6.1 Introduction

It will have become clear in the last chapter that the alternation in the phonological realisation of morphemes is for the most part not arbitrary. The same segment types turn up in similar processes found in diverse languages. Phonologists have used the term NATURALNESS to refer to the fact that there is, for the most part, a phonetically well-motivated relationship not only between the allophones of a phoneme, but also between the various phonological manifestations of a morpheme. Naturalness can be approached in terms of MARKEDNESS. What is NATURAL can be said to be UNMARKED, and what is not natural can be said to be MARKED, i.e. in some sense unusual. The purpose of this chapter is to explore this phenomenon.

6.2 Natural segments, natural classes and natural processes

It is not only classes of sounds which are affected by the same phonological processes that tend to be made up of segments which are phonetically natural. Individual segments themselves also tend to contain phonetic features which are natural. Partly due to physiological constraints, not every conceivable combination of features results in permissible segments. At a very obvious and trivial level, the fact that nobody has lips long enough to make contact with the uvular precludes labio-uvular consonants. More significant, however, is the fact that not all physically poss-
ible feature combinations are equally probable. Certain feature combinations are more likely; they are the ones that recur again and again in various languages. They are the unmarked combinations.

For instance, voiceless sonorants such as the nasals [m ɳ ɲ ŋ] are much less common than their voiced counterparts [m ɳ ɲ ŋ]. Likewise, voiceless approximants like [w j l r] are less common than voiced ones. Sounds produced with the velaric airstream mechanism (i.e. clicks) and those produced with the glottalic airstream mechanism (i.e. implosives and ejectives) are less common than sounds produced with the pulmonic airstream mechanism. Front rounded vowels are rare (the main concentration of front rounded vowels is north-western Europe where they occur in languages such as French, German and Swedish) but front unrounded vowels are not. Nasalised vowels, though widespread, are still much less frequent than their oral counterparts both in the world’s languages and in those languages where they occur. That certain combinations of features are more favoured, more natural than others is beyond dispute. We shall consider some possible reasons for this at the end of this chapter.

I invite you now to determine which of the segments in each pair below is marked (less natural). State your reasons.

[6.1] A B

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>u</td>
<td>u</td>
</tr>
<tr>
<td>ɶ</td>
<td>o</td>
</tr>
<tr>
<td>ɶ</td>
<td>ɛ</td>
</tr>
</tbody>
</table>

In each case the sound in column A is marked. Vowels are normally voiced like [u] and not voiceless like [ʊ]; vowels are normally oral like [o] and not nasal like [ɶ]; front vowels are normally unrounded like [ɛ] and not rounded like [ɶ].

Languages typically have both natural segments and natural phoneme inventories. In Chapter 2 we noted that phoneme inventories tend to be SYMMETRICAL. That observation can be restated in terms of naturalness. As a
rule, creating symmetrical phoneme inventories entails maximising the use of a few phonological parameters. Such an arrangement is economical and has the merit of reducing the burden on memory during language acquisition: a small number of features is learned and is reused many times. This is preferable to having phonemes which have little in common with each other and which entail mastering numerous distinctive features.

Contrast the inventories in [6.2] with those in [6.3]:

[6.2] (a) Swahili vowels
    i  u
    e  o
    a

(b) Turkana (Kenya) consonants (Dimmendaal 1983)
    p  t  c  k
    b  d  Ꞧ  g
    m  n  ꞣ  ꞣ
    s
    l
    r
    j  w

[6.3] (a) i
    (b) p  t  ?
    i
    e  m  ꞣ
    ꞣ
    ꞣ

A phoneme inventory like that in [6.3b], with its many holes in the pattern, is less likely to be attested in natural languages than the symmetrical Turkana inventory in [6.2b], which distinguishes voiced stops, voiceless stops and nasals at each one of the three places of articulation exploited. Likewise, the balanced Swahili system in [6.2a] where front vowels are paired with back ones is a more likely vowel inventory than the skewed one containing only front vowels which is shown in [6.3a].

