2.2.4.0 Some Natural Classes of Vowels

Support for our classification of vowels is rendered by their restriction, in some cases, to particular morphemes, environments or processes.

2.2.4.1 Vowel-Commencing Radicals

Only [-high] vowels, i.e. /a/, /e/ and /o/ occur as the initial vowel of such radicals, /i/ and /u/ never occur in this environment.

(14). Examples:
   ūk'wákha "to build" [u[ku[[akh]a]]]
   ukwenza "to do, make" [u[ku[[enz]a]]]
   ukósa "to roast" [u[ku[[om]a]]]

2.2.4.2 Noun Prefixes

The high vowels of the basic noun prefixes are optionally deleted in conversational Zulu. In most descriptions of Zulu, mention is made only of the deletion of the basic noun prefix vowel of classes 1 and 3, where such deletion is obligatory. Here are examples of this obligatory deletion, which occurs when the root is disyllabic or longer:

(15). ūmfána "boy" cf. ūmufó "stranger"
   ūmthwálo "burden" cf. ūmuthí "tree, medicine"

In both classes i.e. 1 and 3, the high vowel /u/ deletes from the basic noun prefix /mu/.

Here are examples of the optional deletion of high vowels in other noun classes:

(16). istímela "train" cf. isitímela
   ukphéndula "to answer" cf. ukuphéndula
   ūbdóda "manhood" cf. ubúdóda
Optional deletion of the high basic noun prefix vowel is a very late phonetic rule. This rule results in phonologically inadmissible consonant clusters such as /st/, /kph/, /bd/ etc. Such clusters do not exist in the phonological component, they exist only in the phonetic component of Zulu.

Optional deletion never occurs in basic noun prefixes incorporating [-high] vowels e.g.

(17). abélungu "whites" never *áblungu
ábafána "boys" never *ábfána
amáphiko "wings" never *ámphiko

2.2.4.3 Loan Words

When foreign words are admitted into Zulu, they are first restructured to fit into the syllable structure of the language. Very little work has been done in the study of loan-word phonology in Zulu (for a preliminary study see Khumalo (1984)), consequently our observations in this section still require amplification by further research. However, the fitting of foreign roots into the syllable structure of Zulu entails mostly the provision of rhymes for those consonants which are perceived as onsets of incomplete syllables. The principles governing the epenthesis of such vowels have not all been determined, but two of them seem clear enough.

In a number of adoptives, the final root vowel is copied onto the majority of the "rhymeless" syllables of the root.
In examples (a), (b) and (d), the final root vowel is copied onto all the syllables that lack rhymes, but in (c), it is copied onto one syllable only (it is not clear why the final syllable takes a different vowel) and in (d) onto two only.

In cases where the root vowel is not copied, labal consonants epenthesize the labial high vowel, while non-labial consonants epenthesize the non-labial high vowel. This epenthesis rule we will term Loan Word Vowel Epenthesis:

(19). Loan Word Vowel Epenthesis

\[
\emptyset \rightarrow [\text{-cons}] / [\text{lab}]^+ \text{hi} / [\text{lab}]
\]

This rule will only apply if no other rule has applied.

(20). Examples:
(a) inabukeni < "napkin"
(b) üsit'åfunesi < "staff-nurse" "a nursing sister"
(c) isidómu < dom (Afrikaans) "a stupid person"
(d) isit'åládĩ < straat (Afrikaans) "street"
(e) isit'åshi < "starch"
(f) ínkotõlíki < 'contract"

Examples (a), (b) and (c) illustrate the epenthesis of the labial high vowel in a syllable containing a labial onset, i.e. /bu/, /fu/, /mu/, while the [-labial] consonants epenthesize the [-labial] high vowel. (The epenthesis of the /i/ vowel to
the initial consonant /s/ in examples (b), (d) and (e) is, however, governed by what Rubach (1984) terms folk etymology i.e. when "Native speakers try to 'discover' their own morphological structure in borrowed words" (p.53). In the case of these examples, the initial syllable, i.e. /s/ of the foreign root is perceived as the consonant of the basic noun prefix of class 7. The /i/ is, therefore, epenthesized because that morpheme in Zulu is /si/).

Our claim in this section is that when vowel epenthesis is phonologically conditioned in loan words, then it is the class of high vowels that is involved in the epenthesis.

2.3 Phonetic Vowels

There are seven phonetic vowels in Zulu. The vowels /e/ and /o/ are realized phonetically either as [+raised] or as [-raised]. The phonetic rule that raises the vowel height of these vowels applies optionally. Let us call this rule Vowel Raising. A [-hi][-lo] vowel is optionally raised if it occurs in a syllable immediately preceding a syllable incorporating either a [+hi] vowel or another [+raised] vowel. This means that we need two rules to account for vowel raising:

(20) \text{Vowel Raising}^1

\[
\begin{array}{c}
\text{rhyme} \quad \text{onset} \quad \text{rhyme} \\
[-\text{cons}] \\
[-\text{hi }] \rightarrow [+\text{raised}] \quad - \quad C \quad (C) \quad V \\
[-\text{lo }] \quad [+\text{hi}] \\
\end{array}
\]

\[
\begin{array}{c}
\text{Vowel Raising}^2
\end{array}
\]

\[
\begin{array}{c}
\text{rhyme} \quad \text{onset} \quad \text{rhyme} \\
[-\text{cons}] \\
[-\text{hi }] \rightarrow [+\text{raised}] \quad - \quad C \quad (C) \quad V \\
[-\text{lo }] \quad [+\text{raised}] \\
\end{array}
\]
In the phonetic script, the usual orthographic letters viz. "e" and "o" represent the raised allophones i.e. [e], [o]; while the unraised allophones are represented by [ɛ] and [ɔ] respectively. Consider the following forms:

(22).

a. uyasëbënza "He works, he is working"
b. akasebënzi "He doesn't work etc."
c. isisebënzi "worker"
d. akâthekelézi "He doesn't tie up ..."

In example (a), the vowels in syllable 2 and 3 are unraised because there is no environment for Vowel Raising. Example (b) has two common pronunciations:

(23).

i. [akasëbënzi]
ii. [akasebënzi]

In (i), only Vowel Raising\(^1\) has applied, while in (ii) both Vowel Raising\(^1\) and Vowel Raising\(^2\) have applied. While the pronunciation [akasêbënzi] (i.e. where no Vowel Raising applies) is possible, it would sound weird. The common pronunciation, of course, is that of (ii).

Like 22(b), (c) would have two pronunciations, but the preference for (ii) is greater here where [-hi][-lo] vowels are flanked by [+hi] vowels:

(24).

i. [isisebënzi]
ii. [isisebënzi]

Example (d) also has two common pronunciations:

(25).

i. [akâthekelézi]
ii. [akathekelézi]
These examples suggest that the preference is for both Vowel Raising\(^1\) and Vowel Raising\(^2\) to apply.

Immediately preceding depressors tend to block Vowel Raising.

(26). Examples:

\[\eta\text{goküdiá} \quad "by eating" \quad \text{NOT} \quad \eta\text{goküdiá}\]
\[\eta\text{gelikabanı} \quad "whose is it?" \quad \text{NOT} \quad \eta\text{ge}kabanı\]

In both examples above, Vowel Raising does not apply.

Long vowels are optionally raised.

(27). Examples:

Š\text{banı} \quad \text{or} \quad \check{\text{b}}\text{anı} \quad "\text{who (plural)}"
\text{či}lámı \quad \text{or} \quad \check{\text{či}}lámı \quad "\text{mine}"

Finally the first position demonstrative for classes 4/9, viz. /Ie/ and the third position demonstrative for class 16, viz. /le/ employ these two vowel allophones distinctively. We know of no other instance of the distinctive use of these allophones. (The underlining "=" represents [+stress]\(^2\))

2.2.5 Conclusion

So far we have been discussing the supralaryngeal features of vowels and glides. As we indicated in Chapter 2, all sonorants are not specified for laryngeal features. A very late phonetic rule which we referred to earlier, redundantly specifies all sonorants [+voiced].

(28). Sonorant Voicing

\([+\text{son}] \rightarrow [+\text{vd}]\)

We will defer the discussion of certain [+dep] vowels and glides to the section dealing with depressors.
3. **Nasals**

There are three phonological nasals viz. the bilabial /m/, the alveolar /n/ and the palatal /ŋ/. In Zulu orthography, the palatal nasal is represented by the digraph /ny/, and we will use this representation in most instances.

Phonetic nasals, on the other hand, are five in number with the addition of a labiodental nasal [ɲ] and a velar nasal [ŋ] to the alveolar [n], bilabial [m] and palatal [ŋ]. The first two nasals viz. [ɲ] and [ŋ] occur only in prenasalized consonants, consequently their classification as allophones has some justification. This we will discuss presently. Let us first consider the distinctive features for nasals:

![Feature Table](image)

The feature [+nasal] distinguishes nasals from all other segments in the language, while the features [anterior] and [coronal] distinguish the three phonological nasals. Here are three roots incorporating each of the nasals above:

(30).

- **imali** [imâli] "money"
- **in'yôka** [înô:ka] "snake"
- **inalâ** [ina:la] "plentiful harvest"

The phonetic nasals are illustrated in the following nouns:

(31).

- **in'gâne** [înganê] "child, baby"
- **in'kôsi** [înk'ôsi] "chief, king"
- **ímífene** [împf'înt] "baboon"
- **îmûî** [îgâvu] "sheep (sing.)"
As we previously stated, the nasals [ŋ] and [g] occur only in prenasalized consonants. We propose that these two nasals be accounted for as outputs of Nasal Assimilation, a rule we have already met. Our claim, which will be discussed in detail when we consider prenasalized stops and affricates, is that prenasalized consonants have an underlying structure comprising at least two components: a [+nas] segmental node and a [-cont] segmental node. The 'nasal' component assimilates to the 'stop' component by delinking from its (the nasal's) place of articulation tier, and linking onto the place of articulation tier of the 'stop'. This rule we met in Chapter 2, but we will reproduce it here for easy reference:

\[(32). \text{Nasal Assimilation}\]

<table>
<thead>
<tr>
<th>Feature Tier</th>
<th>etc.</th>
<th>etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place Tier</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supralaryngeal Tier</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Segmental Tier</td>
<td>[+nas]</td>
<td>[-cont]</td>
</tr>
</tbody>
</table>

Five nasals are the output of this rule, viz. a bilabial nasal [m], a labiodental nasal [g], an alveolar nasal [n], a palatal nasal [ŋ] and a velar nasal [ŋ]. The labial, alveolar and palatal nasals need no discussion now, since they also occur independently. The labiodental nasal [g] occurs with a complex labiodental stop series, [+dep] and [+ej], for which Doke has chosen the signs [ɸ] and [ϕ] respectively. Its occurrence, however, is restricted to this environment. The velar nasal /ŋ/, on the other hand, presents many problems and merits a detailed discussion. In Zulu orthography /ŋ/ is represented by the digraph /ng/, which is confusing since the same digraph represents the prenasalized stop /ŋg/. In the Central Zululand dialect, the nasal /ŋ/, in addition to its
occurrence as the nasal component of the prenasalized 'velar' stop, it is also the dialectal variant of /ŋg/, and it (/ŋ/) is restricted to non-root initial position. According to Kubeka (1979), the nasal /ŋ/ replaces, in non-root initial position, the prenasalized stop /ŋg/ in the Central Zululand and Northern Natal dialects. In the other four dialects viz. the Zululand Coastal, Natal Coastal, Lower Natal Coastal and South Western Natal dialects, there is free variation between /ŋ/ and /ŋg/ in non-root initial position. Let us supply the only forms commonly occurring in the Central Zululand and Northern Natal dialects. The second column will incorporate forms used in the other four dialects as variants to the forms in column 1. All three examples are in phonetic script:

<table>
<thead>
<tr>
<th>Column 1</th>
<th>Column 2</th>
<th>Column 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>/ŋːŋiːsːbɛːnza/</td>
<td>/ŋgːŋiːsːbɛːnza/</td>
<td>&quot;I was working&quot;</td>
</tr>
<tr>
<td>/ŋiːjaboːqa/</td>
<td>/ŋiːjaboːŋqa/</td>
<td>&quot;I thank you&quot;</td>
</tr>
<tr>
<td>/ŋkʊːŋqʊ/</td>
<td>/ŋk'uːŋqʊ/</td>
<td>&quot;mist&quot;</td>
</tr>
</tbody>
</table>

Our claim is that when the nasal /ŋ/ occurs on its own, i.e. not as a component of a prenasalized consonants, then some rule has applied deleting the consonant component of the prenasalized consonant. In all cases of /ŋ/ occurring on its own, an underlying /ŋg/ can be postulated, and the examples in (36), support our claim. The velar nasal /ŋ/, therefore, occurs as the nasal component of a 'velar' prenasalized stop, and where it occurs on its own, then the velar stop has been deleted. In conclusion, we wish to point out that Zulu orthography employs the letter "n" to represent the velar nasal when it is a component of prenasalized stops. This nasal is also the component that occurs in prenasalized clicks, which, as we will indicate later, are also specified [+hi] [+bk] as is the velar nasal. Here are a few examples:
occurrence as the nasal component of the prenasalized 'velar' stop, it is also the dialectal variant of /ɔg/, and it (/ŋ/) is restricted to non-root initial position. According to Kubeka (1979), the nasal /ŋ/ replaces, in non-root initial position, the prenasalized stop /ŋɡ/ in the Central Zululand and Northern Natal dialects. In the other four dialects viz. the Zululand Coastal, Natal Coastal, Lower Natal Coastal and South Western Natal dialects, there is free variation between /ŋ/ and /ŋɡ/ in non-root initial position. Let us supply the only forms commonly occurring in the Central Zululand and Northern Natal dialects. The second column will incorporate forms used in the other four dialects as variants to the forms in column 1. All three examples are in phonetic script:

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<thead>
<tr>
<th>Column 1</th>
<th>Column 2</th>
<th>Column 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>ɳå:nisbe:nza</td>
<td>ɳgå:nisbe:nza</td>
<td>&quot;I was working&quot;</td>
</tr>
<tr>
<td>ɳijabo:na</td>
<td>ɳgilabo:nga</td>
<td>&quot;I thank you&quot;</td>
</tr>
<tr>
<td>ɳku:ŋu</td>
<td>ɳk'u:ŋu</td>
<td>&quot;mist&quot;</td>
</tr>
</tbody>
</table>

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80.

(34).

a. in'gâne [ĩŋgâne]  "child, baby"
in'kôsi [ĩnk'ôsi]  "chief, king"
inqâmâ [ĩŋqâmâ]  "ram"
in'côma [ĩŋcôma]  "grass for making mats"
i:nxiwa [i:nxiwa]  "abandoned hut"

The deletion of high vowels which was reported in 2.2.4.2 occurs also in prefixes e.g. Subject and Object prefixes. In the Central Zululand dialect, this is very common in the 1st person singular Subject and Object prefix which, in both cases, is /ŋgi/. This occurrence, to the best of our knowledge, has not been reported upon. It results in interesting forms which, to say the least, look strange in the current orthography:

(34)

b. akâng'thaändî [akaŋ'thaändî]  "He doesn't like me"
ang'ândaba [aŋ'ándaba]  "I don't care"

To conclude our discussions of nasals, let us repeat what we stated in our discussion of vowels and glides, viz. that all sonorants are not, as a general rule, specified for laryngeal features and that they acquire their phonetic specification, viz. [+vd] through the application of Sonorant Voicing. The issue of a small class of [+dep] nasals will be taken up later, when we discuss depressors.

4. Liquids

Zulu has only one liquid viz. the lateral /l/. To distinguish this segment, we require only two features viz. [+lateral] and [+sonorant]. The liquid /r/ of English and the vibrant of Afrikaans were both initially perceived as /l/, hence the following loan-words:
Now, however, the Zulus have incorporated the trill /r/ into their phonemic system. Still, it presents a problem of analysis since the Zulus have not managed to give it one phonemic classification. In some environments /r/ is perceived almost as a voiced fricative while in others it functions as a liquid. It is in root-initial position where /r/ functions as a voiced fricative: it is extra low-toned and it functions as a regular depressor. Some resonants in specified morphemes behave like depressors as we shall see later, but /r/ differs from them in that it is specified [+dep] in a regular environment in all affected morphemes. In terms of the principle of consonant harmony described in the previous chapter, we will classify /r/ in root-initial position as an opaque segment, underlyingly associated to the laryngeal node dominating a [+dep] feature:

(36).

<table>
<thead>
<tr>
<th>Feature Tier</th>
<th>Laryngeal Tier</th>
<th>Segmental Tier</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+Dep</td>
<td></td>
</tr>
<tr>
<td>is admissible</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>r</td>
<td>root</td>
</tr>
</tbody>
</table>

Here are some examples of /r/ in this environment:

(37).

- i:phálishi < "porridge"
- isikolóbho < skrop (Afrikaans) "part-time job"
- isítaládi < straat(Afrikaans) "street"
The first example clearly demonstrates that /r/ in this position functions like a depressor. The root /rayisi/ is underlyingly 'untoned', but the high tone associated to the noun prefix shifts, by a general rule we will encounter in Chapter 5, to the ante-penultimate syllable of the root viz. /ra/. But this happens to be a depressed syllable. The high tone is then shifted by Depressor Shift to the following syllable which does not incorporate a depressor. This syllable has already been lengthened by Prepausal Lengthening, and it already is associated with a low tone, consequently the tone on this syllable becomes a high-low tone cluster. (All these rules will be discussed in detail later; here we quote them just to make our point about the segment /r/). The root of the third example is low-toned like that of the first example, and the same rules apply as in the first example, excepting that Depressor Shift is blocked from applying since the following syllable also incorporates a depressor viz. /bh/. The high tone on /r/, therefore, is realized as a low-high cluster, as is that on /ro/ in the second example.

