and since speakers already needed to learn a complex series of alternations involving labial consonants which results in labialized palatals, the labiality of that

15In fact, b often has a non-labialized palatal alternant: kolɔdʒwana - kolɔdʒana.
series is extended to all palatals derived from labials, whether historically justified or not.16

Another fact which points to the non-phonological status of palatalization is the number of exceptions to the process which occur. For example, in Zulu diminutives, some bilabials do not alternate:

(23) impi impana 'army'
    isimbo isimbana ~ isimboana 'digging stick'

There are far more exceptions in the locative (cf. Section 4.3) where palatalization does not occur when expected:

(24) izinquqo eziinquqeni 'cattle'
    impedile empedileni 'medicinal plant'
    iphupho ephiphoni ~ ephiphoni 'dream'

and cases where palatalization occurs but should not:

(25) igama egameni ~ egañeni 'name'
    iqoma eqomeni ~ eqoñeni 'basket'

The criterion of rule opacity is also used to distinguish morphophonological and phonological rules. It is generally asserted that phonological rules tend to be transparent whereas morphophonological rules are opaque, i.e. they are superficially ambiguous. Morphological rules proper may be transparent or opaque. Thus, the substitution of labio-palatal affricates ff, pf: bofa, bofwa or bofwa; thopfwa or thotfwa represents a morphologization of a morphophonological process which increases transparency.

The morphophonological alternations are opaque in two ways. First, in some languages distinct labial input segments have identical output alternations, e.g. Tswana ph and f are tʃh. Second, the palatal consonants may represent underlying palatals or derived palatals, e.g.

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16 This does not represent a rule merger since the rules are still formally distinct. Exactly how these rules are to be formally represented is not an issue in this paper. The question of formal representation is a larger theoretical issue involving the general treatment of complex segments.
Zulu iñdźana (iñdz) 'small dog', intañdźana (intambo) 'small string'; isitjango (isitja) 'small plate', intaţana (intaba) 'small hill'. Similarly, the derived palatals may have distinct sources in categories where the alternations have been extended: iŋkoñana (iŋkomo) 'small beast', inoñana (iñoni) 'small bird' as well as cases of underlying ń. However, the criterion of opacity is not a particularly strong one for determining morphophonological status.

Thus, we claim that the process of diminutive formation in some Southern Bantu languages, especially within the Nguni group, is not a phonological process, but a morphophonological process. A good case could be made for fully morphological conditioning in Zulu where the alternations have been extended to include all noun forms regardless of the stem-final vowel. Our analysis of nouns with back rounded vowels in Tswana, Sutho, etc. parallels exactly our analysis of passives in these languages. There is a similar tendency in both cases to avoid the palatalization by the use of an alternate suffix. However, the palatalization of all final consonants in front vowel noun stems is a formally unrelated phenomenon in these same languages. This front vowel palatalization occurs in other environments in these languages where no change is exhibited in the languages of other groups.

4.3. Other contexts for palatalization. Although the passive form of verbs and the diminutive of nouns represent the categories in which palatalization/velarization is most pervasive in Southern Bantu, similar alternations are less regularly exhibited in other contexts. Doke [1967:94] notes that palatalization also occurs in some noun formations in Zulu, particularly in Class 14, which shows the class prefix uSu-, e.g.:

(26) uSu + ała → utśwala 'beer'  
(Xh. utywala)  
uSu + aní → utśaní 'grass'  
(Xh. utyani)  
umu + ana → uñana 'child'

in which forms a stem-initial vowel causes the prefix-final u- to lose its syllabicit and thereby to elicit palatalization of the prefix labial consonant.
Palatalization also occurs in locative formations in certain languages which form locatives by suffixation. In these cases, labial consonants are palatalized before back rounded vowels when the locative suffix follows, e.g. Zulu:

(27) isiSopho esisopheni 'grass rope'
    isigubu esigudzini 'calabash'
    ingubs engufjeni 'blanket'
    umloko emlokeni 'mouth'
    emlambo emlamdzeni 'river'