While recognising the importance of symmetry, we need to constantly bear in mind the fact that it is not an absolute imperative. Inelegant, skewed phonological
systems are not unheard of. The Kikuyu plosives system, for instance, contains no bilabial voiceless stop:

\[ t \quad k \]
\[ b \quad d \quad g \]

We shall end this section by re-examining data first introduced in the last chapter, which are reproduced below as [6.5] for convenience. These data illustrate the role of NATURAL CLASSES in the phonology of Luganda:

[6.5] m-bala I count
m-pa I give
n-daga I show
n-sika I pull
n-\( \text{-}\)ela I sweep
n-gula I buy
n-kuba I hit

The segments [m n n η] which acquire the place of articulation of the following consonant are not a random collection of segments; rather, they are a coherent class of phonetically similar sounds. They form a natural class. The homorganic nasal assimilation rule affects only the natural class consisting of nasal consonants.

The other phonological processes discussed in Chapter 5 also affect natural classes. The segments which condition or undergo a phonological process do share in each instance some phonetic characteristic. Thus, typically, palatalisation of velar consonants occurs in the context of front vowels (especially high ones like [i]) which are themselves produced with the tongue approximating the hard palate. Labialisation occurs in the neighbourhood of labial vowels like [u] which are themselves produced with rounded lips. Nasalisation of vowels occurs when they are adjacent to nasal consonants. Voiceless consonants may acquire some voicing when juxtaposed with inherently voiced segments like vowels or sonorants (such as nasals), and so on.

Important though they are, naturalness and markedness are not absolute concepts. Rather, they are both relative. What is marked on unmarked will often depend on the circumstances. A nonlinguistic analogy should help to clarify this: wearing a bikini or a kilt and sporran are in a
sense marked modes of dress. Most people most of the time do not go about their business so attired. However, a woman in a bikini on the beach on a hot, sunny day or a Scotsman in a kilt at a Burns Supper would respectively be very ‘unmarked’. So it is in phonology. Nasal vowels, to take one example, are marked. Indeed, we would be extremely surprised if we found a language which had only nasal vowels and no oral ones. However, between two nasal consonants, or before a nasal plus consonant cluster like [nd], nasalised vowels would be unmarked. It would be somewhat unusual for vowels occurring in those contexts to have no nasalisation. Using an oral [æ] in [mæn] is marked but using a nasalised [ñe] and saying [mñe] is unmarked. The same would apply to palatalisation of velars before high front vowels or labialisation before rounded vowels. Markedness cannot be interpreted with total disregard for context.

For the next example look back at the discussion of voice assimilation in English in section 5.2 of the last chapter. The consonants in the suffixes -s, -z, -iz; -t, -d, -id that figure in English voice assimilation are either fricatives or stops. This is not accidental. In many languages fricatives and stops (together with affricates) form a natural class to which the label OBSTRUENT (or NON-SONORANT) is given. These sounds share the phonetic characteristics of having very significant obstruction in the oral tract and of being typically voiceless. They also tend to display similar phonological behaviour.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>bat</td>
<td>tab</td>
<td>pat</td>
<td>tap</td>
<td></td>
</tr>
<tr>
<td>goal</td>
<td>log</td>
<td>coal</td>
<td>lock</td>
<td></td>
</tr>
<tr>
<td>vine</td>
<td>safe</td>
<td>fine</td>
<td>safe</td>
<td></td>
</tr>
<tr>
<td>zoo</td>
<td>as</td>
<td>sue</td>
<td>ass</td>
<td></td>
</tr>
<tr>
<td>gin</td>
<td>edge</td>
<td>chin</td>
<td>etch</td>
<td></td>
</tr>
</tbody>
</table>

Say the words in [6.6] aloud again and again. Compare the voicing of the words on the same line carefully and see if there is some kind of pattern.
What you will discover is that in English obstruents are more heavily voiced at the beginning of a word than they are word-finally. Generally word final voicing is so attenuated that it is barely detectable. In fact, the distinction between ‘voiced’ and ‘voiceless’ obstruents word-finally is less important in discriminating between words than the lengthening of the vowel that precedes a ‘voiced’ consonant.