At the point of contact of Zulu and the donor languages, these three nouns would possibly have been rendered as:

\[
\begin{align*}
\text{ilayfisi} & \quad \text{"rice"} \\
\text{ilo kwwe} & \quad \text{rok (Afrikaans)} \\
\text{ilobhodi} & \quad \text{robot ("traffic-light"} \\
\end{align*}
\]

In fact Zulu speakers use the first two forms. The third word is a late entry into the language, consequently it has undergone little restructuring (even those Zulu speakers who substitute /l/ for /r/ in the first syllable do not, as a general rule, apply consonant harmony to the root).

To get back to our main argument, /r/ in non-root initial position functions as a regular liquid: it is voiced, it is a non-depressor and it is a transparent segment:
(Nowadays, the noun Mary is rendered /hMeri/). The second example illustrates that /r/ in non-root initial position is neutral to consonant harmony.)

With older Zulu speakers, an interesting phenomenon regarding the sequencing of /l/ and the new phoneme /r/ manifests itself in the following examples:

(40).

<table>
<thead>
<tr>
<th>Old Zulu</th>
<th>Modern English</th>
</tr>
</thead>
<tbody>
<tr>
<td>frolí</td>
<td>&quot;lorry&quot;</td>
</tr>
<tr>
<td>i'Khoréla</td>
<td>&quot;cholera&quot;</td>
</tr>
<tr>
<td>ŬFrolâ</td>
<td>&quot;Flora&quot; (a proper noun)</td>
</tr>
<tr>
<td>ŬRólense</td>
<td>&quot;Lawrence&quot; (a proper noun)</td>
</tr>
</tbody>
</table>

These two segments which the older Zulu perceived as 'the same' were, however, different in that the /r/ was new and complex, and we guess that that was the reason why it was always moved to precede the easier /l/ whenever the two were in adjacent syllables. This, we want to emphasize, is only a guess; we couldn't pursue the phenomenon any further.

The feature [-nasal] distinguishes /l/ and /r/ from other [+cons] sonorants, while the feature [+lateral] may be used to distinguish /l/ from /r/, should the need arise.

In most treatments of Zulu segments (cf. Lanham (1960), Cope (1966), Louw (1962)), the segment /r/ is left out of the analysis because it "is a sound foreign to Zulu, and usually occurs only in words borrowed from a European language." (Louw 1962: 57). The large number of loan-words in which it is now regularly employed, however, forces us to recognize it as a segment of the language - as much a part of it as the loan-words are.
Let us conclude this discussion of /l/ and /r/ by indicating that the trill /r/ is also found in a few native exclamatory or onomatopoeic words such as:

\[ (41) \]

- `phr` - representing the flying of a bird
- `ndr` - representing the flying of a bird

5. **Non-Click Stops**

The following distinctive features would distinguish non-click stops:

\[ (42) \]

| continuant | - | - | - | - | - | - | - | - | - | - |
| sonorant   | - | - | - | - | - | - | - | - | + | + |
| aspiration | - | - | - | - | - | - | - | - | + | + |
| anterior   | + | + | - | - | + | + | + | - | + | - |
| coronal    | - | + | - | - | + | - | - | - | + | - |
| labial     | + | - | + | - | - | + | - | - | + | - |
| aspirated  | - | - | - | + | + | - | - | - | + | - |
| depressed  | - | - | - | - | + | + | - | - | + | - |
| high       | - | - | + | - | - | + | - | - | + | - |
| back       | - | - | + | - | - | + | - | - | + | - |

The feature `-cont` distinguishes stops from all other segments while the feature `-aspiration` distinguishes click stops from non-click stops. All the other features we have discussed elsewhere. The tongue-body features [high] and [back] are not distinctive for stops, but we have included them in (42) because we will need them later for cross-classifying velars and clicks.

The classification of stops into types is best done in terms of their laryngeal features. According to this classification, there are three stop types, viz. unspecified
steps, aspirates and depressors. Each type in turn has three members arrayed on different nodes in the place of articulation tier. These are the bilabial [+ant] [-cor]; the alveolar [+ant] [+cor]; and the velar [-ant] [-cor]. Later on in this discussion, we will consider some severe constraints on the distribution of velar stops, which velars share with clicks. Now let us turn to a discussion of each stop type.

5.1 Unspecified Stops

There are two types of unspecified stops, viz. ejectives and lenis-voiced stops.

5.1.1 Ejectives

Doke (1926) introduces each ejective by stating "The ejective form ... is ... found after 'n' [n] ... Also found apart from 'n' in a restricted number of words" (p.8). Apart from their occurrence in nasal clusters, as Doke indicates, ejectives occur mostly in ideophonic words and, of course, lately in loan-words from English and Afrikaans. Some analysts, e.g. Louw (1962) have reported a great deal of variation in the ejection of these stops. Doke (1926) states: "It is noticeable that when emphasis is required, the ejection becomes very pronounced. In ordinary speech, however, to the untrained ear, the ejection of the explosives is scarcely perceptible" (p.47).

Our claim is that this ejection is a phonetic feature supplied by a late rule in the language. This rule, to which we have referred earlier, we term Ejection.

(43) Ejection

[-suct] [+ejected]
[-cont]
[-son] [-esp] [-dep]
This rule supplies an unspecified non-click stop with the phonetic feature [+ejected]. This rule, as we shall see later, will also apply to unspecified affricates. Here are some examples of ejective stops:

(44).

- umákh'ot'i - "bride"
- ukúk'ak'a - "to surround"
- úp'et'e - "knock-kneed person"
- úp'at'a - "grain preserved underground"
- úkut'áp'á - "to collect" (honey, ochre etc.)

No constraints apply to the distribution of \([t']\) and \([p']\), but \([k']\) requires some discussion.

The majority of Zulu dialects (four out of six, to be exact, with the remaining two displaying some variation according to Kubeka 1979: 135) restrict the occurrence of \([k']\) to root initial position.

In all dialects root-initial \([k']\) may recur.

(45). Examples:
- a. ukúk'ak'a - "to encircle, surround"
- b. íp'íki - "pick-axe"
- c. Qí't'áket'á - "nervousness, weakness"
- d. ukúhleka - "to laugh"
- e. ík' át'i - "cat"

In the examples above \([k']\) occurs root initially in examples (a) and (e), and in example (a) in recurs in the second syllable of the root. In examples (b), (c) and (d) however, it is the lenis-voiced \(/k/\) that occurs in the non-root initial environments. As we shall see a little later, it is all the [-son] velar stops (i.e. the ejective, the aspirate and the depressor) that are restricted to root-initial position, unless recurring. Let us express the morpheme structure condition stipulating this distributional fact in the form of a negative condition termed the Velar Constraint.
(46). Velar Constraint

$$\begin{align*}
\text{CV Tier} & \quad \begin{array}{c|c|c|c|c}
\text{C} & \text{(C)} & \text{V} & \text{C} & \text{X} \\
\text{[-cont]} & \text{[-cont]} & \text{[-ant]} & \text{[-bk]} & \text{[-cor]} \\
\text{[-son]} & \text{[-son]} & \text{[-son]} & \text{[-son]} & \text{[-son]}
\end{array}
\end{align*}$$

is inadmissible unless the root-initial consonant to the left is also root-initial and another velar stop.

The velar prenasalized stops and unspecified clicks are exceptions to this constraint.

This constraint bars a [-son] velar stop from occurring in non-root initially unless the root-initial syllable incorporates another velar stop. Since the condition is iterative, it would admit all of the following examples:

(47).

a. iːgogōgo - "paraffin (kerosene)"
b. isikhúkhukhu - "species of edible river-nettle"
c. ukúk'ik'íza - "to ululate"

By restricting the feature [-son], the Velar Constraint permits the lenis-voiced velar stop /k/ to occur non-root initially (it is specified [+son]) without restriction. Yet the same stop is restricted in its occurrence in root-initial position: it may only occur morpheme-initially with monosyllabic forms. This morpheme structure condition will be expressed in the form of a Voiced Velar Constraint.

(48). Voiced Velar Constraint

$$\begin{align*}
\text{CV Tier} & \quad \begin{array}{c|c|c|c|c}
\text{C} & \text{(C)} & \text{V} & \text{C} & \text{X} \\
\text{[-cont]} & \text{[-cont]} & \text{[-ant]} & \text{[-bk]} & \text{[-cor]} \\
\text{[-son]} & \text{[-son]}
\end{array}
\end{align*}$$

is inadmissible

This negative condition bars the root-initial occurrence of the voiced velar stop /k/, where the root is disyllabic or longer.
This accounts for the occurrence of this segment in the verbal root /ke\(^5\)/ and in all other monosyllabic forms.

Two Zulu dialects, however, violate the Velar Constraint, according to Kubeka (1979). In these dialects, the ejected velar stop occurs non-root initially, in environments where, in other dialects, the lenis-voiced velar stop occurs. For the Lower Natal Coast dialect, he explains that "probably this usage stems from the influence of Xhosa\(^6\), in view of the region's proximity to the Transkei." (p.120). For the South Western Natal dialect, he states "Again this is possibly explainable in terms of Xhosa influence from the Transkei" (p.124).

Here are some examples that illustrate the points under discussion. The examples are arranged into two columns. Column 1 illustrates the only pronunciation of the majority of Zulu dialects while Column 2 illustrates the second possible pronunciation of the Lower Natal Coast and South Western Natal Dialects.

<table>
<thead>
<tr>
<th>Column 1</th>
<th>Column 2</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>ūku-phākā</td>
<td>ūku-phāk'a</td>
<td>&quot;to dish up&quot;</td>
</tr>
<tr>
<td>ukūzīt'fāk′a</td>
<td>ukūzīt'fāk'a</td>
<td>&quot;to indulge oneself&quot;</td>
</tr>
<tr>
<td>i-p'īk'i</td>
<td>i-p'īk'i</td>
<td>pick &quot;pick-axe&quot;</td>
</tr>
<tr>
<td>phāk'athī</td>
<td>phāk'athī</td>
<td>&quot;Inside&quot;</td>
</tr>
</tbody>
</table>

It should be noted that the usage of ejective [k'] in place of the lenis-voiced /k/ is a preference in these two dialects, and that "this does not imply that the lenis velar plosive is ruled out altogether." (Kubeka 1979: 120). Kubeka, of course, means that the lenis voiced /k/ is not ruled out altogether from occurring in non-root initial position. In other words, some speakers of these two dialects still abide by the general Velar Constraint stated earlier.

Finally, it is worth noting that ejective stops are barred from occurring in monosyllabic roots and in affixes.
5.1.2 Lenis-Voiced Stops

A number of analysts have aligned the stops /b/ and /k/ and specified them lenis-voiced.

Lanham (1960) puts up a strong case for the phonetic alignment of these two stops: "At first sight, the alignment of /k/ with /b/ appears unlikely, because audible injection is never heard in any representation of /k/ and current phonetic studies make much of the injection associated with /b/. In fact, however, many representations of /b/ reveal very strong similarities in representation in that both are voiced throughout and the occlusion is broken with very little flow of air either in or out of the mouth." (p.41).

Other facts which argue for the alignment of these two stops are:

1. They are the only two voiced stops that do not function as depressors.
2. They are, as we saw in Chapter 2, the only stops that are neutral to consonant harmony.
3. Unlike ejectives, they occur in monosyllabic roots, and they also co-occur with click stops.

Here are a few examples of some of the points we have been making about these two stops:

(50). Examples:

a. ukuhlakilela "to weed" cf. ukugamela "to approach threateningly"
b. ukubolokha "to lend/borrow" cf. ukubhoboka "to have a hole"
c. i:bhakade "bucket"
d. i:gasade "lod of soil"
e. i:ke kafika "they once came"
f. u:na nguthishá "he will be a teacher"
g. uk:xeke "to criticize"
h. ukugxoba "to trample"
In the first examples in (a) and (b), the high tone surfaces on the antepenultimate syllable because the stops /b/ and /k/ are non-depressors, but in the second examples the high tone is shifted by Depressor Shift and it clusters with the low tone in the next syllable. Examples (c) and (d) illustrate the occurrence of /b/ and /k/ as 'transparent' segments; (e) and (f) illustrate their occurrence in monosyllabic roots while (g) and (h) illustrate their co-occurrence with clicks in roots.

5.2 Aspirates

In Chapter 2, it was demonstrated that the root feature [+ASP] spreads to all stops within a root excluding /b/ and /k/. It was also pointed out that the feature [+ASP] does not spread onto a non-root initial velar unless the root initial stop is also a velar. No explanation was offered then and the reader was referred to this section for explanation. The answer, of course, is provided by the Velar Constraint; in other words, any non-root initial velar, that occurs without another velar in root-initial position is specified [+son] and thus exempt from consonant harmony. Consonant harmony will only apply to root initial or recurring velar stops in a laryngeally specified root.

(51). Examples:

isikhova  "owl"
i:khikhki  "pocket"
i:khákhakhka  "species of thistle"

Some analysts have misunderstood the constraint that applies to [-son] velar stops viz. the Velar Constraint. To most, the constraint applies only to the stop /kh/ which, in their analysis, is restricted to root-initial position (no-one else, to our knowledge, has described this as a constraint on all [-son] velar stops). In these analyses, the stop /kh/ is restricted to root-initial position without possibility of
recurring. A recurring /kh/, therefore, has to be accounted for by a process different from that applying to a root-initial /kh/: "Assimilation of kh:
kh occurs normally only in the first syllable of a stem; if a kh occurs in another syllable, it is the result of assimilation to the kh of the stem syllable, e.g. -khokha (take out) instead of *-khoka
ukhakhayi (top of skull) instead of "ukhaskayi (cf. Xhosa)" (Ziervogel 1967: 172).
In our analysis, Consonant Harmony and Velar Constraint would account for the derivation of roots in the above quotation and this avoids the complication of introducing an assimilation rule.
Velar Constraint, however, is limited to velar stops, and no distributional constraints apply on the other aspirates:
(52). Examples:
isiThupha "thumb"
ukuphutha "to miss"

5.3 Depressors
It is difficult to give a clear picture of depressor stops in the absence of a full description of depressors in general and of the intersection of tonal and segmental material in the makeup of such segments. Let us then, digress onto a full description of depressors in general, and of their relationship to tone before returning to a discussion of depressor stops.
Let us use a rather lengthy quotation from Cope (1966) to lay the ground for our discussion of Zulu depressors:
"The influence of phones on tones has been noticed and discussed by all investigators of Nguni tonal systems: Beach, Tucker, Doke, Lanham, Rycroft and myself, in particular the lowering effect of depressors. This phenomenon seems to be peculiar to Nguni languages within Southern Bantu, for it is not reported in the Suthu or the Shona languages nor in Venda"
However, it is not limited to the Nguni languages within the wider field of Bantu, for Carter reports it in Plateau Tonga; nor to Bantu itself, for Welmers reports it in Kpelle, a Liberian language. These scholars attribute the influence of depressors to inherent low toneme.

Carter writes that the consonants are lower in pitch than preceding or following high vowels, so that the preceding high tones and following tones become rising tones. Welmers transcribes /b, d, g, v, z/ as /'p, 't, 'k, 'f, 's/, for it is unnecessary to indicate both the quality of heavy voice and the low toneme. For this reason, Beach comes to the opposite but equally valid conclusion for Xhosa, and decides to differentiate between the two phones thereby causing the two tones to become members of the same toneme, rather than to differentiate between the two tones thereby causing the two phones to "come members of the same phoneme!" (p.62).

Even though Cope (1966) does not, himself, accept the association of a depressor with an inherent low tone, "Vowels bear tonemes in Zulu, but not consonants" (p.67), the majority of analysts do. "This prosodic feature (depression) comprises 'breathy voice' phonation for the vowel onset (or throughout the vowel if the tone is low), linked with simultaneous lowered pitch realization." (Rycroft 1980:9) "Depressors are voiced consonants with an inherent low tone." (Lanham 1960: 89).

An instrumental investigation into Zulu depressors is reported in Traill et al. (forthcoming). In the production of depressors, the majority of subjects employed a distinctive supra-glottal gesture which "induces an unusual degree of shortening of the vocal chords with a consequent lowering of their rate of vibration. Obviously, in the case of speakers do not use this mechanism for depression, the same degree of shortening and pitch reduction can be achieved with other musculature" (Traill et al. (forthcoming)).
We employ the phonological feature [depressed] to represent the laryngeal feature, and also associate the depressor with a low tone (whose phonetic realization is 'extra-low') to capture the 'pitch reduction' feature.

The question may arise, however, whether this low tone should be associated to the depressor or to the following vowel. Traill et al. (forthcoming) report that "there is some evidence that the maximal 'depression gesture' takes place even before the vowel begins... the pitch of voiced fricatives dips noticeably at the mid point of the fricative and then rises for the remainder of the fricative, continuing its rise into the following vowel." They continue, "the second bit of evidence which suggests that the depression adjustment is located within the consonant comes from fiberoptic views of the larynx during the production of depressors ... This gesture takes place during the consonant and it ceases at its release" (Traill et al. (forthcoming)).

The additional statement that "this adjustment is associated with extra-low pitch" convinces us of the wisdom of associating the low tone to the consonant, rather than to the vowel. The characterization of this tone as 'extra-low' is crucial for an understanding of the surface forms of adjacent low tones. (Low tones in the environment assimilate to the extra-low tone quality of this tone). However, these and other tonal rules will be discussed at length in Chapter 5.

To get back to our description, recall that in Chapter 2 we characterized a depressor as a consonant that was underlyingly associated to a laryngeal node dominating a [+dep] feature.

(53).

\[
\begin{array}{c}
\text{CV Tier} \\
\text{Laryngeal Tier} \\
\text{Feature Tier} \\
\end{array}
\begin{array}{c}
C \\
\end{array}
\begin{array}{c}
[+\text{dep}] \\
\end{array}
\]
This representation, as should be obvious now, is an incomplete representation of a depressor, as it does not represent its underlying association to a low tone. This is done by associating the depressor to an unspecified node in the tonal tier. When tone default rules apply, they will specify the tone as a low tone:

\[(54)\]

| Tonal Tier | L |
| CV Tier    | C |
| Laryngeal Tier |  |
| Feature Tier | [+dep] |

The laryngeal features and the low tone of a depressor always spread onto the tautosyllabic vowel to the right.

\[(55)\] Depressor Assimilation

| Tonal Tier | L \rightarrow T |
| CV Tier    | X \rightarrow C \rightarrow V |
| Laryngeal Tier |   |
| Feature Tier | [+dep] |

Depending on the tone associated to the vowel, the two tones now associated to this short vowel are either LH or LL. Tone Simplification - a process that applies when more than one tone is associated to one tone-bearing unit - does not apply to this extra-low tone which, let it be remembered, is associated to the consonant. The LH and LL clusters incorporating this extra-low tone surface as such, the former manifesting itself as the much described rising or upgliding "allotone of the high
toneme" (Lanham (1960), Cope (1966), Khumalo (1981) etc.), and the latter as the "lowered allotone of the low toneme" (Cope 1966) or the "unraised allotone of the low toneme" (Khumalo (1981)).