Similarly, in Ronga:

(28) nomo nojwen 'mouth'
    ngubu ngubyn 'feast'
    mombo mombyen 'fact'

No alternation occurs before any other vowels or with non-labial consonants. The pattern is thus exactly that of the passives and the diminutive. In many languages, the locative is no longer formed by suffixation; in other languages, it is formed by a suffix which does not condition any alternations, e.g. in Venda, -ni is suffixed directly to the noun stem:

(29) mulamboni 'from the river'
    mbudzini 'on the goat'

4.4. The patterning of nasals. It is necessary to address briefly the general question of how nasal consonants, particularly the bilabial nasal m, are integrated into the series of consonant alternations. The situation is least complex in Nguni where m participates as expected in palatalization, e.g. Zulu:

(30) luma lwnwa 'bite/be bitten'
    thuuma thuwna 'send/be sent'
    umloko emlokeni 'mouth'/(loc.)
    igkombo ingkøfana 'beast'/(dim.)

As was mentioned in Section 4.2, palatalization has been extended to include alveolar consonants within the diminutive paradigm in Zulu. The palatal equivalent of n is again the expected ñ
In the Tsonga group, ē is the normal development from mw, although the passive suffix -wa occurs only in Ronga:

(33) kuma kunēwa/kumiwa 'find'/(pass.)
    homu honēwa 'ox'/(dim.)
    nomo nonwen 'mouth'/(loc.)

A similar situation obtains in the Sutho group:

(34) roma roēwa 'send'/(pass.)
    kʰomə kʰonēwa 'ox'/(dim.)

The range of variation occurring with m plus w sequences is also exhibited in comparative Class 1 and 3 noun forms, e.g.:

(35) *mu-ana 'child'
    Xhosa uñana
    S.Sutho ēwana
    Shona mŋana

17 In some languages, ŋ is also velarized to ŋ, e.g. Tswana:
    feña feŋwa 'be conquered'
    seña seŋwa 'be spoiled'
The problematic forms here are the Sotho, Venda, and Tsonga øw, where we expect ñw, mŋ, and mj respectively, based on the patterning of oral consonants. It is necessary in these languages to postulate an independent, possibly older, rule whereby mw → øw. There is no problem with the reconstructed phonetics of such a situation; similar rules occur independently in many languages outside the area. The fact that w patterns as a velar rather than a labial in such an assimilation is mirrored in its development into velar fricatives and plosives in those languages with velarization processes, e.g. Shona, where we also find mŋ as the alternate of m. The assimilation rule in conjunction with rules of palatalization and velarization thus accounts for all of the alternations which we find within the Southern group. The exact chronology of development, including the question of whether mw → øw preceded the development of palatalization/velarization, is a topic for future research.

5. Conclusion

By way of summary, there are a number of points which have been established during the course of this brief paper. First, within the framework of the Southern Bantu languages, an attempt was made to demonstrate that the complex series of consonant alternations traditionally termed palatalizations and prepalatalizations is no longer fully phonological in character. The analysis proposed in this paper is that the processes of alternation are morphophonological in most languages; through the course of time these alternations have come to be associated with particular morphemes and grammatical categories. It is juxtaposition with a particular morpheme and membership in a certain category which determines the alternation synchronically, though the alternations could be described in purely phonological terms. In some languages, a stronger case can be made for fully morphological conditioning, i.e.
the alternations occur context-free within a particular category.18 Numerous types of evidence were cited in defense of such an analysis which included the many idiosyncracies and exceptions to palatalization, the phonetic non-naturalness and opacity of the alternations, the non-contiguous conditioning in some languages, the tendency for the alternation-determining suffixes to be lost in the course of time thereby eliminating the alternations, and the over-generalization of the process in certain categories, e.g. the diminutive in Zulu, so that the alternation receives a fully morphological status. Additionally, there are other facts, relating to the non-transfer of these alternations to sequences of labial consonant plus w in foreign language learning [A. Nkabinde, personal communication], the patterning of these alternations in language games, and the possibility that sound symbolism may account for their spread in certain categories, which point to the non-phonological status of palatalization.