It is natural for obstruents to be voiceless. Many languages have more voiceless obstruents than voiced ones and some have no voiced obstruent phonemes at all. That is the situation in many Australian languages. And numerous languages, with voiced obstruents, have a rule which devoices them in syllable final position. Such an obstruent devoicing rule can be seen at work in Turkish:

[6.7] Turkish obstruent devoicing (Kenstowicz and Kisseberth 1977:50)

<table>
<thead>
<tr>
<th>objective</th>
<th>absolute</th>
<th>plural</th>
<th>gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>ip-ı</td>
<td>ip</td>
<td>ip-ler</td>
<td>rope</td>
</tr>
<tr>
<td>dib-ı</td>
<td>dip</td>
<td>dip-ler</td>
<td>bottom</td>
</tr>
<tr>
<td>at-ı</td>
<td>at</td>
<td>at-lar</td>
<td>horse</td>
</tr>
<tr>
<td>ad-ı</td>
<td>at</td>
<td>at-lar</td>
<td>name</td>
</tr>
</tbody>
</table>

The stops /b/ and /d/ are devoiced in syllable-final position, i.e. when they occur in preconsonantal or word final position.

6.2.1 Phonological strength hierarchies

In the last chapter we saw that assimilation and dissimilation are useful concepts for elucidating phonological alternation. Many natural phonological processes involve some kind of assimilation or less commonly, dissimilation. But assimilation and dissimilation are not the only concepts in terms of which naturalness can be discussed.

Many phonological processes can be fruitfully examined using the notions of STRENGTHENING (also called FORTITION) and WEAKENING (also called LENITITION). These two concepts are not independent of each other. They are merely two poles of the same gradient. As in everyday life, strength and weakness are relative. In [6.8]
I have reproduced a commonly accepted phonological strength hierarchy (> indicates a step towards a 'weaker' pronunciation):

\[6.8\] (a) VOICELESS > VOICED
 (b) STOP > AFFRICATE > FRICATIVE > APPROXIMANT > ZERO

Before you proceed, I suggest that you work out the phonetic parameter(s) on which this hierarchy is based. Is it place of articulation, manner of articulation, airstream mechanism, phonation or something else? Now use your answer to rank the following sounds on the hierarchy which you have established. In some cases you might need to have more than one sound occupying the same place:

\[6.9\] t r o β z s k d
  g m w ð θ p b a

In \[6.8a\] SONORITY is the parameter in question. As a first approximation, sonority is related to voicing. The greater the propensity a sound has of spontaneous voicing, the more sonority it has:

\[6.10\] Sonority hierarchy

\begin{align*}
\text{least sonority} \\
1 & \text{voiceless obstruents (e.g. } t s k) \\
2 & \text{voiced obstruents (e.g. } d g β z) \\
3 & \text{nasals (e.g. } m) \\
4 & \text{liquids (e.g. } r) \\
5 & \text{glides (e.g. } w) \\
6 & \text{vowels (e.g. } a o) \\
\text{greatest sonority}
\end{align*}

The sonority hierarchy is an inverse restatement of the strength hierarchy (see also [9.6] page 158 below). In view of this, some phonologists question the need to distinguish between the strength hierarchy and the sonority hierarchy. Under the heading of strength they would prefer to include not only stricture (i.e. obstruction of the airstream) but also sonority.

Grouping together stricture and sonority under the rubric of the strength hierarchy might strike you as odd.
On the face of it, the two phenomena appear unrelated. However, closer examination reveals an interesting relationship, especially where language evolution is concerned. To understand this relationship we need to draw a distinction between SYNCHRONIC and DIACHRONIC approaches to the study of language. Synchronic linguistics studies the state of a language during one period in its history. A grammar of mid-twentieth century English is a synchronic description. Diachronic (or historical) linguistics, on the other hand, studies the evolution of a language during successive periods.

Frequently, both synchronically and diachronically, voiceless consonants change into voiced ones in environments similar to those where the reduction in the strength of the obstruction in the production of consonants takes place. Indeed, one process may facilitate the other. It is significant that the sounds at the weak end of the strength hierarchy are typically voiced, while those at the strong end are normally voiceless. Voiced sounds are weaker than their voiceless counterparts – [d] is weaker than [t], [z] is weaker than [s] and so on. When a voiceless sound like [t] becomes voiced, we can speak of ‘weakening’.