The failure of Tone Simplification to apply to a LH tone sequence leads to the rule that spreads the high of a LH tone cluster on a short vowel to the syllable to its immediate right. This rule has generally been referred to as the Tonal Displacement rule, but it might be better characterized as the Depressor Shift rule.

(56). Depressor Shift

The rule dissolves a low-high tone cluster by delinking the high tone from the vowel to which it is associated, and linking it to the vowel of the following syllable.

(57). Examples:

izihlalo: "chair" of isihlalo "chair"
i:bhakade: "bucket" of i:phakethe "packet"
izilabelele: "they sang" of sihlabelele "it sang"

When, however, the following syllable also incorporates a depressor, then the high tone cannot spread onto such a syllable without violating the Crossed Lines Constraint.
In such a case then, as in others that will be discussed in Chapter 5, the Low-High tone cluster is co-articulated with the short vowel, resulting in what is usually referred to as a rising or upgliding high tone, e.g. (59).

\[ \text{izigodi } \] "districts" cf. \( \text{isigodi} \)
\[ [-/ -/] \]
\[ (\text{isigodi}) \]

We are not the first to suggest a LH cluster interpretation of rising high tones. Lanham (1960) proposed this interpretation for all Zulu, Swazi and Ndebele rising high tones, but his motivation was different from ours. He claimed that all rising high tones in Xhosa should be interpreted as allotones of the high tone conditioned by depressors. But in the other three languages he claimed that some rising tones were the result of "the clustering of the low toneme of the copulative or adverbial prefix with the high toneme of the first syllable of the noun and this cluster is represented by a rising glide on a short peak vocoid" (p.110). Lanham then classifies all rising high tones in these three languages as LH clusters because ".from the aspect of descriptive simplicity - there appears to be no possibility of affording rising glides conditioned by depressors any different treatment from those that represent LH." (p.111).
Later on in this section, we will return to unnam's analysis and demonstrate that in those examples a uniform analysis can be provided which interprets all rising tones as LH clusters conditioned by depressors and occurring in short [+dep] syllables.

Before going to other types of depressors, then, let us conclude this section by restating that a regular depressor is a consonant that is underlyingly associated to the feature [+dep] and also to a low tone. These segments in Zulu are: /bh, d, g, gc, gq, gx, v, z, dl, hh, j/. To this list must be added /r/ in root initial position and all prenasalized consonants associated to the feature [+dep], viz. /mb, nd, ng, ngc, ngq, ngx, mv, nz, ndl, nj/.

However, there are other segments which are not regular depressors, but which in special environments function as depressors. Such segments are either lexically associated to the [+dep] feature and a low tone in those special environments, or they are associated to the [+der] feature and a low tone by a morphological process. These segments are discussed extensively in Khumalo (1981: 75-77), and in this section we will fit only a few examples into the present analysis.

As an example of a segment underlyingly associated to the feature [+dep] and a low tone, let us use the oft-quoted root-initial /m/ in the noun ñámá - "mother" (60).

| Tonal Tier | H | L | H | L |
| CV Tier | V | C | V | C | V |
| [±hi] | [±nas] | [±lo] | [±nas] | [±lo] |
| [+bk] | [±cor] | [±cor] |
| Laryngeal Tier | |
| Feature Tier | [+DEP] |

u - m - a - m - a
This exceptional association of a non-depressor with the [+dep] feature and a low tone applies only to resonants. If it applied to a non-depressor obstruent it would, of course, result in a regular depressor.

One other example that we wish to discuss is the identificative copulative prefix. A claim is made that the [+dep] feature in this prefix is morphologically conditioned. We wish to reverse our opinion expressed in Khumalo (1981: 75) on this matter. We now believe that the [+dep] feature in these prefixes comes through Depressor Assimilation and then the deletion of the depressor triggering the assimilation. Let us first describe this type of deletion. Some nouns, as we have previously indicated, sometimes delete the consonant of the noun prefix.

(61).

a. i:kl'át'i "cat" ( < ilikati)  
b. uluphaphe "feather" ( < uluphaphe)  
c. izingane "children" ( < izingane)

The deletion of the noun prefix consonant in these three examples is not quite the same. In examples (a) and (b), the noun prefix, in most dialects of Zulu enters the lexicon as a gen.nate vowel, while in a few dialects it is the product of an early allomorphy rule which deletes /l/ in the full noun prefixes when they occur with polysyllabic roots. Like all other allomorphy rules, the deletion of /l/ in the noun prefixes of class 5 and 11 applies very early in the derivation. The deletion of /z/, however, in example (c) is the result of a very late phonetic rule, typical of late phonetic rules in its optional application. The deletion rule that applies, we claim, delinks the 'C' slot associated with the /z/ consonant.

(62). /z/ Deletion
But by the time the /z/ deletes through the delinking of its "C" node, Depressor Assimilation has applied leaving the vowel to the right depressed. Depressor Assimilation is correctly formulated because it does not apply to the vowel to the left. Zulus have no difficulty in distinguishing between /išıngáne/ "children" and /išıngáne/ "they are children."

Now we claim that a similar process applies to the identificative copulative prefix. Our claim is that the underlying form of the identificative copulative prefix is /ng-/. This claim is based on the fact that /ng-/ may occur with all forms excepting those commencing with the vowel /i/.

(63). Examples:

a. [ng[a[ba[ntu]]]] → ngabántu "They are people"
b. [ng[u[baba]]] → ngubábá "It's father"
c. [ng{o[mama]]] → ngomá:má "It's my mother's"
d. [ng[e[ya[mi]]]] → ngeyámi "It's mine"

This prefix does not occur with /i/-commencing forms, e.g. the following derivations are not possible: (64).

a. [ng[i[N[khosí]]]] → *nginkósí "It's the king"
b. [ng[i[silwane]]] → *ngisilwane "It's an animal"

The only environments where /ng/ may not occur are those where it would be immediately followed by the vowel /i/. The identificative copulative prefixes that occur with demonstratives are /yi/ and /ngu/. It is interesting to note that there are dialectal variants /i/ and /u/ to the prefixes /yi/ and /ngu/ as illustrated below: (65).

a. ngũwe or ũwe "It's you"
b. ngũye or ũye "It's him/her"
c. yĩbo or ỹbo "It's them (cl.2)"
d. yĩyo or ỹyo "It's it (cl.9) or It's them (cl.4)"
The data presented in (63), (64), and (65) support the postulation of /ng/ as the underlying identificative copulative prefix for Zulu. The analysis would claim its obligatory deletion in the environment of /i/-commencing bases, and an optional deletion elsewhere. Optionally also, after the deletion of /ng/, the remaining vowel, to which Depressor Assimilation has already applied, may occupy both the "C" and "V" slots of the syllable, in which case /i/ surfaces as /yi/ and /u/ as /wu/. Let us term this spread rule High Vowel Spread.

(66). High Vowel Spread

Segmental Tier

[-cons]  [+]hi

CV Tier

Id. Cop. prefix (optional)

The rule states that optionally the high vowel of the identificative copulative prefix spreads onto the "C" slot to its immediate left. There is another form, not generally accepted, used by some Zulu speakers which after the deletion of /ng/, also optionally surfaces with a glide. This is the form commencing with the vowel /o/:

(67). Examples:

womama "It's my mothers"

wobhutí "It's my elder brothers"

Since this form is not generally accepted, we will not spend any more time on it. Here is a table containing all the possible forms of the identificative copulative prefix, excluding /wo/. We will use figures, below, to label the different forms: "1" will refer to those examples where /ng/ occurs; "2" for examples where /ng/ optionally deletes; "3" for examples where the prefix vowel spreads after /ng/ deletion; and "4" for the gloss.
This description of the occurrence of [+dep] in the
identificative copulative prefixes, permits us to give a
uniform description of all the different types of depressors
occurring in Zulu. It also removes all the problems
encountered by Lanham at the beginning of this section.

After this long digression, let us now turn back to the
description of depressor stops. The distributional constraints
that apply to depressor stops are similar to those applying to
aspirates and unspecified stops, i.e. none apply to /bh/ and
/d/, while the Velar Constraint applies to /g/. A slight
refinement, however, is needed in the Velar Constraint in order
to accommodate the fact that a depressor velar may occur in C²
position if C¹ position is occupied either by another velar or
by a click stop. The following examples illustrate this
distribution:

(69). Examples:

- [úgdgo] "grandmother"
- [ukúgithika] "to giggle"
- [ixhegu] "an old man"
- [ukúgu] "to limp"
- [ukúxega] "to be loose"

All we really have to do is to alter the condition of the Velar
Constraint to read: "is inadmissible unless the root-initial
consonant is [+bk] [+hi]" instead of "is inadmissible unless
the root-initial consonant... is also [+cont ; -ant ; -cor ;
-son]". (see (46), in this chapter).
The rule then would reveal the close affinity between velars and clicks. This will be explored at length in the next section where we will be discussing click stops.

Let us conclude our discussion of non-click stops in general and depressor stops in particular by focusing attention on the relationship between place of articulation features and the sequencing of the stops within the root. We have noted that in all three stops, i.e. ejectives, aspirates and depressors, the velars are restricted to root-initial position. This is a restriction that applies generally to [+hi] [+bk] consonants. This would seem to suggest a marked status for such segments in Zulu. The condition, therefore, that restricts velars - and clicks, as we shall see later - to root-initial position may be one that stipulates the occurrence of oral segments in order of their markedness. If that be true, it may offer an explanation for the /r/ metathesis which we met in (40) of this chapter, i.e. the /r/ metathesis reported for some Zulus in the restructuring of adoptives may be explained in terms of sequencing the marked /r/ before the unmarked /l/.

6. Click Stops
6.1 Historical Background

Herbert (1977b) reports that clicks "occur only in certain restricted Southern Bantu languages and in the Khoisan languages, from which they were originally borrowed into Bantu." (p.41.)

What Herbert terms the Southern Bantu languages are the languages which we characterized (in note 6 of this chapter) as the South Eastern zone subgroup of the so-called Bantu family of languages. There is sufficient historical evidence now to support Herbert's claim that clicks came to these languages from the Khoisan languages. Zulu and Xhosa have retained the largest number of clicks - each having the unaspirated-undepressed, the aspirated and the depressed series of the dental, alveolar and lateral clicks. Nasal clusters incorporating some of these clicks also occur in these languages.
6.2 Distinctive Features for Clicks

Only the oral click stops will be considered in this section, the nasal clicks will be discussed under prenasalized stops, together with non-click prenasalized stops. The following are the features needed to distinguish click stops:

(70).

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<th>c</th>
<th>q</th>
<th>x</th>
<th>ch</th>
<th>qh</th>
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</tbody>
</table>

The features [−continuant] and [+suction] are class features, the former assigning clicks to the class of stops, the latter distinguishing them from non-click stops. The feature [+suction] characterizes all segments produced with the ingressive voicing airstream mechanism. In our matrix, the tongue-position in the production of /q/ is specified 'apical', i.e. [−laminal] as opposed to the laminality of /c/ and /x/. We wish to admit that this feature specification is not based on any instrumental analysis of Zulu click sounds, but rather on the impressionistic evidence of a number of mother tongue speakers of Zulu. We are aware that this specification differs from that of !X65 reported in Traill (1985), where the lateral click /x/ is apical and not laminal. We could have got the same distinction by employing the feature [delayed release] as we did in Khumalo (1981), but it is our conviction that the apicality/laminality distinction is more real. The following table illustrates the similarity in the specification obtained either by employing [laminal] or [delayed release].
Clicks have both an anterior and velar closure. The features [laminal] and [lateral] specify the anterior closure while the [high] and [back] specify the velar closure. Since all clicks have a velar closure, all of them are specified [+hi] [+bk].

The laryngeal features [+aspirated] and [+depressed] were discussed in Chapter 2 when we were considering consonant harmony. According to their laryngeal specifications, clicks can be divided into three types, viz. unspecified, aspirates and depressors. Before discussing each type, let us consider some of the distributional constraints on clicks. There are two main constraints on the distribution of clicks, first that only one type of click may occur within a root (i.e. either dental, or alveolar or lateral); second that laryngeally specified clicks (i.e. aspirates and depressors) are restricted to root-initial position unless they recur.

(72). Click constraint

<table>
<thead>
<tr>
<th>Feature Tier</th>
<th>[+dep]/[+asp]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laryngeal Tier</td>
<td>is inadmissible unless the root-initial consonant is also [+suct]</td>
</tr>
<tr>
<td>CV Tier</td>
<td>C V (C V) \ [+suct]</td>
</tr>
</tbody>
</table>

This constraint allows only the laryngeally unspecified
click in non root-initial position when the root-initial consonant is a non-click. If a laryngeally specified click should occur in this position, then it must be preceded by another click. The next constraint ensures that the clicks in a root are identical.

(73). Click Type Constraint

\[
\begin{array}{ccc}
  C & V & C \\
  \{+\text{suct}\} & \{+\text{suct}\} & V \\
  \{\'\text{laryngeal feature}\} & \{\text{laryngeal feature}\} & X \text{ is admissible} \\
  \{\text{laminal}\} & \{\tilde{\text{laminal}}\} & \\
  \{\text{lat}\} & \{\text{lat}\} & \\
  \text{root} & \\
\end{array}
\]

This positive syllable structure condition restricts a laryngeally specified click consonant to root initial position. It further stipulates that if one or more click syllables should immediately follow, then both must be of the same type and they must have the same feature specifications. In other words, the stipulation is that they must be identical clicks. The following examples illustrate the application of this stipulation:

(74).

- **uqhòqhoqho** "windpipe"
- **izinqaqhábezi** "hardy people" [iIN[[qhaqhabez]i]]
- **ukúgcaga** "to get married"
- **inxúxhumo** "restlessness" [i[N[[xhxhur]o]]]

This concludes our general discussion of clicks. Let us now turn our attention to the different laryngeal types of clicks. These are three in number, viz. unspecified clicks, aspirate clicks and depressor clicks. Let us discuss each in turn.
6.3 Unspecified Clicks

No special phonetic realization rule applies to unspecified clicks, consequently unspecified click stops have the phonetic form 'voiceless unaspirated'. (When we discuss prenasalized stops, we will indicate that unspecified clicks in nasal clusters are converted to [+dep] clicks.)

6.4 Aspirate Clicks

In the previous chapter we illustrated how the P-segment [+ASP] is underlingly associated to a click P-bearing unit. We also promised to explain why aspirate clicks were restricted to root initial position. We have supplied the explanation in the form of the Click Constraint. When we discuss prenasalized stops, we will illustrate how click aspirates in nasal clusters are converted to unspecified clicks.

6.5 Depressor Clicks

Depressor clicks have been discussed under consonant harmony. They also are subject to the Click Constraint.

We wish to sum up our discussion of click consonants by pointing out that the clicks in Zulu are a class of velar segments. Non-click velar segments are a marked class of segments hence their subjection to the Velar Constraint. Clicks are more marked than non-click velars, however, because while they are also velar segments, they are, in addition borrowings from another language family.

One last point concerning clicks in general is a distributional fact that we are unable to interpret. In our study of clicks and non-click stops, we were not able to come across any roots where clicks and ejectives co-occurred. As we have just pointed out, we do not know how to interpret this.

7. Fricatives

Here is a table of phonological features for specifying Zulu fricatives:
In some dialects, the voiceless glottal fricative /h/ is replaced by the velar fricative [x]. Examples: (we will represent this velar fricative with /h/ in order to avoid any confusion with the click /x/.

(75).

\[
\begin{array}{cccccccc}
\text{f} & \text{v} & \text{u} & \text{z} & \text{hl} & \text{dl} & \text{sh} & \text{h} & \text{hh} \\
lateral & - & - & - & + & + & - & - & - \\
depressed & - & + & - & + & - & - & + & - \\
anterior & + & + & + & + & - & - & - & - \\
coronal & - & - & + & + & + & - & - & - \\
high & - & - & - & - & - & + & - & - \\
labial & + & + & - & - & - & - & - & - \\
\end{array}
\]

In some dialects, the voiceless glottal fricative /h/ is replaced by the velar fricative [x]. Examples: (we will represent this velar fricative with /h/ in order to avoid any confusion with the click /x/.

(76).

- **Ukúhámba** "to go" cf. Ukuhámba
- **Ukúhóna** "to snore" cf. Ukúhóna
- **Ukúhóya** "to be rough to the touch" cf. Ukúhóya
- **Ukúhódebe** a surname cf. Ukúhódebe

Loan words incorporating the velar fricative are interpreted in terms of the dialectal perception of /h/'s fricative, i.e. in the majority of dialects it is interpreted as the glottal fricative while in the minority of dialects it remains a velar fricative.

(77). Examples:

<table>
<thead>
<tr>
<th>/h/-dialects</th>
<th>h-dialects</th>
<th>source</th>
<th>English gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ukuhóha</td>
<td>Ukuhóha</td>
<td>Jan (Afrik.)</td>
<td>to hurry</td>
</tr>
<tr>
<td>Ochala</td>
<td>Ochala</td>
<td>Garing (Afrik.)</td>
<td>cotton</td>
</tr>
</tbody>
</table>

In some dialects, the velar fricative is favoured in emphatic environments such as the imperative, e.g.

[pámba] "go!"
There is, however, one adoptive where all dialects employ the velar fricative only viz. /ɪhohə/ < gogga (Afrikaans < Khoikhoi) "insect, creeping creature."