It was demonstrated that the alternate passive suffixes -wa/-iwa in many languages are not synchronically derived from a single underlying form via a rule of i-deletion. The fact that both forms may occur in certain languages points to the spread of the -iwa form, which was originally limited to monosyllabic stems; this spread is possibly motivated by the desire to avoid completely the complex series of alternations. The development of an alternative diminutive suffix -ñana is explained in similar fashion. The situation with respect to the decline of palatalization in the locative and other categories is more complex, but the result is the same, viz. the alternations tend to be lost through change.

The history of palatalization in Southern Bantu parallels the general direction of change proposed by Dressler [to appear]. That is,
phonological rules become morphophonological rules which may ultimately become morphological rules. Of course, in many developments a phonological rule does not pass through a morphophonological stage in becoming morphological. Morphological rules are phonologically context-free; there is a tendency for the opacity of morphophonological rules to be lessened in morphologization as was seen in the example of labio-palatal affricates \( f\), \( b\), etc.

The particularly problematic cases in Tswana examined by Stahlke were shown to involve two distinct series of palatalizations. The second of these, which is of a different nature than "palatalization by \( w\)" occurs in the causative, with front vowel stems in the diminutive, etc. The fact that labial consonants give rise to palatals with labiality led Stahlke to a fusion analysis since there is no underlying \( w\) to explain the labialization in these cases. However, we proposed that the labialization in these cases is to be explained by reference to the older series of consonant alternations, which do involve an underlying \( w\) or back rounded vowel. That such a contamination could occur points again to the non-phonological status of the older series of alternations.

The reconstructed phonetics of palatalization needs to be worked out in much greater detail than the sketch presented within this paper. We also need to establish the relative chronology of palatalization and the rules with which it interacts and to determine, for example, whether the nasal assimilation rules \( m \rightarrow n / \_w\) in Sutho, Venda, Tsonga represent shared or parallel innovations. While it may be possible to find satisfactory answers to the above questions, there will remain the most important question of why incompatibility between labial consonants and \( w\) developed originally. The issue of actuation is, of course, one of the most vexing issues in any historical study.

Although we feel that a fusion analysis cannot be accepted for the palatalization of labials in Tswana or most of the Southern Bantu languages, this paper does not claim to cast any doubt on the general validity of the process of phonological fusion. As was stated in Section 1, there are numerous cases of vocalic and suprasegmental fusion which seem particularly well established. Cases of consonantal fusion involving two consonants also exist, but they are less frequent than the above types
and are often less convincingly argued. The issue of consonantal fusion is examined in some detail in Herbert [1977]. What does seem questionable at the present time is that fusion of segments which do not share any major class features might occur. For example, Stahlke's analysis of Tswana data involves a fusion of underlying consonants and vowels.

There are, of course, numerous cases where glides fuse with both consonants and vowels in various languages. This is fully expected since glides exhibit properties of both consonants and vowels. For example, Sasse [1976] notes that certain palatalized consonants arise from sequences of consonant plus palatal glide and that some labialized consonants derive from sequences of consonant plus w. In this respect, the palatal consonants which we have examined in this paper do represent a fusion since, as was mentioned in Section 3.1, the labiality runs throughout the consonant articulation. However, this is a very different type of fusion than that proposed by Stahlke who accounts for the palatality of these consonants by the fusion of a labial consonant with a palatal vowel or glide. None of the coalescence processes surveyed by Clements [1976], apart from a citation of Stahlke's Tswana analysis, involve fusion of opposing major classes. The fusion of segmental and suprasegmental units, e.g. tones, nasality in some languages, etc., is a fusion of a very different sort; it may be best to regard this phenomenon as a "formal association". Many more cases need to be examined before this limitation on segmental fusion can be considered established. It is presented here as a profitable direction for further research.

REFERENCES