If you are in any doubt as to what the answer to [6.8b] ought to be, turn back to the first chapter and work out the manner of articulation of each sound. The strength hierarchy in [6.8b] is based on manner of articulation i.e. the way and the extent to which the airstream is obstructed in the articulation of a particular sound. Stops involve the strongest obstruction and approximants the weakest, with the remaining types of sound falling in between. Of course, having no obstruction at all and dropping a sound altogether is the ultimate form of weakening.

Many phonological concepts like assimilation, strengthening, etc., refer to processes that can be understood from either a synchronic or diachronic point of view (see Chapter 8). Strengthening and weakening are exemplified below using some data from historical phonology.

Compare the forms in [6.11] (Hooper 1976):

(a) Latin Italian Spanish French
    vita vita vida vie ‘life’

(b) Latin Italian Spanish French
voiceless ——> voiceless ——> voiced ——> zero stop

$t$ ——> $t$ ——> $d$ ——> $\emptyset$

(where ——> = becomes)

The changes exemplified involve movement down the sonority hierarchy.

In some cases, before being deleted a voiced stop may go through a fricative phase. The word meaning 'loyal' in modern Spanish is derived from Latin legale whose [g] weakened to the velar fricative [ɣ] in Medieval Spanish when it was pronounced as leyale. The velar fricative was eventually lost, resulting in the modern Spanish form leal. In this case the progression down the sonority hierarchy is from a voiced stop to a voiced fricative before deletion takes place.

The examples presented so far have been of weakening. But sounds can move up the strength hierarchy. In Luganda [l], an approximant, becomes a stop [d] when it is immediately preceded by a nasal stop:

[6.12] [lag]  ‘show’  [nd]  ‘I show’
[kaliga]  ‘lamb’  [ndiga]  ‘sheep’

Some linguists have added PLACE OF ARTICULATION as a parameter of the universal strength hierarchy:

[6.13] LABIAL > ALVEOLAR > VELAR

This dimension of the hierarchy seems to be valid for the languages of Western Europe, like Danish, where in intervocalic position, velar /g/ undergoes the most extreme form of lenition (i.e: weakening), being deleted altogether; alveolar /d/ is moderately weakened, being changed to the fricative [ð] but labial /b/ remains unchanged.

However, the universal validity of a place of articulation hierarchy is doubtful. In many Bantu languages, for instance, it is the labial place of articulation that is weakest. Many languages in this family historically weakened and completely dropped the labial stops /p/ or /b/ while retaining the alveolar and velar ones. Thus in Kikamba (Kenya) the reflex of the Proto-Bantu noun class prefix *ba- is a-. The labial [b] was deleted except where it was preceded by a nasal. After a nasal it survives as prenasalised
Proto-Bantu /p/ is equally prone to lenition \( ^*p \rightarrow h \) in Sukuma (Tanzania), Rundi (Burundi), Pare (Tanzania) etc.; \( ^*p \rightarrow \phi \) in Pokomo (Kenya), and Rimi (Tanzania) etc. Typically velars and alveolars do not undergo lenition to the extent that labials do. Given this evidence, it would be unwise to insist on the universality of a strength hierarchy based on place of articulation.

It is arguable that the sonority and manner of articulation strength hierarchies in [6.8] should be replaced by the single hierarchy shown in [6.14]. This, for the reasons given above excludes the dimension of place of articulation.

[6.14] VOICELESS STOP > VOICED STOP > VOICELESS AFFRICATE > VOICED AFFRICATE > VOICELESS CONTINUANT > VOICED CONTINUANT > NASAL > APPROXIMANT

One type of consonant not included in [6.14] which there is strong evidence for is the GEMINATE consonant like [tː] or [dː], usually represented by doubling consonant letters ([tt] or [dd]). Gemination occurs when two identical consonants are adjacent to each other in the same syllable as in English penknife [penːaɪf]; in other words, gemination occurs when a particular segmental articulation is prolonged to cover what would otherwise be two distinct segments. Geminate consonants occupy the highest rung of the hierarchy.

The strength hierarchy, re-stated now in [6.15], is manifested in synchronic phonological alternation and in historical sound change in numerous languages:

[6.15] GEMINATE VOICELESS STOP > GEMINATE VOICED STOP > VOICELESS STOP > VOICED STOP > VOICELESS FRICATIVE > VOICED FRICATIVE ....