The voiceless glottal fricative in foreign roots is sometimes perceived as its voiced counterpart.

(78). Examples:

ihhotela < hotel
i:hhólo < hall

The voiced glottal fricative sometimes alternates with the glottal stop in occupying the empty consonantal slot between vowels in loan-words:

(79). Examples

i:hhóvisi or i?óvisi < office
i:hhápula or i?ápula < apel(Afrikaans)-"apple"
îhhakháwunti or i?akháwunti < account

In native words, the glottal fricatives are restricted to root-initial position, but this restriction seems to have no influence on the tailoring of loan words. For now, we will overlook this morpheme structure constraint and only return to it when the need arises.

Loan-word phonology provides interesting data on the lateral fricative; the foreign consonant cluster /sl/, which has both the 'alveolar' and the 'lateral' features is sometimes perceived as the lateral fricative /hl/:

(80). Examples:

isíhlilingi < sling
isíhluthúlélo < sleutel (Afrikaans) - "key"

The labial fricative in Zulu has both 'dental' (in its point of articulation) and 'labial' features, consequently the interdental voiceless [ʃ̪], when perceived as a fricative, is replaced by the labiodental /f/. We could not find many examples of this retailoring:
109.

(81). Examples:

| infímbolo | "thimble"

The palatal fricative has a dialectal variant [č] in a few dialects:

(82). Examples:

<table>
<thead>
<tr>
<th>majority dialects</th>
<th>minority dialects</th>
<th>English gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>sheshá</td>
<td>[čeča]</td>
<td>&quot;hurry!&quot;</td>
</tr>
</tbody>
</table>
| shayá             | [ćeja]             | "hit, strike!"

As the examples above illustrate, the aspirated voiceless affricate, as a variant of the palatal fricative occurs mostly in emphatic environments such as the imperative.

(Earlier transcriptions of the name of the king who founded the Zulu nation indicate that his name may have been pronounced differently from now, because it is recorded as /Tshaka/ instead of /Shaka/).

In loan words also, English /č/ is perceived as Zulu /ʃ/: '83). Examples:

| iššáši         | "church (of England)" | "Anglican Church"
| f:šádi         | "chart"               |
| ukúshibha      | "cheap"               | "to be cheap"

The question that arises, of course, is why such a restructuring occurs, i.e. why is it that an affricate is perceived as a fricative. The answer seems to lie in the Zulu perception of unspecified segments. Unspecified (non-click) stops and affricates are phonetically [+ejective] while unspecified fricatives, on the other hand are [-ejective]. The palatal affricate /č/ is [-ejective] and so a Zulu perceives it as a fricative, and classifies it as such.

There is little else worth special note in the other fricatives, they correspond to similar fricatives in donor languages in loan-word phonology.
There is one morpheme structure constraint that applies to fricatives. It applies almost unexceptionally in native roots, but in loan words there are a number of exceptions. The condition stipulates that within a root a [+dep] fricative may not immediately precede a laryngeally unspecified fricative. Let us term this constraint the Fricative Constraint.

This negative morpheme structure condition stipulates that a [+dep] consonant within the root may not be immediately followed by a laryngeally unspecified consonant of identical manner feature specification. This condition cannot apply to clicks since only one type of click may occur within a root. The rule also does not apply to non-click stops because if consonant harmony did not apply then the second stop would either be [+son] or a click, in which case the two stops would not be [±manner]. In underlying structures, affricates also do not violate this constraint; only late in the derivations, after palatalization has applied do we get forms that violate this constraint, e.g. (86).

\[ \text{jub} + \text{tw} + \text{a} < \text{jutshwa} \quad \text{"to be commissioned"} \]
This constraint, then, as formulated applies only to fricatives. This constraint explains why phonetic representations incorporate only fricative sequences of similar laryngeal specifications, otherwise we get an unspecified fricative followed by a specified, i.e. [+dep] fricative.

(87). Examples:
- ukúsusa "to remove"
- ĕkúffhla "to hide" (trans.)
- ukúhasha "to praise"
- ukúvůza "to leak"
- ubůdlová "brute force"
- ukúnhñaha "to growl"
- ũkusifza "to help"
- ũkufúza "to resemble"

Minor adjustment rules apply to foreign roots to make them conform to this constraint.

(88). Examples:
- i:hhóvisi < off "e"
- i:fosholo < shovel

In the first example, the fricative /hh/ is employed to occupy the empty consonantal slot between the vowels /i/ and /o/, but since this is a [+dep] fricative, the unspecified fricative /f/ is then converted to a [+dep] fricative also so that the Fricative Constraint is not violated.

In the second example, on the contrary, the [+dep] fricative /v/ in the first syllable is converted to or perceived as the unspecified fricative /f/, and that conforms to the stipulation of the Fricative Constraint.

There are, however, some loan words which, like the final syllable of the first example in (88), violate the Fricative Constraint.

(89). Examples:
- ũhhñfu < half
- i:hhñshí < horse
8. **Affricates**

Affricates, like prenasalized consonants, are complex segments where two segmental nodes are dominated by one "C" node in the CV tier, as illustrated below:

(90).

```
CV Tier

Segmental Tier
```

The difference between the two is that the initial segmental node in an affricate is occupied by an oral segment while in a prenasalized consonant it is occupied by a nasal segment.

In both affricates and prenasalized consonants, the segment of the initial segmental node differs in manner features from the segment of the succeeding node. In the case of affricates, the initial segmental node is associated to a supralaryngeal node which dominates a manner node associated to a [-cont] feature.

(91).

```
Feature Tier [-cont] [+cont]
Manner Tier
Supralaryngeal Tier
Segmental Tier
CV Tier
```

Affricates in Zulu also resemble prenasalized consonants in that they are 'homorganic', which in our framework means that the supralaryngeal tiers of both segments are linked to one place of articulation node.
Affricates on the other hand differ from prenasalized stops in that the two segmental nodes are associated to one laryngeal node, so that affricates are both 'homorganic' and 'homolaryngeal'.

There are nine phonetic affricates in Zulu:

<table>
<thead>
<tr>
<th>Labio-</th>
<th>Alveolar</th>
<th>Lateral</th>
<th>Palatal</th>
<th>Velar</th>
</tr>
</thead>
<tbody>
<tr>
<td>dental</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>unspecified</td>
<td>'ff'</td>
<td>'ts'</td>
<td>'tʃ'</td>
<td>'tʃ'</td>
</tr>
<tr>
<td>depressed</td>
<td>'dv'</td>
<td>'dz'</td>
<td>'dʒ'</td>
<td>'dʒ'</td>
</tr>
</tbody>
</table>

Only four of these affricates viz. /'ts'/, /'tsb'/, [tʃ'], /j/ [dʒ], and /'kl'/ [kk'] occur outside prenasalized consonants, and of the four only the two palatal affricates are
in common usage. Here are some words illustrating these four affricates:

(95).

- *isits'a ko* "gap between front teeth" [ts']
- *út shwa la* "beer, liquor" [tʃ']
- *isí jingi* "pumpkin porridge" [dʒ]
- *ukúk lé sa* "to milk into the mouth" [kx']

Let us conclude our discussion of affricates by illustrating what the feature specification of [tʃ'] and [dʒ] would look like:

(96).

[tʃ']

Feature Tier  
- [-cont]  
- [+cont]

Manner Tier

Feature Tier  
- [+cor]  
- [-ant]

Place Tier

Supralaryngeal Tier

Segmental Tier  
- [-suct]

Laryngeal Tier

Feature Tier

The feature [-cont] classifies the initial root segment as a stop. The feature [-suct] tells us this is a non-click stop. The feature [+cont] tells us that the second root segment is a fricative. The complex segment is [-ant] [+cor] in other words a palatal, and the fact that the laryngeal node
dominates no features tells us that this complex segment is laryngeally unspecified, which means Ejection will apply. Now we have identified the palatal affricate [tʃ й].

(97).

Feature Tier
[-cont] [+cont]

Manner Tier

Feature Tier
[+cor] [-ant]

Phonation Tier

Place Tier

Segmental Tier
[-suct]

Supralaryngeal Tier

Laryngeal Tier

Feature Tier

[+DEF]

The only difference between the feature specification for [tʃ й] and [dʒ] is that in the latter the laryngeal node dominates a [+dep] feature, which then classifies [dʒ] as a depressor.

9. Prenasalized Consonants

Prenasalized consonants are of two major types: prenasalized stops and prenasalized affricates. Underlyingly, we claim, prenasalized consonants are clusters of nasal and oral components. Affricates and prenasalized consonants are similar in that both have a stop segment as a component. In prenasalized consonants, the stop occurs in segment 2, while in affricates it occurs in segment 1 position. This stipulation we will formalize as a complex Segment Constraint.
(98). Complex Segment Constraint

This positive syllable structure condition stipulates that of any two segments co-linked to one syllable-initial 'C' slot, one will be a stop. The mirror image condition allows us to have the stop either in segment\(^1\) or in segment\(^2\). Segment\(^1\) position will be in the case of affricates while segment\(^2\) position will either be in the case of prenasalized stops or prenasalized affricates.

9.1 Prenasalized Stops

Prenasalized stops are of two types, viz. non-click prenasalized stops and click prenasalized stops.

As we indicated when we discussed affricates, prenasalized stops are also 'homorganic'. In our framework, this means that the supralaryngeal nodes of the two segments are linked to one place of articulation node.
Here is a list of all phonetic prenasalized stops:

<table>
<thead>
<tr>
<th>unspecified</th>
<th>mb</th>
<th>nt</th>
<th>nk</th>
<th>n</th>
<th>ng</th>
<th>n//</th>
</tr>
</thead>
<tbody>
<tr>
<td>depressed</td>
<td>mb</td>
<td>nt</td>
<td>nk</td>
<td>n</td>
<td>ng</td>
<td>n//</td>
</tr>
</tbody>
</table>

(102). Examples:

- impende [imp anci] "root"
- intombi [int’ombi] "girl"
- inkungu [in’kungu] "mist"
- ukuncela [ukun’kela] "to suckle"
- ukungcola [ukun’kola] "to be dirty"
- inqola [in’qola] "wagon"
- inqondo [in’qondo] "mind, brain"
- inxiwaxa [in’xiwaxa] "an abandoned hut"
- ingxoxo [in’g/xo] "discussion"
The nasal assimilation in non-click prenasalized stops involves labial, alveolar and velar points of articulation while in prenasalized clicks the nasal assimilates to the velar, i.e. [+hi; +bk] aspect of the click.

Prenasalized stops may either be underlying or they may be formed in the course of a derivation. In the latter case, then Nasal Assimilation applies. The rule was presented in (32); it is reproduced here for easy reference:

(103). Nasal Assimilation

```
Feature Tier
Place Tier
Supralaryngeal Tier
Segmental Tier

[+nas] [-cont]
```

The rule delinks the place tier of the nasal and links the supralaryngeal tier of the nasal to the place tier of the stop. However, before Nasal Assimilation applies, a rule we shall call Prenasalizing first applies.

When, in the course of a derivation, a nasal and a succeeding consonant become members of the same syllable, the new structure created triggers a number of phonological processes. First of all, it triggers the Nasal Assimilation described above (when, for instance, a deletion rule applies and creates a nasal-consonant sequence, such a sequence is not tautosyllabic and, therefore, will not trigger such rules as Nasal Assimilation, e.g. umkhulu - "grandfather" (\(<\ [u[mu[khulu]]\)). Other rules triggered by this structure will be discussed presently, these are Nasal Deaspiration, Nasal Devoicing, Nasal Depressing etc. We wish to characterize the new structural relationship of a tautosyllabic nasal-consonant
sequence in the form of a rule. This rule will formalize the formation of such a complex structure; in other words a nasal and a succeeding consonant each of which has been associated to a 'C' slot will now both be associated to one slot.

(104). **Prenasalizing**

![Diagram](image)

This rule stipulates that a tautosyllabic nasal immediately followed by a stop delinks from its 'C' slot and links onto the C slot of the following stop.

Before we supply illustrations of the forms under discussion, let us consider an important syllable structure constraint that disallows the 'pivotal' stop of complex segments from being associated to a [+ASP] feature.

(105). **Complex Stop Constraint**

![Mirror image](image)
This negative syllable structure condition functions as a filter to the Complex Segment Constraint. Recall that the latter stipulates that of two initial segments colinked to one 'C' slot, one will be a stop. This unqualified stipulation admits any kind of stop. The Complex Stop Constraint then bars only unaspirates from this position. This constraint provides an explanation for the absence of aspirated affricates in Zulu. Recall that the aspirated palatal affricate /tʃ/ has no phonological status in Zulu and on the rare occasions when it occurs, it functions as an allophone of the palatal fricative /ʃ/ (see the discussion in 7).

In prenasalized stops, the Complex Stop Constraint also bars an aspirate stop. A phonological rule, which we referred to earlier as Nasal Deaspiration, delinks a pivotal stop from the [+ASP] feature.

(106). Nasal Deaspiration

Feature Tier  +ASP

Laryngeal Tier

Segmental Tier  [+nas]

CV Tier

If we leave out the [+nas] specification, the rule becomes more general and it applies to affricates also.

Now we can consider a few derivations:

\[
\text{Feature Tier} \quad +\text{ASP}
\]

\[
\text{Laryngeal Tier}
\]

\[
\text{Segmental Tier} \quad [+\text{nas}]
\]

\[
\text{CV Tier}
\]
Nasal Deaspiration ensures that all underlying aspirated prenasalized stops will be converted to unspecified prenasalized stops. Consequently, we will posit an underlying nasal-aspirate sequence for all phonetic unspecified prenasalized stops. Doke (1926) argues for two sources for ejective prenasalized stops, viz. nasal-aspirate and nasal-ejective sequences, but that we will discuss presently. For the moment, let us illustrate the point under discussion.

(108)a.  [u[ku[[KuNth][+ASP]]]]

    [u[ku[[kuNth]a]]]  Consonant Harmony
    [u[ku[khu-Ntha]]]  Syllabification
    [u[ku[khuNta]]]  Prenasalizing
    [u[ku[khunta]]]  Nasal Deaspiration
    pu[ku[khunt'a]]  Nasal Assimilation
    u[ku[khunt'a]]  Ejection

    "to become mouldy"
This account of phonetic prenasalized stops presents a unified method of analysing all such stops in the language. It also has the advantage of a principled explanation for Nasal Deaspiration and for the absence of aspirated affricates. The analysis also lends support to our characterization of prenasalized stops as opaque segments. They are, after all, underlyingly associated to a laryngeal feature consequently they cannot participate in consonant harmony, since the harmonizing feature cannot spread past them without violating the Crossed Lines Constraint.

Now let us consider the [+dep] prenasalized stop. A number of 'nasal-stop' sequences in derivations result in such prenasalized stops:

(109).

b. \[i[i\{Tan\text{thi}\}+\text{DEP}]\]
\[i[i\{da\text{Nthi}\}]\]
\[\text{Consonant Harmony}\]
\[\text{Prenasalizing}\]
\[N\text{th}\]
\[i[i\{da\text{Nti}\}]\]
\[i[i\{dant\text{ti}\}]\]
\[i[i\{dant'\text{i}\}]\]
\[\text{Nasal Deaspiration}\]
\[\text{Nasal Assimilation}\]
\[\text{Ejection}\]
\[\text{imidant'i }{"\text{details"}}\]

c. \[u[\text{k}[\{Pi\text{Nch}\}+\text{DEP}\text{a}]\]
\[u[\text{k}[\{bhiNch\text{a}\}]\]
\[\text{Consonant Harmony}\]
\[\text{Resyllabification}\]
\[\text{Prenasalizing}\]
\[N\text{ch}\]
\[u[\text{k}[\{bhinca\}]\]
\[u[\text{k}[\{bhioca\}]\]
\[\text{Nasal Deaspiration}\]
\[\text{Nasal Assimilation}\]
\[\text{\=Okubhingo }{"\text{to wear traditional garments"}}\]
b. Nasal-lenis-voiced stop $\rightarrow$ [+dep] prenasalized stop e.g. 
\[ [i[N([bong]i)])] \rightarrow \text{imbongi} \text{ "poet" (} < \text{ "raise"} \) 
\[ [i[N([bang]i)])] \rightarrow \text{imbangi} \text{ "rival" (} < \text{ "dispute"} \) 

c. Nasal-ejective stop $\rightarrow$ [+dep] prenasalized stop 
The evidence here is slim and comes only from _-can-words:_
\[ \upsim\text{ènè} < \text{cement} \]
\[ \text{ibhâng} < \text{bank} \]
\[ \text{išitêmb} < \text{stamp} \]

The evidence is further weakened by the uncertainty whether this voicing may not be the result of Final Depressing$^{13}$. Doke (1926) claims that 'nasal-ejective stop' sequences surface as such, but his evidence is just as unimpressive. Here are some of his examples, others come from Doke & Vilakazi (1948): 

(110) 
\[ [i[z[i[N(t'ununu)]])] \rightarrow \text{izint'\text{únunú} "a person with a prominent backside or (pl.)"} \]
\[ [i[z[i[N(p'\text{"ane)]])] \rightarrow \text{izimp'\text{íyâne} "pianos"} \]
\[ [i[z[i[N(t'eku)]])] \rightarrow \text{izint\text{"ekú} "jocular people"} \]

The problem with these examples is that these plural forms are hardly ever used. We would dispute the existence of a noun such as /izimpíyâne/. One could just as well use /izitununu/ and /izipiyane/ in place of what Doke offers.

We wish to conclude this discussion by stating that we are convinced that a 'nasal-unspecified stop' $\rightarrow$ [+dep] prenasalized stop alternation is a viable analysis of the facts presented above. This will be formulated in terms of a phonological rule, Nasal Depressing. 

(111) Nasal Depressing 

\[ (+\text{DEF}) \]
\[ (+\text{nas}) \]
\[ (+\text{cont}) \]
Laryngeal Tier 
Segmental Tier 
CV Tier
This rule states that an unspecified stop co-linked to a 'C' slot with a nasal becomes associated to a laryngeal node which dominates a [+dep] feature. One 'C' slot becomes associated to the [+dep] laryngeal feature. This rule is ordered to apply before Nasal Deaspiration, otherwise it would convert to output of the latter rule to [+dep].