The relative strength remains the same with other manners of articulation.

Synchronically, in many languages in positions of weakening, for instance between vowels, geminate segments like [tː] (spelled with tt in the examples which follow) alternate with plain segments like [t]. Thus in Luganda the singular of the word ‘branch’ is ttabi [tːaBi] but
the plural is *matabi* [mataBi]. An historical example of the same kind is provided by the word for ‘drop’ in Romance languages where the reflexes of Latin *gutta* are *gota* in Spanish and *goutte* in French. The original geminate has changed to [t] in both languages.

6.3 Explanations of naturalness

The assimilatory phonological processes of the kind which we explored in the last chapter all have a firm basis in articulatory phonetics. We can point to a good articulatory reason for a process like palatalisation, labialisation or nasalisation. Where possible, adjacent sounds are made similar to each other so that one avoids using any more effort than is required to ensure that one is understood by the addressee. But while assimilation makes the task of speech production easier, it can make speech perception more difficult. It is easier to discriminate between sounds if they are very different from each other than it is to distinguish them when they are very alike. To counterbalance assimilation, there are natural processes which have the effect of enhancing differences between sounds. These facilitate the task of the hearer. In Chapter 5, voice dissimilation in Kirundi was introduced as an example of dissimilation. When this rule applies, the prefix and the root end up not having the same value for voicing, which makes them more different from each other than they would otherwise be.

Vowel patterns also frequently obey the principle of MAXIMUM PERCEPTUAL DIFFERENTIATION. The set in [6.16] turns up in language after language with a three vowel system (see section 3 of Chapter 2).

[6.16]

```
 front  back
 high   i    u
 a      low   ```
The choice of these vowels is not accidental. These three vowels occupy the most peripheral positions in vowel space: [i] is the highest front vowel, [u] is the highest back vowel and [a] is the lowest vowel. Perceptually they are maximally distinct. If a language has only three vowels, in order to avoid hearers getting them confused (and as a consequence getting the meanings of words in which they occur confused), it is almost invariably the three vowels [i a u] that are selected. Languages as diverse as Greenlandic Eskimo and Australian Pitta-Pitta have /i a u/ as their only vowel phonemes.

Languages with a five vowel phoneme system consisting of /i e a o u/, if they have rules which neutralise vowel distinctions in certain environments, tend to maintain the opposition between /i a u/ in the places of neutralisation. An example should clarify this. In many Bantu languages with the five vowel phonemes /i e a o u/, only the peripheral vowels /i a u/ occur in noun class prefixes which mark the class (or gender) of a noun, as you can see in the Luganda forms below:

[6.17] mu-sota snake mi-sota snakes
       mu-ntu person Ba-ntu people
       ki-ntu thing Bi-ntu things
       ka-tale market Bu-tale markets

6.3.1 Natural phonology

Phonologists do not agree on the place of naturalness in phonological theory. Those who belong to a school called NATURAL PHONOLOGY which was pioneered by Stampe (1973) argue that the phonological component of language is not merely the result of CONVENTION, rather it is the way it is for very good reasons. It reflects, on the one hand, the auditory, articulatory and speech processing capacity of humans, and on the other hand the functions which language serves. They maintain that in all languages, phonemes and phonological processes are the residue of UNIVERSAL PHONOLOGICAL PROCESSES. Typically these are assimilation processes like homorganic nasal assimilation, pataisation, nasalisation, voice assimi-
lation, and so on. It is claimed that in acquiring the phonological system of its language, a child has to learn to suppress in different ways and to different language-specific degrees various innate universal phonological processes. A rump of those processes survives, tailored to fit whatever quirks a particular language may have acquired over the centuries. It is suggested that the striking similarity that exists between the phonological processes found in unrelated languages can be largely explained in terms of their having preserved the same or similar aspects of universal natural processes.

In this approach, a sharp distinction is drawn between rules and processes. The term rule is used to refer to phonetically wholly or partially unmotivated alternations, like those exemplified in the next paragraph, which are governed by the conventions of a particular language. Processes are alternations which are regulated by universal phonetic or functional factors. Unlike processes, rules are idiosyncratic properties of particular languages and do not form part of humankind’s common phonological inheritance. Natural processes are more common than idiosyncratic rules. Donegan and Stampe (1979:127) claim that natural phonology ‘follows naturally from the nature of things’ because essentially phonological patterning is not merely a matter of convention.

Nonetheless, even the most ardent natural phonologist would admit that not everything in synchronic phonology is natural. The alternation in the shape of some morphemes either has a tenuous phonetic basis or is entirely arbitrary: there are numerous unnatural alternations which are motivated by lexical or grammatical considerations rather than phonetic factors. For instance, in English the plural of a noun is normally formed by suffixing an alveolar fricative which agrees in voicing with the last segment of the noun root. But in a few irregular forms like ox, which becomes oxen instead of the expected *oxes in the plural, or sheep, which remains sheep in the plural instead of the expected *sheeps, the regular natural process of assimilation does not apply.

A case has been made in the literature for restricting phonology to processes with a genuine phonetic basis and reserving for the morphological component of the grammar
any rules regulating alternations that are determined by nonphonetic factors. This dichotomy between processes and rules is justified on the grounds that natural processes are easier to master in language acquisition than rules, which are not natural. Furthermore, when the language faculty disintegrates in aphasia, control of idiosyncratic rules, vanishes before control of natural processes. The theory predicts, for example, that an English-speaking aphasic is more likely to continue correctly forming regular plurals like *ships* and *boxes* which obey the natural process of voice assimilation than irregular plurals like *sheep* and *oxen* which obey an ad hoc rule.

But there are complications. There is not always a simple dichotomy between natural processes and unnatural rules. With the passage of time, natural processes may have severe constraints imposed on their application without their natural basis becoming entirely lost. Re-examine the treatment of place of articulation in the last chapter. In section 5.3.4 we considered the process of place of articulation assimilation in English and in various African languages. You will recall from section 5.2.1 that in a language like Luganda all nasals always take the place of articulation of the following consonant, this being the universal natural process. In English too, this principle does apply, albeit in a very restricted way, as we saw in the examples in [5.16]. It automatically affects the prefix *in-* but not the prefix *un-.* In Luganda the universal natural process of homorganic assimilation is preserved intact but in English it is inhibited, though not completely suppressed. It applies not across the board, but rather in restricted, morphologically defined environments. But this is still less arbitrary than the rule which says add nothing to form the plural of *sheep.*

Continue exploring the notion of 'degrees of naturalness' by examining some more data, this time taken from Swahili.

[6.18]

<table>
<thead>
<tr>
<th>Noun class 9/10</th>
<th>Noun class 1</th>