The application of Prenasalizing to lenis voiced stops will trigger Nasal Devoicing.

(112) Nasal Devoicing

Manner Tier

Supralaryngeal Tier

Segmental Tier [+nas]

CV Tier

The rule states that a lenis voiced stop delinks from its [+son] feature when it shares the same "C" slot with a nasal segment. Nasal Depressing applies after Nasal Devoicing resulting in a [+dep] prenasalized stop.

(113) Sample Derivations

a. Here is a noun derived from the verbal radical /xox/ "chat"
   [i[N([xox]o)]]
   [i[Nxoxo]]
   [i[Nxoxo]]
   [i[Ngxoxo]]
   [i[nggxoxo]]

   In ngxoxo "discussion"
b. Here is a noun derived from the verbal radical /biz/
"call"

\[i[\text{N}([\text{biz}]o)]\]
\[i[\text{Nbi}-z\text{O}]]\]  \text{Resyllabification}
\[\text{N}_b\]  \text{Prenasalizing}
\[i[\text{NPi}-z\text{O}]]\]  \text{Nasal Devoicing}
\[i[\text{Nbh}i-z\text{O}]]\]  \text{Nasal Depressing}
\[i[\text{mbhizo}]\]  \text{Nasal Assimilation}

\text{Imbizo}  \text{"meeting"}

Underlying prenasalized stops, therefore, are, in our analysis, either [+ASP] or [+DEP]. As we observed on p.122, this ties up with our claim that prenasalized stops are opaque segments. Here are a few examples:

(114)

\[u[\text{k}ع[\text{T}u\text{Ng}][+A.\text{3}]]\]
\[u[\text{k}ع[\text{th}u\text{Ng}]a]\]  \text{Consonant Harmony}
\[u[\text{k}ع[\text{th}u-N\text{ag}]a]\]  \text{Resyllabification}
\[u[\text{k}ع[\text{th}u-g\text{a}]a]\]  \text{Nasal Assimilation}

\text{ukuthýnga}  \text{"to sew"}

\[u[\text{k}ع[\text{T}u\text{Ng}][+\text{DEP}]]\]
\[u[\text{k}ع[\text{d}u\text{Ng}]a]\]  \text{Consonant Harmony}
\[u[\text{k}ع[\text{d}u-N\text{ag}]a]\]  \text{Resyllabification}
\[u[\text{k}ع[\text{d}u\text{ga}]a]\]  \text{Nasal Assimilation}

\text{ukúdunga}  \text{"to make turbid"}

Let us conclude by stating that our claim is that in underlying prenasalized stops, the 'nasal-stop' sequence is already co-linked to one 'C' slot.

9.2 Prenasalized Affricates

A prenasalized affricate is a complex segment in which
three segments, a nasal, a stop and a fricative are co-linked to one 'C' slot:

(115).

\[ \text{Segmental Tier} \quad [-\text{nas}] \quad [-\text{cont}] \quad [+\text{cont}] \quad \text{CV Tier} \]

All prenasalized affricates are 'homorganic', i.e. all the supralaryngeal nodes are linked onto one place of articulation node.

(116)

\[ \text{Place Tier} \]

\[ \text{Supralaryngeal Tier} \]

\[ \text{Segmental Tier} \quad \text{CV Tier} \]

Only the stop and fricative are also 'homolaryngeal'. A more detailed description of a prenasalized affricate would indicate that the three roots differ in their manner features the nasal differs laryngeally from the stop and fricative which share the same features, but all three share the same place features:
There are nine phonetic prenasalized affricates in Zulu:

<table>
<thead>
<tr>
<th>feature</th>
<th>labio-</th>
<th>alveolar</th>
<th>lateral</th>
<th>palatal</th>
<th>velar</th>
</tr>
</thead>
<tbody>
<tr>
<td>unspecified</td>
<td>nj</td>
<td>nts'</td>
<td>ndz</td>
<td>ndg</td>
<td>ndz</td>
</tr>
<tr>
<td>depressor</td>
<td>nty</td>
<td>nts'</td>
<td>ndz</td>
<td>ndg</td>
<td>ndz</td>
</tr>
</tbody>
</table>

Here are words illustrating the prenasalized affricates:

- îmfe ne [ɪ'ʃɛnɛ] - "baboon"
- îmvû [ɪ'ʃu] - "sheep (sing.)"
- însiżwa [ɪnts'izwa] - "young man"
- înžila [îndzila] - "mourning clothes"
- înhlavá [întʃ'avá] - "stalk-borer"
- îndilela [îndʒila] - "path, road"
- ïntshebe [întʃ'ebɛ] - "beard"
- înjá [îndʒa] - "dog"
- ukúnklinya [ukuŋkx'ĩna] - "to throttle"
Here are two rules that apply in the formation of affricates. The rules are Affrication, which epenthesizes a stop between a nasal and fricative in the formation of an affricate, and Affrication Assimilation where the epenthesized stop assimilates to the place and laryngeal tier of the fricative.

(120) Affrication

\[
\emptyset \Rightarrow [-\text{cont}] / [+\text{nas}] \downarrow [+\text{cont}]
\]

The Well-formedness condition associates the epenthesized [-cont] segment to the 'C' slot, so that all three segments are co-linked.

(121) Affrication Assimilation

Place Tier

Supralaryngeal Tier

Segmental Tier [+nas] \cdot [-\text{cont}] \cdot [+\text{cont}]

Laryngeal Tier

Since this representation is three dimensional, it is not possible to indicate that three segmental nodes, i.e. [+nas], [-cont] and [+cont], are linked onto one 'C' slot. Here are a few illustrative derivations:

(122)

\[
\begin{align*}
\text{i}[N[(\text{ni})c]] & \\
\text{f}[Nzi-lo] & \quad \text{Resyllabification} \\
\text{h}[c] & \quad \text{Prenasalizing}
\end{align*}
\]
Summary:
This discussion of the phonological features for Zulu segments has pointed to a necessary division of the segments of Zulu into two major classes, viz. simple and complex segments. Simple segments fall into four major classes viz. [-cons] resonants, i.e. vowels and glides; [+cons] resonants, i.e. nasals and liquids; [-cont] obstruents, i.e. stops and [+cont] obstruents, i.e. fricatives.

Two segments, the lenis voiced stop /b/ and /k/, fail to fall neatly within one of the classes above. These segments are [-cont] i.e. stops, but they are strictly speaking, not obstruents since they carry a [+son] specification. The phonological processes they undergo reflect the ambivalent nature of these segments. Let us now supply a complete table of distinctive features for the simple non-click segments of Zulu:

(123) (See separate page)

The following are the distinctive features for clicks:

(124) |  | c | ch | gc | q | gh | go | x | xh | gx |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>suction</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>laminal</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>lateral</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>aspirated</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>depressed</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td></td>
</tr>
</tbody>
</table>

(All are [+cons], [-son], [-cont], [+hi], [+bk], [+ant], [+cor])
| p' | ph | b | bh | m | f | v | t' | th | d | s | h | l | n | r | sh | n | y | k' | k | kh | g | w | h | h | i | e | a | o | u |
| consonantal | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| sonorant | - | - | - | + | + | - | - | - | - | - | - | - | - | - | - | - | + | - | + | + | + | + | + | + | + | + | + | + | + | + | + |
| continuant | - | - | - | + | + | - | - | - | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| high | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| back | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| low | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| labial | + | + | + | + | + | + | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| nasal | - | - | - | - | + | + | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| lateral | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| aspirated | - | + | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| depressed | - | - | + | + | + | + | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| coronal | - | - | - | - | - | - | - | - | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| anterior | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |

(123)
The complex segments of Zulu are affricates, prenasalized stops and prenasalized affricates. The proposed features have the advantage of treating simple segments uniformly, i.e. click and non-click stops, for instance, are distinguished only by those features that distinguish the two classes of segments viz. [suction], [laminal] and [lateral], otherwise the same distinctive features apply to both classes.

The analysis of complex segments proposed in this analysis has the advantage of treating all complex segments uniformly. Affricates, prenasalized stops (click and non-click) and prenasalized affricates are all characterised as complex segments where two or more segments are co-linked to one "C" slot. The consequences of this co-linking are in the form of a number of phonological rules viz. Prenasalizing, Nasal Assimilation, Nasal Deaspiration, Nasal Devoicing, Nasal Depressing, Affrication and Affrication Assimilation. Further research, we are convinced, will lead to a simpler and more precise statement of the rules triggered by the co-linking.
NOTES TO CHAPTER 3

1. These two constraints were supplied in Chapter 1 to illustrate possible structure conditions in CV phonology.

2. Local stress resides in certain morphemes, e.g.
   a. Root-initial syllables of ideophones:
      - *di* indicating quietness
      - *thushu* indicating sudden appearance
      - *gilikidi* indicating falling down

   b. Monosyllabic first position demonstratives:
      - *le* "this one (cl.1 or 3)"
      - *nje* "like this"
      - *le* "here"

3. The labiodental stops described here are phonetic segments. The labiodental nasal [n], therefore, is specified for its place of articulation features in the phonetic component since it acquires these features from the labio-dental stop - a phonetic segment.

4. Kubeka does not state this explicitly. In his discussion of the phonological characteristics of the Lower Natal Coast dialect, he states: "The singular characteristic of this dialect is its preference for the ejective or glottalized velar explosive /k/ even where the standard dialect and other Natal dialects use the lenis velar plosive /k/" (Kubeka (1979)).

5. It was Louw (1962), we believe, who first pointed out that although it was well-known that lenis voiced /k/ was disallowed in root-initial position, yet it 'exceptionally' occurred in the deficient verb /ke/ "sometimes, once".

6. Xhosa is one of the languages that, together with Zulu, form part of the Nguni subgroup of the South Eastern zone of the 'Bantu' family of languages.
7. Cope (1966) and Lanham (1960) classify /b/ and /k/ "lenis-voiced". To Louw (1962), /k/ varies between "radical", i.e. voiceless unaspirated, and "voiced", while /b/ is regularly "implosive". To Doke (1926), /b/ is "implosive" while /k/ is "unvoiced, unaspirated". The latest study, Traill et al. (forthcoming), provides instrumental evidence in support of the phonetic alignment of /b/ and /k/, and finds no evidence of 'implosion' in the articulation of /b/.

8. Phonetically [Um'Kama].


10. To distinguish a [+depressed] vowel that does not acquire this feature from a tautosyllabic depressor we use the subscript diaeresis.

11. There will, of course, be a few exceptions like /iːtʰəˈneːma/ "mother" where a non-obstruent is underlingly associated to the feature [+dep]. But these are exceptional forms in the language.

12. We cannot account for this metathesis.

13. This rule is not discussed in this thesis. However, it states that in a laryngeally unspecified root where the penultimate syllable has a vowel associated with a high tone, then the unspecified stop in the final syllable becomes associated with the feature [+dep]. This is a very late rule which applies after segments and tones have been associated. It applies mostly in loan words, e.g.

- isit'ala di < straat (Afrikaans) "street"
- ínk'indobo < knoop (Afrikaans) "button"
- ík'ilógo < klok (Afrikaans) "clock"
- isf'olóbo < skrop (Afrikaans) "casual employment"

14. The deletion of the [+son] feature blocks the application of Sonorant Voicing and that is why we term this a devoicing rule.
CHAPTER FOUR

SEGMENTAL RULES

1. Introduction
In this chapter, we wish to discuss the segmental rules of Zulu. Such a task is always a daunting one, but this one is made more difficult by a tradition of morphological analysis which consisted mainly in breaking up larger phonetic forms into constituent morphemes without considering how those phonetic forms derive from underlying representations. The problem is that the phonological shape of most morphemes has been determined on phonetic considerations rather than on representations that are derived from the application of a number of phonological rules. Our attempt at providing such underlying representations is made more difficult by such a tradition.

2. Vowels in Juxtaposition — Lexical Derivations
In 2.2.1 of Chapter 3, we indicated that vowels may not be adjacent to each other within a Zulu word. Such a sequence in our analysis is barred by the Vowel Sequence Constraint (see (1) of Chapter 3). The claim of CV phonology is that morphemes are fully syllabified in the lexicon.

When, however, they combine in word formation, then vowels sometimes get juxtaposed within the newly formed word. This juxtaposition of vowels violates the Vowel Sequence Constraint and it (the juxtaposition) is corrected first through the application of re-syllabification which is in two steps, first Syllable Delinking and then Syllabification.
(1). **Syllable Delinking**

```
CV Tier
X V V X

Syllable Tier
word
```

This rule states that when, within a word, two vowels, each linked to a syllable slot, become adjacent, then the leftmost one delinks from its syllable node and it associates to the syllable to its immediate right. We are aware that Syllable Delinking actually involves two separate rules:

(2). **Vowel Linking**

```
CV Tier
X V V X

Syllable Tier
word
```

(3). **Syllable Delinking**

```
CV Tier
X V V X

Syllable Tier
word
```

We treat them as one simply as an abbreviation since they always immediately follow each other. After Syllable Delinking, a rule we met in (5) of Chapter 3 (Nucleus Delink) then applies:

(4). **Nucleus Delink**

```
Syllable Tier

CV Tier

Nucleus Tier
N N
```
The rule delinks the nucleus tier of the leftmost of the two vowels linked to the same syllable node.

Then the convention that converts to a 'C' any 'V' that is not associated to a Nucleus, applies (This convention was introduced in Chapter 3). If the vowel to the left is [+hi], then it is realised as a glide (cf. Vowel/Glide Realisation in Chapter 3), otherwise it deletes (cf. Vowel Deletion later in this chapter).

2.1 Glide Formation

Now we can start examining what happens when two vowels are in juxtaposition within a word. First of all, high vowels occurring to the immediate left of the syllable vowel will be realised as glides, following our Vowel/Glide Realisation convention. In some phonological descriptions, e.g. Aoki (1974), what we term Vowel/Glide Realisation is referred to as Glide Formation, while in others it is termed Consonantalization. We have chosen the term Vowel/Glide Realisation to express the generalization that a [+hi ; -cons] segment co-linked to a "C" node is realised as a glide, while any [-cons] segment co-linked to a "V" slot is realised as a vowel.

(5) Examples:

a. [u[enz]a] → wénza "he does" cf. [u[[dl]a]] → údia "he eats"

b. [lu[enz]a] → lwénza "he does" cf. [lu[[dl]a]] → lódia "he eats"

c. [i[enz]a] → yénza "he does" cf. [i[[dl]a]] → ídia "he eats"

d. [si[enz]a] → sénza "he does" cf. [si[[dl]a]] → sidia "he eats"

e. [u[akh]a] → wákha "he builds" cf. [u[[ph]a]] → úpha "he gives"

f. [lu[akh]a] → lwákha "he builds" cf. [lu[[ph]a]] → lúoha "he gives"
In the examples above, whenever a high vowel without a preceding consonant is to the left of the syllable vowel, then the high vowel unexceptionally surfaces as a glide. If, however, the high vowel has a consonant to its left, then it is open to the application of two constraints that we have already come across viz. the \( C^1 \) Constraint and the Labial Glide Constraint. Let us reproduce these syllable structure conditions for easy reference:

(6) \( C^1 \) Constraint

\[
\begin{array}{c}
\text{CV Tier} \\
\begin{array}{c}
\text{C} \\
\text{C} \\
\end{array} \\
\begin{array}{c}
[-\text{cons}] \\
[+\text{hi}] \\
\end{array} \\
\text{Syllable Tier} \\
\begin{array}{c}
\sigma \\
[+\text{lab}] \\
\end{array}
\end{array}
\]

This positive syllable structure condition admits only the glide /w/ in \( C^1 \) syllable position.

(7) Labial Glide Constraint

\[
\begin{array}{c}
\text{Segmental Tier} \\
\begin{array}{c}
[-\text{cons}] \\
[+\text{lab}] \\
\end{array} \\
\begin{array}{c}
[+\text{lab}] \\
\end{array} \\
\text{Syllable Tier} \\
\begin{array}{c}
\sigma \\
(mirror \text{ image})
\end{array}
\end{array}
\]
This negative syllable structure condition functions as a filter to the C' Constraint by barring the co-occurrence of the labial glide with a labial consonant or with a labial vowel if C' is occupied.

The preservation of admissible syllable structure is the motivation for some phonological rules in Zulu. Two such rules are Y-Deletion and Labial Dissimilation.

(8) Y-Deletion

This rule deletes glide /y/ occurring in the disallowed C' syllable position.

(9) Labial Dissimilation

This rule states that if either C' and C'' or C' and V are both filled by labial segments, then the segment in C' position dissimilates by delinking from its [+lab] feature. We now know (see C' Constraint) that the C' segment can only be the labial glide, and if that delinks from its [+lab] feature, then it can
only be realised as the non-labial glide /y/. The conversion of the C₂ segment into a palatal glide paves the way for the palatalization of the labial consonant in C₁ position in the first case, while in the second it triggers Y-Deletion.

With the addition of these two rules, we can now supply the derivations for all the forms in (5). (We will indicate the application of the rules Syllable Delinking and Nucleus Delink only in the first example. From then onwards, we will collapse the two rules and refer to them as Syllabification, and we will underline the two vowels affected.)

(10) Sample Derivations

a. [si[enz]a]

\begin{array}{ll}
\text{sienza} & \text{Affixation} \\
\text{syenza} & \text{Syllable Delinking} \\
\text{senza} & \text{Y-Deletion} \\
\text{sēnza} & \text{"he/she/it does"}
\end{array}

b. [lu[os]a]

\begin{array}{ll}
\text{lucsa} & \text{Affixation} \\
\text{lucsa} & \text{Syllabification} \\
\text{lwosa} & \text{Vowel/Glide Realization} \\
\text{lyosa} & \text{Labial Dissimilation} \\
\text{losa} & \text{Y-Deletion} \\
\text{lōsa} & \text{"he/she roasts"}
\end{array}

Here is more data incorporating other types of vowels:
(11) a. [e[[zulu]ini]] + ezulwini "heaven (loc.)"
b. [e[[dolo]ini]] + edolwini "knee (loc.)"
c. [e[[khala]ini]] + ekhâleni "nose (loc.)"
d. [e[[khishi]ini]] + ekhishini "kitchen (loc.)"
e. [e[e[[[kule]ini]]] + èsikôleni "school (loc.)"

Examples (a) and (d) above present no problems because we have met all the rules that apply in their derivation:

(12) Sample Derivations
a. [e[[zulu]ini]]²
ezuluini Affixation
ezuluini Syllabification
ezulwini Vowel/Glide

ezulwini "heaven, sky (loc.)"

b. [e[[khishi]ini]]²
ekhishiini Affixation
ekhishiini Syllabification
ekhishini Vowel/Glide

ekhishini Y-Deletion
ekhishini "kitchen (loc.)"

Examples (b), (c) and (e), however, can only be attempted after we have introduced vowel coalescence.

2.2. Vowel Coalescence

C.M. Doke, the greatest of all South African Sintu scholars, stated in 1927 that: "Zulu, like other Bantu languages, has three basic vowels, /a/, /i/ and /u/. The mid-forward vowels, /e/ and /ê/, are secondary in value, and are often the result of coalescence of /a/ and /i/; similarly, the mid-back vowels, /o/ and /ô/, are secondary in value, often being the result of the coalescence of /a/ and /u/." (p.1) He continues: "Zulu coalescence, when it takes place, results then
as follows:

\[
\begin{align*}
  a + i &= e \\
  a + u &= o \\
  a + a &= u''
\end{align*}
\] (Doke 1927: 23).

In an important article on Xhosa, a related language, Aoki (1974) demonstrated that vowel coalescence, which he terms vowel shortening, could be accounted for in two operations; ne, a rule which lowered a high vowel to the right of a [-high] vowel; two, a rule that deleted the vowel to the left. This is what the derivations would look like:

(13)

\[
\begin{align*}
  a + i ; a + u ; a + a &= \text{Vowel Lowering} \\
  a + e ; a + o ; - &= \text{Vowel Deletion} \\
  \hat{A} + e ; \hat{A} + o ; \hat{A} + a
\end{align*}
\]

Aoki in his description of 'vowel shortening' included a Glide Formation rule which covered the domain of our Vowel/Glide realization and Labial Glide Formation rules. We will be discussing the Labial Glide Formation rule presently, but before we do that we want to point out that our analysis follows Aoki's.

When two vowels become juxtaposed within the lexical component, the order of application of the rules that dissolve this unpermitted sequence is determined by the value of the feature [high] in the leftmost vowel. After the application of Syllable Delinking and Nucleus Delink, if the leftmost vowel is [-hi], then as we have already learned, Vowel/Glide Realization applies converting the high vowel to its related glide.

If, on the other hand, the leftmost vowel is [-hi], then a number of phonological rules apply before the vowel is deleted. The first of these rules is one that spreads the [-hi] feature of the leftmost vowel to the vowel to its right, after which the vowel to its right then delinks from its [high] feature. The motivation for this rule is to be found in a Tongue Height Constraint that we have not formalized. This constraint states that of any two adjacent [-cons] segments within a syllable,
the leftmost must either be of the same tongue height or higher than that of the vowel to the right. This constraint applies without exception to all Zulu syllables.

(14) Vowel L o w e r i n g

<table>
<thead>
<tr>
<th>Feature Tier</th>
<th>[hi]</th>
<th>[hi]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place Tier</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Segmental Tier</td>
<td>[cons]</td>
<td>[cons]</td>
</tr>
<tr>
<td>Syllable Tier</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This rule spreads the [-hi] feature of the leftmost vowel of any two vowels co-linked to the same syllable node. The rightmost vowel then delinks from its [+hi] feature. If the vowel is [-hi], then the rule applies vacuously, otherwise the rule converts a [+hi] specification to [-hi].

It is not yet possible to illustrate the application of this rule because we need to know the rule that deletes one of these two vowels. But before that, we need to study another rule which accounts for the consonantalization of the vowel /o/, when it occurs as the leftmost of any two vowels. Let us call this rule Labial Glide Formation.

(15) Labial Glide Formation

\[ [-hi] \rightarrow [+hi] / [+back] \]
This rule converts the [-hi] feature of a [-cons] [+bk] segment dominated by a "C" node to [+hi]. After this conversion, Vowel/Glide Realization applies and the back vowel is realized as its related glide.

The next rule that applies is Vowel Deletion:

(16) Vowel Deletion

Feature Tier [-hi]
Place Tier
Segmental Tier [-cons]
CV Tier C

This rule delinks a [-cons ; -hi] segment dominated by a "C" node. The rule ensures the non-occurrence of [-hi] glides in Zulu.

Vowel Deletion is the last of the rules that apply to vowels in juxtaposition within the lexical component. To sum up, let us now go over all the rules that apply to vowels in juxtaposition. The first two rules that apply to any sequence of two vowels in the lexical component are Syllable Delinking and Nucleus Delink, in that order. Then the rules apply according to the value of the [high] feature of the leftmost vowel. If it is [+hi], then Vowel/Glide Realization will apply and it will be realized as a glide. If, on the other hand, it is [-hi], then Vowel Lowering will apply, ensuring that the vowel to the right is either equal in tongue height or lower than that of the vowel to its left. Thereafter, if the leftmost vowel is both [-hi] and [+bk], then Labial Glide Formation applies converting its [-hi] feature to [+hi], after
which Vowel/Glide Realisation applies and the segment is also
realised as a glide. But if the vowel to the right is [-hi ;
-bk], then Vowel Deletion applies to it.

(17) Vowels in Juxtaposition

\[
\begin{array}{c|c|c}
X & V & V \\
N & N & X
\end{array}
\]

violates Vowel Sequence Constraint

\[
\begin{array}{c|c|c}
V & V & V \\
\downarrow & \downarrow & \downarrow \\
N & N & N
\end{array}
\]

\[
\begin{array}{c|c}
V & V \rightarrow C V \\
+hi & \{-\text{cons.}\} \\
+hi & \\
\end{array}
\]

Syllable Delinking

\[
\begin{array}{c|c|c}
V & V \rightarrow V & V \\
-\text{hi} & \{-\text{hi}\} & \{-\text{hi}\}
\end{array}
\]

Mucleus Delink

\[
\begin{array}{c|c|c}
V & V \rightarrow V & V \\
-\text{hi} & \{+\text{hi}\} & \{+\text{bk}\} \\
\end{array}
\]

Vowel Glide Realization

\[
\begin{array}{c|c|c}
V & V \rightarrow V \\
-\text{hi} & \{-\text{bk}\} & \{-\text{bk}\}
\end{array}
\]

Labial Glide Formation

\[
\begin{array}{c|c|c}
V & V \rightarrow V \\
-\text{hi} & & \{-\text{hi}\} \\
\end{array}
\]

Vowel Lowering

\[
\begin{array}{c|c|c}
V & V \rightarrow V \\
-\text{hi} & & \{-\text{bk}\} \\
\end{array}
\]

Vowel Deletion

In this analysis, we have been able to account for 'vowel
coalescence' in terms of three phonological rules, viz. Vowel
Lowering, Labial Glide Formation and Vowel Deletion. We have
also shown that the Tongue Height Constraint supplies the motivation for Vowel Lowering. Let us present our analysis of 'vowel coalescence' in tabular form:

(18) Vowel Coalescence

<table>
<thead>
<tr>
<th>Leftmost</th>
<th>Rightmost</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Vowel</td>
<td>Vowel</td>
<td></td>
</tr>
<tr>
<td>(o), a, e</td>
<td>i, u, o, a, e</td>
<td>Vowels in Juxtaposition</td>
</tr>
<tr>
<td>(o), a, e</td>
<td>e, o, o, a, e</td>
<td>by Vowel Lowering</td>
</tr>
<tr>
<td>(w), a, e</td>
<td>e, o, o, a, e</td>
<td>by Labial Glide Formation</td>
</tr>
<tr>
<td>(w), i, a</td>
<td>e, o, o, a, e</td>
<td>by Vowel Deletion</td>
</tr>
</tbody>
</table>

This table gives a full picture of vowel coalescence resulting from vowels in juxtaposition. First, it indicates that the leftmost vowel must be [-h; otherwise it would be realized as a glide). The rightmost vowel, on the other hand, is any of the five phonological vowels. The first rule that applies is Vowel Lowering which lowers /i/, /u/ to /e/, /o/ respectively, but applies vacuously to /o/, /a/ and /e/. Then Labial Glide Formation converts leftmost /o/ to u, which by Vowel/Glide Realization is converted to /w/. Then Vowel Deletion deletes the leftmost vowel in each case.

Now let us return to examples 11 (b), (c) and (e) which, earlier on, we were not able to supply derivations for:

(19) Sample Derivations:

a. \[a[[dolo]ini]]
edoloini Affixation
edoloini Syllabification
edoloeni Vowel Lowering
edolueni Labial Glide Formation
edolweni Vowel/Glide realization
edolwêni "knee (loc.)"
Vowel coalescence, as formulated by Doke, would apply only in (b) above, because in his formulation the vowel to the left had to be /a/. There are, however, not many instances where the vowel to the left is not /a/, since the great majority of prefixal morphemes whose vowels participate in vowel coalescence are morphemes ending in that vowel. That is why hardly any attention has been paid to cases where the leftmost vowel is not /a/, e.g. examples (a) and (c) above. Another problem is that in a number of cases where vowel coalescence takes place, the morphemes involved have been presented in the form in which they appear after vowel coalescence has taken place. It is necessary, therefore, to consider as many constructions as possible in order to cover the majority of cases where vowel coalescence takes place:

2.2.1 Possessives

In Zulu, the possessive is made up of a possessive prefix and a possessive base. The possessive prefix is made up of the subject prefix of the class plus a possessive marker /a/. When the possessive prefix is affixed to a noun, i.e. when the possessive base is a noun, then vowel coalescence takes place if the initial vowel of the noun is a high vowel. Let us supply a derivation of the possessive whose prefix is class 5.
/li-a/ and the possessive base is the noun /isizwe/ - "nation".

(20) **Sample Derivation**

\[:culo [li[a[i[i[sizwe]]]]]\]

- /aisizwe/ Affixation
- /aizizwe/ Syllabification
- /aesizwe/ Vowel Lowering
- /esizwe/ Vowel Deletion
- /liesizwe/ Affixation
- /liesizwe/ Syllabification
- /lyesizwe/ Vowel/Glide Realization
- /lesizwe/ Y-Deletion

\[:culo lesizwe - "national anthem" (lit. song of the nation)\]

2.2.2 Derived Possessives

Derived possessives go under various names, e.g. Doke (1927) calls them possessive pronouns, while Cole (1955) calls them independent possessives. Derived possessives are formed when, for purposes of emphasis, the antecedent is moved to the right of the possessive and it leaves a pronominal copy on the possessive. This pronominal copy is made up of the pronominal marker plus the initial vowel of the noun prefix. Let us illustrate this morpheme.

The normal word order in Zulu is for the possessive to follow the antecedent, i.e. the noun it qualifies e.g. /Umáñosa wami/ "my boy" (lit. the boy of mine). If the antecedent moves to the right then we get /6:wami, Umáñosa/ "mine, the boy that is". The pronominal copy is /o/, made up of the pronominal marker /a/ and the initial vowel of the noun prefix /u/. If the same movement occurred to the possessive phrase /6:skuku lwesìne/ "the fourth day", we would get /6lwesìne, 6:skuku/ "the fourth, day that is". Of course the antecedent could then delete just leaving /6lwesìne/ "fourth, Thursday". Let us provide a derivation for the derived possessive /6lwesìne/. The pronominal copy is /a - u/, i.e. pronominal marker plus initial vowel of the noun prefix. The possessive prefix is
/lu-a/, i.e. subject prefix plus possessive marker. The possessive base is the class 7 noun /isine/ "the ordinal number four".

(21) Sample Derivation

\[
\text{aisine} \quad \text{Affixation} \\
\text{aisine} \quad \text{Syllabification} \\
\text{aesine} \quad \text{Vowel Lowering} \\
\text{esine} \quad \text{Vowel Deletion} \\
\text{luesine} \quad \text{Affixation} \\
\text{luesine} \quad \text{Syllabification} \\
\text{luesine} \quad \text{Vowel/Glide Realization} \\
\text{uluesine} \quad \text{Affixation} \\
\text{auluesine} \quad \text{Syllabification} \\
\text{aoluesine} \quad \text{Vowel Lowering} \\
\text{oluesine} \quad \text{Vowel Deletion} \\
\text{olwesine} \quad "the fourth, Thursday"
\]

2.2.3 Adverbial Prefixes

The adverbial prefixes /na/ "with"; /nga/ "by means of"; /njenga/ "like"; /nganga/ "as big as"; /kG:na/ "more than" are prefixed to nouns and pronouns to form adverbs or copulatives. When they are prefixed to nouns with [+hi] initial vowels then vowel coalescence takes place. Here is a sample derivation:

(22) Sample Derivation

\[
\text{unjenga} \quad \text{Affixation} \\
\text{unjenga} \quad \text{Syllabification} \\
\text{unjenga} \quad \text{Vowel Lowering} \\
\text{unjenga} \quad \text{Vowel Deletion} \\
\text{unjenga} \quad "He is like his father"
\]

2.2.4 Demonstrative Pronouns

We will consider the demonstrative pronoun of the first position only. It is made up of the demonstrative morpheme /la/ plus the full noun prefix. If the initial vowel of the
noun prefix is a high vowel, then vowel coalescence takes place:

(23) **Sample Derivation**

```
[la[i[sii]]]
```

<table>
<thead>
<tr>
<th>Affixation</th>
<th>Syllabification</th>
<th>Vowel Lowering</th>
<th>Vowel Deletion</th>
</tr>
</thead>
<tbody>
<tr>
<td>laisi</td>
<td>laisi</td>
<td>laesi</td>
<td>lesi</td>
</tr>
</tbody>
</table>

"this (cl.7)"

2.2.5 **Relatives and Adjectives**

In all these constructions above, the two vowels that coalesce have been clearly evident. In the so-called relative and adjectival constructions, however, the prefixes incorporate an initial vowel which is [-hi] and which alternates according to the high vowel of noun class prefix:

<table>
<thead>
<tr>
<th>Noun</th>
<th>Relative</th>
<th>Adjectival</th>
<th>Noun</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class</td>
<td>Prefix</td>
<td>Prefix</td>
<td>Prefix</td>
</tr>
<tr>
<td>1</td>
<td>o-</td>
<td>om~om-</td>
<td>um~um-</td>
</tr>
<tr>
<td>2</td>
<td>aba-</td>
<td>aba-</td>
<td>aba-</td>
</tr>
<tr>
<td>3</td>
<td>o-</td>
<td>om~om-</td>
<td>um~um-</td>
</tr>
<tr>
<td>4</td>
<td>e-</td>
<td>emi-</td>
<td>i:~i</td>
</tr>
<tr>
<td>5</td>
<td>eli-</td>
<td>eli-</td>
<td>i:~i</td>
</tr>
<tr>
<td>6</td>
<td>a-</td>
<td>ama-</td>
<td>ama-</td>
</tr>
<tr>
<td>7</td>
<td>esi-</td>
<td>esi-</td>
<td>isi-</td>
</tr>
<tr>
<td>8</td>
<td>e-</td>
<td>eN-</td>
<td>iN-</td>
</tr>
<tr>
<td>9</td>
<td>esi-</td>
<td>esizin-</td>
<td>izin-</td>
</tr>
<tr>
<td>10</td>
<td>olu-</td>
<td>olu-</td>
<td>u:~ulu</td>
</tr>
<tr>
<td>11</td>
<td>obu-</td>
<td>obu-</td>
<td>ubu-</td>
</tr>
<tr>
<td>14</td>
<td>oku-</td>
<td>oku-</td>
<td>uku-</td>
</tr>
</tbody>
</table>

An examination of the data in (24) suggests that the alternation of the initial vowel in question can be accounted for in terms of the coming together of an /a/ element and the vowel of the noun class prefix. This /a/ element we term the relative marker. Poulos (1982) called it the 'specifier marker'.
while Hendrikse (1975) terms it the 'referential marker'. To Poulos the /a/ of the derived possessive (what we termed the possessive marker), the /a/ in the demonstrative prefix /la/, and the relative marker /a/ are all the same morpheme, "the formulative /a/ functions as a specifier and pronominal marker in demonstrative pronouns, RCs and adjectives. In possessives, on the other hand, its only function is a pronominal marker ... I shall henceforth in this study refer to this formative as a specifier marker" (Poulos 1982: 110). These morphemes are, however, not identical, the /a/ occurring in demonstratives is inherently a short vowel, while that of relatives is inherently long, and that of possessives is long or short depending on one's dialect. Even though the relative /a/ is underlyingly long, yet it surfaces as a short vowel in most phonetic forms.

The strongest evidence supporting its geminate status is tonal viz. a high tone on this vowel cannot be shifted by Depressor Shift. Also, when segmentally identical forms become ambiguous, it is the bimoric nature of the relative morpheme that helps to distinguish them.

(25)

a. Amántombazane ázogéza "The girls will wash"
b. Amántombazane ázogéza "The girls who will wash"

In most cases, the relative /á:/ of sentence (b) surfaces as a short vowel (a low-level vowel shortening rule applies in most cases) but when it is necessary to distinguish it from the underlyingly short /a/ of sentences like that in sentence (a), then it surfaces as a bimoric vowel.

Another difference among these formatives is tonal, the short formatives are all associated with a high tone, and so is the bimoric form of the relative marker, but the dialectally long form of the possessive marker is associated with the high-low tone cluster:
It is because of these differences that we treat these 
formatives as different morphemes. In our analysis the initial 
vowel of the 'relative' and 'adjective' prefixes is made up of 
the relative marker plus the initial vowel of the noun prefix 
(which, in reality, is the vowel of the noun class prefix). 
Adjectives we treat as relatives occurring with irregular 
stems. The irregularity of the adjectival stems is in their 
incorporation of the basic noun prefix in both the positive and negative conjugations, e.g.

(27)  
a.  It'she élikhulu   "A big stone"  
b.  Itshe élingelikhulu   "A stone which is not big"

In the positive conjugation of the so-called adjective, the 
subject prefix deletes. Here are illustrative examples:

(28)  Sample Derivations  
a.  f:visa [a:li[qatha]] 
   a:iliqatha   Affixation 
   a:iliqatha   Syllabification 
   a:iliqatha   Vowel Lowering 
   a:iliqatha   Vowel Deletion 
   a:iliqatha   Vowel Shortening 
   f:visa éliqatha -   "A thick fighting stick" 

b.  f:visa [a:linge[qatha]] 
   a:lingeqatha   Affixation 
   a:lingeqatha   Syllabification 
   a:lingeqatha   Vowel Lowering 
   a:lingeqatha   Vowel Deletion 
   a:lingeqatha   Vowel Shortening 
   f:visa élingeqathé -   "A fighting stick that is not thick"
152.

c. itshe [a:i[li[li[khulu]]]]
   a:ililikhulu Affixation
   a:ililikhulu Syllabification
   a:elilikhulu Vowel Lowering
   e:ilkhulu Vowel Deletion
   elikhulu SP-Deletion
   elikhulu Vowel Shortening

   itshe dlikhulu — "a big stone"

d. itshe [a:i[li[ngi[li[khulu]]]]]
   a:ilingelikhulu Affixation
   a:ilingelikhulu Syllabification
   a:elingelikhulu Vowel Lowering
   e:elingelikhulu Vowel Deletion
   e:elingelikhulu Vowel Shortening

   itshe dlingelikhulu — "A stone which is not big"

In our analysis all four examples above are relatives, but in
Doke (1927) and in almost all other morphological studies, the
qualificatives in (a) and (b) are relatives, while those in (c)
and (d) are adjectives.

?2.6 Verbs with latent /i/
"List of Monosyllabic Verb-stems with latent -i:
   -ma (stand) -za (come)
   -mba (dig) -zwa (hear)
   -va (increase)

These stems are derived from more primitive vowel verbs, -ima,
-imba, -iva, -iza and -izwa. The latent influence of the
vowel /i-/ is only felt when, in the conjugation, the vowel
/a/- would normally come immediately before the stem in which
case /a/ and /i/ coalesce to form /e/." (Doke 1927: 129)

Later in their history, these verbs must have converted
initial /i/ to initial /e/, since there are now no verbs in
Zulu that commence in a high vowel, all vowel-commencing verbs
commence in /a/, /e/ or /o/. We are convinced that these five verbs changed to /e/-commencing verbs, and that they are now in the process of changing to consonant-commencing verbs. Evidence in support of our claim is that many Zulus today still use the verb /-mb-/ as /-emb-/, as is illustrated in such common usages as: Úbaba wémba Úmgodi "Father is digging a hole". The morphological structure of the verb in this sentence is u[/emb̥a\]. There is no /a/ vowel to appeal to for the occurrence of /e/ in the verb. The derivation for this verb is so straightforward that it doesn't need to be supplied.

In conclusion, we wish to express again our indebtedness to Aoki (1974) for having suggested to us this analysis of vowel coalescence.

3. **Vowels in Juxtaposition : Post-lexical Derivations**

The rules that have applied to vowels in juxtaposition so far have been lexical rules, i.e. rules that apply within words or across morpheme boundaries only. In Khumalo (1981), we have supplied tonal evidence suggesting that a number of verbal prefixes such as /be/ and /se/ should be considered underlying verbal roots. In this section, we supply evidence that the lexical rules that have applied across morpheme boundaries do not apply between /be/, /se/ etc. and adjacent morphemes. This strongly confirms that /be/, /se/ etc. should be treated as underlying verbal roots. Let us first consider the underlying structure of subject prefixes in Zulu. Most subject prefixes of consonant-vowel structure, such as 1st person singular /ngi/ or class 2 /ba/ surface as such word-medially or word initially:

(29) Examples:

- ngiyahamba "I'm leaving"
- angithándi "I don't want to"
- bayáhleka "They are laughing"
- abasebénzi "They do not work"
A few CV prefixes, however, surface as such word-medially, but word-initially they surface without the consonant, e.g.

(30) ngifuna áhambé  “I want him to go”
  makáhambe          “Let him go”

All subject prefixes incorporating a glide surface like the subject prefix in (30):

(31) Examples:
  a. íngáne iyadlá  "The baby is eating"
  b. íngáne ayidlí  "The baby doesn't eat"
  c. ñmfula úshíle  "The river is dry"
  d. ñmfula avushílé "The river is not dry"
  e. ámakát'i álélé  "The cats are asleep"
  f. ámakát'i awulélé "The cats are not asleep"

In the examples in (31), a Vowel/Glide Realization account of the /ĩ/alternations is possible, but not for /a-ves/ (a[-hi] segment cannot be realized as a glide). An epenthesis solution would have to make a [+bk] claim for the vowel /a/. Deletion seems to offer the most satisfactory explanation. An advantage that deletion has over the other solutions is that it applies to all these examples. It would apply also to the example in (30) and to other morphemes such as the locative prefixes /se/ and /so/:

(32)
  a. Báya okháhlamba "They are going to the Drakensberg"
  b. Básekháhlamba "They are at the Drakensberg"
  c. Ufike ákáha "Come home"
  d. Ngisákháya    "I'm at home"

For these prefixes, we are proposing a CV underlying structure with a restricted deletion rule applying to just these few morphemes when they occur word-initially. Let us call this minor rule initial-C Deletion. Let us now consider the possible underlying structure for two verbal compounds:
After all the lexical rules have applied in the forms above, we end up with the following structures:

(34)

a. \([\text{wube}] [\text{wusebenza}]\)

b. \([\text{yibe}] [\text{yisebenza}]\)

After the application of Initial-C Deletion, we get the forms:

(35)

a. \([\text{ube}] [\text{usebenza}]\)

b. \([\text{ibe}] [\text{isebenza}]\)

These two verbs are then compounded into one verb. If we tried to apply lexical rules in this post-lexical environment, we would get wrong results.

(36) Sample Derivations:

a. \([\text{ube}] [\text{usebenza}]\)

[\text{ubeusebenza}]

\(\text{ubeusebenza}\)

\(*\text{ubeosebenza}\)

\(*\text{ubosebenza}\)

Compounding

Syllabification

Vowel Lowering

Vowel Deletion

b. \([\text{ibe}] [\text{isebenza}]\)

[\text{ibeisebenza}]

\(\text{ibeisebenza}\)

\(*\text{ibeesebenza}\)

\(*\text{ibesebenza}\)

Compounding

Syllabification

Vowel Lowering

Vowel Deletion

In both cases, we get wrong results. Vowel Lowering and Vowel Deletion are both lexical rules which do not apply in the post-lexical component. In order to get the correct results, we need a post-lexical deletion rule. Let us call this rule Post-Lexical Deletion.
(37) Post-Lexical Deletion

Segmental Tier

CV Tier

Syllable Tier

The rule delinks the leftmost of any two vowels colinked to one
syllable node. The deletion rule now in its post-lexical form
is more general, deleting any juxtaposed vowel to the left.

(38) Sample Derivations:

a. [ube] [usebenza]
   [ubeusebenza] Compounding
   ubusebenza Syllabification
   ubusebénza Post-lexical Deletion
   ubusebénza "You were working"

b. [ibe] [isebenza]
   [ibeisebenza] Compounding
   ibisebenza Syllabification
   ibisdbénza Post-lexical Deletion
   ibisbénza "It (cl.9) was working"

c. [ibe] [ise][iphelile]
   [ibeiseiphelile] Compounding
   ibiseiphelile Syllabification
   ibisiphelile Post-lexical Deletion
   ibisiphelile "It (cl.9) was already finished"

At times a different rule - one that deletes the subject prefix
in the verbal complex to the left - applies before Initial-C
Deletion:
(39) Examples:

a. [wube][wusebenza] - bewusebenza "You were working"

b. [yibe][yisebenza] - beyisebenza "It (cl.9) was working"

c. [sibe][sisebenza] - besisebenza "We were working"

d. [ngibe][ngisebenza] - bengisebenza "I was working"

e. [wusa][wusebenza] - sewusebenza "You are already working"

f. [yibe][yise][yisebenza] - beseyisebenza "It (cl.9) was already working"

The examples in (39) will not be discussed any further because they do not involve vowels in juxtaposition.

While Vowel Lowering and Vowel Deletion are strictly lexical rules, Vowel/Glide Realization and Labial Glide Formation apply both lexically and post-lexically (as we shall illustrate presently). Rules that apply both within and between words are post-lexical rules - "the most obvious diagnostic of a post lexical rule is the ability to apply between words as well as within them" (Kaisse and Shaw 1985: 4). In other words, postlexical rules apply whenever their structural descriptions are met.

In fast speech only, Post-Lexical Deletion, Vowel Glide Realization and Labial Glide Formation apply optionally. ("We also suspect that only postlexical rules can be optional and subject to variation due to rate of speech, though this requires further investigation." (Kaisse and Shaw 1985: 5)):

<table>
<thead>
<tr>
<th>Full Form</th>
<th>Post-Lexical Deletion</th>
<th>Labial Glide Formation</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>into avithandavoi intavithundaydlintwayithandayol</td>
<td></td>
<td></td>
<td>what he likes</td>
</tr>
<tr>
<td>tithi akázi</td>
<td></td>
<td></td>
<td>he says he</td>
</tr>
<tr>
<td>tithakázi</td>
<td></td>
<td></td>
<td>doesn't know</td>
</tr>
<tr>
<td>ngizwa izwí</td>
<td></td>
<td></td>
<td>I have a voice</td>
</tr>
<tr>
<td>ngizwizwí</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>úyê ñlwándle</td>
<td></td>
<td></td>
<td>He's gone to the beach</td>
</tr>
<tr>
<td>úyólwándle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>indlu énkulu</td>
<td></td>
<td></td>
<td>A big house</td>
</tr>
<tr>
<td>indlenkulu</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>indlwenkulu</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4. PALATALIZATION

4.1 Introduction

C.M. Doke is reputed to have been the first scholar to use the term 'palatalization' to characterize the phonemic alternations now known under that name in all Southern Sintu languages.

For Zulu, he described the process as follows:

"In Zulu, bi-labial consonants may not be followed by the semi-vowel \( w \). In some cases where this should synthetically take place, \( w \) is dropped, e.g. in the possessive concord for class 7, where \( ba- \) occurs instead of \( bwa- \). But in other cases, notably in the formation of noun diminutives, locative adverbs and verb passives, the bi-labial consonant gives place to a corresponding prepalatal sound. This is termed palatalization ... Palatalization is not entirely confined to bi-labials, for in diminutive formation alveolar explosives may be palatalized ..." (Doke 1927: 21).

Ziervogel (1967) claims that palatalization in Zulu is caused by:

"i. the vowel \( i \) with its equivalent semi-vowel \( \check{u} \), e.g. inkabi (ox) > diminutive *inkabiana > *inkabyana > inkatshana

ii. the vowel \( e \) with its equivalent semi-vowel \( \check{e} \), e.g. uphaphe (feather) > diminutive *uphapheana > *uphaphyana > uphashana

iii. the vowel \( u \) and its equivalent semi-vowel \( \check{w} \), e.g. isigubhu (calabash) > diminutive *isigubhuana > *isigubhwana > isigujana

iv. the vowel \( o \) with its equivalent semi-vowel \( \check{w} \), e.g. inkomo (cow) > diminutive *inkomoana > *inkomwana > inkonyana" (Ziervogel 1967: 38).
In their analysis, the authors ascribe palatalization to two different processes viz. assimilation to the glide /y/ and dissimilation from the glide /w/. The problem of course, is that their solution does not cover all instances of palatalization. It excludes, for instance, the palatalization of a bilabial followed by the vowel /a/ as in /intaba - intázshaná/"mountain (dim.)". In addition, their claim that /e/ consonantalizes to /y/ runs counter to everything else in Zulu phonology. (In fairness to the authors, however, we would like to point out that this handbook has been withdrawn from circulation, and it may be that the authors no longer hold to this view).

O'Bryan (1974) discusses only the palatalization of verb passive stems in Zulu, and she comes to the conclusion that:

"palatalization is basically a phonetic process and occurs at a distance only when it can serve to maintain the identity of a particular passive stem or if the form has a structure which is identical to those in which palatalization can serve to maintain identity ..." (O'Bryan 1974: 176).

We will go back to O'Bryan's claims later, but it is a pity that her analysis is restricted to only one type of palatalization.

Stahlke (1976) in his discussion on palatalization in Tswana sums up his position as follows:

"Certain palatals arise in ways which do not suggest natural assimilation rules. That is, labials palatalize, but neither coronal or back consonants do so. Palatalization always involves the deletion of the vowel or glide which conditions it ... This then suggests that the palatalization does not represent an assimilatory process, but rather the merger or fusion of two segments so that certain distinctive articulatory properties of both original segments are still present. (Stahlke 1976: 51-2)."
Louw (1975) comes to the same conclusion as Stahlke, even though he doesn't say so in as many words. His derivations of prepalatalts from bilabials in passive and diminutive constructions in Xhosa and Tsonga, are just another version of segmental fusion.

Herbert (1977a) concludes that:
"the complex series of consonant alternations traditionally termed palatalizations and pre-palatalizations is no longer fully phonological in character... 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." (Herbert 1977a: 167)

Finally, Ohala (1978) reports:
"In 1970, Talmy Givon and Erhard Voeltz recognized the need to unify all the various instances of palatalization in Southern Bantu under one process triggered by a palatal glide. They found evidence for the 'missing' palatal glides in all the relevant cases of palatalization. They incorporated their views and evidence in various lectures (T. Givon, personal communication)... In what follows, I propose to provide additional evidence for the Givon-Voeltz-Stahlke analysis" (Ohala 1978: 55).

Our own position is much nearer Givon-Voeltz-Stahlke-Ohala, i.e. we will argue for an assimilation of place of articulation features triggered by a palatal glide.

4.2 Data
4.2.1 Passives
The passive suffix in Zulu surfaces as /iw/ and /w/. It assumes the shape /iw/ with all monosyllabic verb roots (mono-
syllabic here includes both C and VC verbal radicals).

(41) Examples:
-\(-dl-\quad+\quad-dliw-\quad"eat\quad(pass.\quad)"
-\(-mb-\quad+\quad-mbiw-\quad"dig\quad(pass.\quad)"
-\(-ph-\quad+\quad-phiw-\quad"give\quad(pass.\quad)"
-\(-al-\quad+\quad-aliw-\quad"refuse\quad(pass.\quad)"
-\(-eb-\quad+\quad-ebiw-\quad"steal\quad(pass.\quad)"

Polysyllabic roots ending in a bilabial stop surface with a corresponding palatal in place of the bilabial, followed by the suffix /w/.

(42) Examples:
-\(-t'ap-\quad+\quad-t'atsh'w-\quad"collect\quad(pass.\quad)"
-\(-elaph-\quad+\quad-elashw-\quad"treat\quadmedically\quad(pass.\quad)"
-\(-gubh-\quad+\quad-gujw-\quad"dig\quad(pass.\quad)"
-\(-hlab-\quad+\quad-hlatsh'w-\quad"stab,\quadslaughter\quad(pass.\quad)"
-\(-thum-\quad+\quad-thunyw-\quad"send\quadon\quadan\quaderrand\quad(pass.\quad)"
-\(-khomb-\quad+\quad-khonjw-\quad"point\quad(pass.\quad)"

In some polysyllabic roots a non-root initial bilabial stop changes to a related palatal even when it is not root final.

(43) Examples:
-\(-sebenz-\quad+\quad-setshenzw-\quad"work\quad(pass.\quad)"
-\(-khumul-\quad+\quad-khunyulw-\quad"undress\quad(pass.\quad)"
-\(-hluphek-\quad+\quad-hlushekw-\quad"suffer\quad(pass.\quad)"
-\(-p'op'ol-\quad+\quad-p'otsh'olw-\quad"examine\quadmedically\quad(pass.\quad)"

In all other polysyllabic roots only /w/ surfaces in the passive construction:

(44) Examples:
-\(-bon-\quad+\quad-bonw-\quad"see\quad(pass.\quad)"
-\(-gqok-\quad+\quad-gqokw-\quad"dress\quad(pass.\quad)"
-\(-fic-\quad+\quad-ficw-\quad"find\quad(pass.\quad)"
-\(-phuz-\quad+\quad-phuzw-\quad"drink\quad(pass.\quad)"
4.2.2 Locative Construction

Palatalization occurs in the locative construction when a noun ending in a labial consonant and vowel takes the locative suffix /ini/.

(45) Examples:
- e + mbobo + ini → ámbotsh'áni "hole (loc.)"
- e + si + gubhu + ini → ásigújini "calabash (loc.)"
- e + mu + lomo + ini → emlonyeni "mouth (loc.)"

4.2.3 Diminutive Construction

In diminutive formation both alveolar and bilabial root-final stop consonants are replaced by their palatal counterparts, irrespective of the quality of the root-final vowel.

(46) Examples:
- ikopí + ikotsh'ána → "cup (dim.)"
- isigúbhu + isigujana → "calabash (dim.)"
- úmlomo + umlónyana → "mouth (dim.)"
- i:khwaphá + i:kwashána → "armpit (dim.)"
- índlebé + indletsh'ána → "ear (dim.)"
- isigodí + isigojána → "district (dim.)"
- imóto + ímotsh'wána → "car (dim.)"
- ingáne + ínganyána → "child (dim.)"
- ú:phuthú + ú:phushwána → "thick porridge (dim.)"

4.3 Analysis
4.3.1 The Passive Construction

The first thing we wish to draw attention to is the fact that palatalization never applies to a root-initial consonant. This statement is true for all constructions:

(47) Examples:
- a. -eb- + -ebiw- → "steal (pass.)" Not *-etshw-
- b. e + si + pho + ini → ásiphéní "left (loc.)" Not *esisheni
- c. isi + mó + yana-isimána → "condition (dim.)" Not *isínýana

In the passive construction monosyllabic roots incorporating a bilabial segment are shielded from the application of
palatalization by the occurrence of the vowel in the passive suffix /-lw/.

There is little doubt that the underlying form of the passive suffix is either /w/ or /iw/. In the former case, the latter form is obtained by /i/ epenthesis, and in the latter case the former allomorph is obtained through /i/ deletion. We claim, however, that in the passive construction, there is neither /i/ epenthesis nor /i/ deletion, but rather this /i/ is the 'missing' palatal that triggers palatalization. The reason why this palatal segment has been 'missing' for so long is to be found in the application of the very general rule introduced in (8) which we termed Y-Deletion.

Our claim for passive palatalization in Zulu is that the passive suffix is /iw/, but that an allomorphy rule converts it to /yw/ before polysyllabic roots. The palatal glide in /yw/, we claim, triggers palatalization, and thereafter the glide is deleted by the general rule we termed Y-Deletion. The rule that converts /iw/ to /yw/ we term Passive Glide Formation.

(48) Passive Glide Formation

\[
\begin{array}{c}
[-\text{cons}] \\
[\text{-lab}] & [-\text{cons}] \\
[\text{+hi}] & [+\text{lab}] \\
\hline
[X \ C \ V \ C \ X] \\
\hline
V \ C \ X \\
\hline
N \\
\hline
\text{Stem} \\
\text{Nucleus Tier} \\
\text{Passive}
\end{array}
\]

This rule, a very localized allomorphy rule, converts, by delinking it from its nucleus node, the 'V' slot of the passive vowel suffix to a 'C' slot. This paves the way for Vowel/Glide realization to convert the passive /i/ vowel to glide /v/, creating the passive allomorph /yw/. This allomorphy rule applies only if the stem to the immediate left of the passive suffix is CVC or longer, i.e. polysyllabic. (We will claim in Chapter 5 that verbal radicals end in an unspecified vowel, not in a consonant. But since that terminating vowel has no
segmental identity we will ignore it in this Chapter.) Here are some monosyllabic verbs which illustrate the affixation of passive /iw/:

(49) Examples:
- u ku - eb - iw - a - ἅκωβια - "to be stolen"
- u ku - cn - iw - a - ἄκονια - "be spoiled"
- u ku - mb - iw - a - ἄκομπια - "to be dug"
- u ku - di - iw - a - ἄκῳά - "to be eaten"

In polysyllabic verbs Passive Glide Formation will apply as the following examples illustrate:

(50) Sample Derivations
a. u ku - bas - iw - a
   u ku - bas - yw - a  Passive Glide Formation
   u ku - bas - w - a  Y-Deletion
   ukubasa  "To be lit"

b. u ku - hlakul - iw - a
   u ku - hlakul - yw - a  Passive Glide Formation
   u ku - hlakul - w - a  Y-Deletion
   ukuhlakulwa  "To be weeded"

When Passive Glide Formation applies to a polysyllabic verbal stem ending in a bilabial consonant, then Palatalisation applies:

(51) Labial Palatalization

\[
\begin{align*}
\text{Feature Tier} & \quad [+lab] \quad [+hi] \quad [-lab] \\
\text{Place Tier} & \\
\text{Supralaryngeal Tier} & \\
\text{Segmental Tier} & \quad \{-\text{cont}\} \\
\text{CV Tier} & \quad \{+\text{cont}\} \quad [+\text{nas}] \\
\text{Syllable Tier} & \quad X \quad C \quad V \\
\text{stem} & \\
\end{align*}
\]
The rule stipulates that a bilabial stop or nasal which is not in stem-initial position, but which is immediately followed by a tautosyllabic palatal glide, links onto the place of articulation tier of the palatal glide and delinks from its own place of articulation tier.

Thereafter Y-Deletion will apply and we will be left with a palatal segment only in place of the bilabial segment and palatal glide. This palatalization of passives is, contrary to the claims of Doke, O'Bryan and a host of other analysts, not a dissimilatory process, but an assimilatory one. Doko claimed that the bilabial segment was dissimilating from the labial glide. Our claim, however, that in a number of instances we start off with a tautosyllabic bilabial consonant - bilabial glide sequence, Labial Dissimilation (see (9) in this chapter) applies, converting the labial glide to a palatal glide. Thereafter the bilabial consonant assimilates in place of articulation features to the palatal glide.

Our palatalization differs from Stahlke's in formulation and in the essential fact that our analysis incorporates the deletion of the palatal glide. The two segments share features, i.e. the bilabial segment sheds its place of articulation features and assumes those of the palatal glide while retaining its own manner and laryngeal features. (Minor adjustments are made where the set of features retained by the bilabial segment do not form part of a palatal segment in Zulu. A typical example is that of the aspirated bilabial stop /ph/. It sheds its place of articulation features, i.e. its labiality and assumes those of the palatal glide while retaining its manner, i.e. [-cont] and laryngeal features, i.e. [+asp]. The problem that arises is that of the non-occurrence in Zulu of a palatal segment with these manner and laryngeal features, i.e. [-cont ; +asp], in other words an aspirated palatal stop or affricate. The nearest palatal segment to an aspirated palatal affricate in Zulu phonology is the palatal fricative, hence the /ph + sh/ alternation). In a sense, this is some type of fusion. The difference is only that after the bilabial segment has exchanged its place of articulation features for those of the
palatal glide, then the glide deletes as a result of the application of the general rule we termed Y-Deletion. The argumentation also accounts for Louw's (1976) analysis of palatalization.

We will react to the Herbert (1977a) and Ohala (1978) analyses after considering palatalization in all constructions where it occurs. Here is a sample derivation illustrating the application of palatalization:

(52) **Sample Derivation**

<table>
<thead>
<tr>
<th>u - ku - khulum - iw - a</th>
<th>Passive Glide Formation</th>
</tr>
</thead>
<tbody>
<tr>
<td>u - ku - khulum - yw - a</td>
<td>Labial Palatalization</td>
</tr>
<tr>
<td>u - ku - khulum - yw - a</td>
<td></td>
</tr>
<tr>
<td>u - ku - khulum - w - a</td>
<td>Y-Deletion</td>
</tr>
</tbody>
</table>

ukúkhulínywa "To be spoken"

Labial Palatalization applies elsewhere, but before exploring that let us reconsider why all forms of palatalization do not apply to the root-initial segment. In (47) we illustrated that palatalization in passives, locatives and diminutives did not apply to the root-initial bilabial consonant. We did not pursue this matter then because palatalization in the passive construction was blocked from applying to monosyllabic verbal roots by the occurrence of the vowel in the passive suffix. Let us reproduce the examples we gave in (47) to illustrate that palatalization in passives, locatives and diminutives did not apply to the root-initial bilabial consonant:

(53) **Bilabial in root-initial position**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>'ebi</td>
<td>sai</td>
</tr>
<tr>
<td>b</td>
<td>isiphó (+loc.)</td>
<td>esiphéné</td>
</tr>
</tbody>
</table>
| c | isimó (+dim.) | isimána | "condition (dim.)"

That palatalization fails to apply in (53) because the bilabial consonants are root-initial (or morpheme-initial, for that matter) is illustrated by the following examples where the phonetic content is identical except for the fact that the
bilabial consonant is not root-initial (or morpheme-initial) and palatalization does take place:

(54) Bilabials not in root-initial position

a. -hleb- (+pass.) + -hletshe- "gossip (pass.)"
b. ubuchopho (+loc.) + ebuchoshehi "brain (loc.)"
c. umlomo (+dim) + umlonya "mouth (dim.)"

The question that arises is why the language does not allow the palatalization of root-initial bilabial consonants. The answer seems to concern the identity of morphemes incorporating such consonants: it would be very difficult, if not impossible, for a morpheme, particularly a monosyllabic one, to retain its identity after a change in its initial consonant. The language, we feel, employs different strategies to ensure the identity of the morpheme-initial consonant. In the passive construction this is achieved by ensuring that in monosyllabic roots the passive moi-eme incorporates the palatal vowel rather than the palatal glide, while in polysyllabic stems, the root-initial bilabial consonant is exempt from palatalization. In the formulation of Labial Palatalization, ensuring the identity of the root-initial consonant is the motivation for exempting the root-initial bilabial consonant from the application of palatalization. It is our argument that palatalization is triggered by the palatal glide and not the palatal vowel and, furthermore, this palatal glide must be tautosyllabic with the consonant that palatalizes. This is the motivation for Passive Glide Formation. Finally, palatalization is restricted to stems and does not apply to prefixes. (The majority of prefixes, however, would still be exempt from palatalization without this provision, since they are monosyllabic). Let us illustrate this last point by providing a derivation for the possessive prefix of Class 14. Recall that in the remarks immediately preceding (20) of this chapter, we pointed out that the possessive prefix is made up of the subject prefix of the class plus the possessive marker /a/. The subject prefix for Class 14 is /bu/, and so we can supply the derivation for the
possessive prefix of this class:

(55) Sample Derivation

bu-a
bwa Vowel/Glide Realization
bya Labial Dissimilation
ba Y-Deletion
ba - Possessive Prefix - class 14

(Compare this prefix with the possessive prefix of class 15, viz. ku-a → kwa)

The point of this derivation is that morpheme-initial bilabial consonants in prefixal morphemes are also exempt from palatalization. By restricting palatalization to stems, of course, we mean that it would not apply to prefixes, even if they were polysyllabic and the bilabial was not root-initial.

Some claims of palatalization involving prefixes, however, have been made in the literature. Doke (1927) claims: "In /utshani/ (grass), the root is /-ani/, the real prefix /ubu-/ being camouflaged by palatalization ..., thus /ubu-ani/ /utshani/, /ubwani/ being impossible to Zulu phonology. Similarly with /utshwala/ (beer) palatalization has taken place, the derivation being /ubu-ala/, and the semi-vowel /w/ retained. Despite these origins, fuller forms, with an additional /ubu-/ prefix, are used, e.g. /ubutshani/, /ubutshwala/" (Doke 1927: 59-60). In our opinion, the present-day roots in these two words are /tshwala/ and /tshani/, and most dialects delete the noun prefix /bu/.

Now let us pay some attention to what has sometimes been described as palatalization 'at a distance'. This is when a bilabial is palatalized when it is not in the syllable incorporating the passive morpheme. Examples were provided in (43), but we will reproduce them here, and add one more example.
Examples:

(a) -sebenz- + -setshenzw- "work (pass.)"
(b) -khumul- + -kunyulw- "undress (pass.)"
(c) -hluphek- + -hlushekw- "suffer (pass.)"
(d) -p'op'ol- + -p'otsh'olw- "examine medically (pass.)"
(e) -phaphamis- + -phashanisw- "awaken (pass.)"

Let us first consider example (c). This example has the following morphological structure [[hluphek] i.e. a regular root plus a neuter suffix. The root may be passivised on its own:

(57) [[hluphek]w]

- hluphyw Passive Glide Formation
- hlushyw Labial Palatalization
- hlushw Y-Deletion
- hlushw - "trouble (pass.)"

A number of analysts, Doke and O'Bryan among them, have argued:

"While the occurrence of palatais rather than bilabial stops in these forms in which the bilabial stop is at a distance from the -w- seems somewhat strange from a phonetic point of view, it is quite reasonable from a morphological standpoint: Since bilabial stops always become palatais when they are contiguous to -w- (that is, when no suffix intervenes between the root or stem-final bilabial and the -w- (e.g. bhenyw < bhem)), allowing the palatal to occur in derivations, where the bilabial and the -w- are separated (e.g. bhenyelwan) keeps the root or stem identical in all its passive forms: e.g. passive Suem of bhem- is bheny-. Thus, although the palatalization process appears to have a phonetic basis, evidence from forms occurring in this group presently under discussion indicates that its extension has a morphological basis. A situation such as this where a particular stem form is extended throughout a paradigm or category or where the scope of a phonological (or phonetic) rule is extended or limited in order to serve some morphological function is, of course, quite common and has been discussed at length"
in recent literature." (O'Bryan 1974: 149)

An analysis like the one presented above describes the facts in stems like /hluphek-/ above, but how do we explain palatalization at a distance in stems like /sebenz/ in (43), where no such root as */seb/ is attested in the language?

O'Bryan explains that palatalization at a distance occurs "only when the phonetic environment is present in the simple stem (that is, in derived formulations, when a simple stem in a final bilabial stop exists as a model) and in 'non-derived' formations of a structure such that they contain a 'possible' phonetic environment... that is a 'possible' stem in a final bilabial and one or more 'possible' suffixes." (p.170)

This means that the verbal stems in (55) have the following 'actual' or 'possible' morphological structure:

(58) a. [[seb]enz]
    b. [[khum]ul]
    c. [[hluph]ek]
    d. [[pop]ol]
    e. [[phaphlam]is]

The fact that these stems are perceived of as falling into one paradigm of morphological structure explains why each of their 'roots' appears in its passive form, i.e. the passive form of the 'root' /seb/ is /setsh/, that of /khum/ is /khuny/ etc. Roots not ending in a bilabial segment, of course, will have the same shape in passive and non-passive constructions.

However, there is a small class of roots ending in a bilabial consonant which has the same 'actual' morphological structure as the stems above but which do not display the expected passive form in their roots when they occur in palatalized stems:

(59) Examples:
    a. babelw "be bitter (appl. and pass.)" ( -bab-sl-iw)
    b. gabisw "depend on (pass.)" ( -gab-is-iw)
The roots /bab/ and gab/ are commonly used roots in Zulu and yet they fail to assume the expected passive shape viz. /*batsh'/ and /*gatsh'/. These are roots which, on their own are never passivized, i.e. forms like the following never get realized in Zulu.

(60)a. [[bab]iw] "be bitter (pass.)"
   b. [[gab]iw] "depend on (pass.)"

In other words, we never get passives like /*batsh'w/ or /*gatsh'w/ in Zulu. These roots are passivized only after having taken other extensions. This small class of verbal roots that fail to be passivized we wish to mark [-passive] in the lexicon. This lexical marking will explain why the roots do not undergo palatalization, i.e. why they have no passive stem shapes. Here are a few examples in sentences of some of these [-passive] roots:

(61)

a. Ubabéwa ngumúthi "He finds the medicine bitter"
b. Bagabíswa yimali "They boast of their good financial standing"
c. Isinkwa sikhukhumalíswa yíni "What makes the bread dough rise?"
d. Ukhukhobéwa ngótsotsí "The thugs are after him"
e. Wáshiphelewá yingulúbe "He has gone off pork"

Any attempt to apply palatalization at a distance to the forms above would render them unacceptable.

In (51), Labial Palatalization was formulated as a rule in which the passive palatal glide spread its place of articulation features to a preceding tautosyllabic bilabial consonant. Palatalization at a distance, therefore, may be conceived of as an extension of Labial Palatalization, i.e. where the application of the rule extends to all other preceding bilabial consonants excluding the root-initial one. This extension, in autosegmental terms, may be represented as some type of harmonic process in which the place of articulation features
function as an autosegment while the bilabial consonants are
cconceived of as P-bearing units. We will use [+PAL] to
represent the autosegment and the passive suffix will then have
to be represented as follows:

(62) Passive Suffix

```
Feature Tier  [+PAL]  [+hi]  [+lab]
Place Tier
Supralaryngeal Tier
Segmental Tier  [-cons]  [-cons]
CV Tier  V  C
passive
```

Since the autosegment does not spread onto the root-initial
labial stop or nasal, passives incorporating monosyllabic
verbal roots (i.e. C or VC radicals) merit no discussion.

(63)

- mb + iw > mbiw  "dig (pass.)"
- ph + iw > phiw  "give (pass.)"
- m + iw > miw  "stand (pass.)"
- ab + iw > abiw  "distribute (pass.)"
- oph + iw > ophiw  "bleed (pass.)"

In the examples in (63), the initial segment of the passive
suffix surfaces as a vowel, i.e. linked to a "V" slot. When,
however, this suffix occurs with a polysyllabic verbal radical,
it is first realized as a glide which is later deleted by the
application of Y-Deletion. Passive Glide Formation (see (48)
in this chapter) now will be formulated differently:
The rule states that if the suffix occurs with a polysyllabic stem, then the initial segment (i.e. the vowel) of the passive suffix delinks from its nucleus node. This delinking, of course, converts the "V" slot into a "C" slot, as we have already learned, and the initial segment is realized as the glide /y/ after the application of Vowel/Glide Realization.

When, however, a polysyllabic verbal radical incorporates a non-root initial labial stop or nasal, then the [+PAL] auto-segment spreads onto any such segment. This type of palatal harmony is organized as follows:

a. The palatal point of articulation features function as the P-segment.

b. The P-bearing segments are all non-root initial labial stops or nasals.
174.

c. The domain of this harmony is a verbal stem incorporating a [+passive] root.
d. All other segments are transparent to alatal Harmony.

(66) **Labial Palatalization**

<table>
<thead>
<tr>
<th>Feature Tier</th>
<th>[+lab]</th>
<th>[+PAL]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place Tier</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supralaryngeal Tier</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Segmental Tier</td>
<td>[+cont], [+nas]</td>
<td>[-cons]</td>
</tr>
<tr>
<td>CV Tier</td>
<td>C</td>
<td>X</td>
</tr>
</tbody>
</table>

Verb stem [+passive]

( iterative )

**Condition:** The rule does not apply to a root-initial bilabial stop or nasal.

The rule states that a [+PAL] autosegment linked to a glide spreads to a non-root bilabial stop or nasal. The bilabial stop or nasal onto which the autosegment spreads then delinks from its place of articulation tier. If there should be another non-root initial bilabial stop or nasal, then the autosegment spreads to it also.

(67) **Sample Derivations**

a. gubh - iw
   - gubhyw **Passive Glide Formation**
   - gujyw **Labial Palatalization**
   - gujw **Y-Deletion**
   - gujw "dig (pass.)"
Author  Khumalo, James Steven Mzilikazi.
Name of thesis  An Autosegmental Account Of Zulu Phonology.  1987

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