<th>Noun class 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>mbuzi goat</td>
<td>mtu person</td>
<td>mvi grey hair</td>
</tr>
<tr>
<td>nguruwe pig</td>
<td>mke wife</td>
<td>mferefe gutter</td>
</tr>
<tr>
<td>njugu peanut</td>
<td>mze old person</td>
<td>mlango doorway</td>
</tr>
</tbody>
</table>
I hope you have been able to see that in Swahili, a word-medial nasal or a nasal prefix marking classes 9/10 must be homorganic with the following consonant but that a nasal prefix marking class 1 or 3 need not be homorganic. While assimilation of a nasal to the place of articulation of the following consonant is itself a natural process, its implementation in Swahili is sensitive to nonphonetic factors – it depends on the noun class which the nasal represents. The homorganic nasal assimilation rule is MORPHOLOGISED. It is not automatically triggered by phonetic information. It requires morphological information. Likewise, the distribution of syllabic nasals, is morphologised. Any class 1 or class 3 nasal prefix is syllabic but a class 9/10 prefix is syllabic only if the root to which it is attached is monosyllabic. The distinction between monosyllabic and longer roots is clearly phonological but information concerning noun class membership is morphological.

Rule morphologisation represents a cline rather than a dichotomy. Some rules may be more morphologised than others; the extent to which the natural basis of a phonological alternation is subverted by nonphonetic factors varies greatly.

Besides morphologisation, another common cause of
the loss of naturalness is TELESCOPING. Telescoping occurs when some intermediate stages in a series of natural historical changes get eclipsed or completely lost, leaving behind a phonetically bizarre set of synchronic alternations. Normally alternants of the same morpheme are related by phonological processes that are plausible. Occasionally, however, we find phonetically triggered, automatic alternations which are arbitrary from a synchronic point of view.

In Luganda, for instance, we find /p/ alternating sometimes with [j] and sometimes with [w], which is extraordinary. It is very odd for a bilabial voiceless stop to have palatal and labio-velar approximants as its allophones. Allophones of the same phoneme ought to be phonetically similar; these sounds have very little in common.

Study the data in [6.19] and state the distribution of the allophones of /p/.

[6.19] kuw.a to give kujita to call kuweta to bend
   wa give! (imp.) tujita we call tuweta we bend
   mpa I give mpita I call mpeta I bend

The fact that [pjw] are in complementary distribution is strange. But we can easily write a rule stating their distribution:

/p/ becomes (i) [j] when followed by [i] and not preceded by a nasal;
(ii) [w] when followed by any other vowel provided it is not preceded by a nasal;
(iii) where it is preceded by a nasal, it is realised as [p] regardless of the vowel that follows it.

When Luganda is compared with another very closely related Ugandan language, Runyankole, the missing stages in Luganda can be reconstructed thus:

[6.20] p > p^h > h > y or w (depending on the following vowel)
Evidence for [6.20] is contained in sound correspondences in forms like:

\[
\begin{array}{ll}
\text{Runyankole} & \text{Luganda} \\
\text{kuha} & \text{kuwa} \\
\text{kuhaisa} & \text{kuweesa} \\
\text{kuheijera} & \text{kuweejeela} \\
\text{omuhiiigi} & \text{omujizzi}
\end{array}
\]

Natural phonology opens new perspectives on the problems of phonological analysis. However, there remain some nagging doubts. The explanation of phonological alternation which it offers is essentially FUNCTIONAL, emphasising as it does natural assimilation processes, and implicitly ease of articulation. But a functional account in terms of ease of articulation which works well for speech production will not be as satisfactory when the focus shifts to speech perception, since what makes the articulation of sounds easier tends to make their discrimination more difficult. The two viewpoints are in conflict. In concrete terms, what this means is that we cannot always explain why in a given case assimilation rather than dissimilation is the preferred solution. The explanation proffered by a natural phonologist might appear to a sceptical observer to be a somewhat arbitrary, post hoc rationalisation whose explanatory value is doubtful.

Consider the claim, for instance, that the ideal syllable type is CV, i.e. the kind of syllable that ends in a vowel (see section 9.5, page 175). It is said that the function of many rules is to maximise preferred CV syllables. It is sometimes suggested that this explains why, in many languages, a word final consonant not followed by a vowel is deleted. For example, in French, the final [t] is dropped in words like petit [pətɛ] ‘little’ (masculine); in the feminine where it is followed by [ə] as in petite [pətɛtə] ‘little’ the consonant is kept. Similarly, the desire to maintain the preferred CV syllable type is said to explain the insertion of extra vowels in English loanwords like hospital when they are borrowed by languages that require consonants to be followed by vowels. Thus hospital is often rendered as hospitali in Swahili and many African languages.

At present there is no way of determining which natural process takes precedence where alternative natural
processes are available. Even if it turned out to be true that naturalness determines rule application, we would be none the wiser when it comes to providing an explanatory account of a specific phonological event. It is not yet possible to explain why, to create a CV sequence, in one instance a vowel is added and in another a consonant is deleted. Intuitively naturalness seems to be a valid concept. However, its predictive value and hence its place in a rigorous theory of phonology is still uncertain.

Exercises

1. All the segments; except one; in each set below form a natural class. Circle the odd one out and state the phonetic property that makes it different from the rest.

(a) r lm  \(\square\)  example [k] is an obstruent  
    [r lm] are sonorants  
(b) p t x g k s f  
(c) l r n j d w j t  
(d) f s t p g b \(\emptyset\)  
(e) s z f v x \(\emptyset\)  
(f) p f d t s t j b v d  
(g) \(\ddot{a}\) \(\ddot{o}\) \(\ddot{i}\) \(\ddot{u}\) \(\ddot{\ddot{y}}\)  
(h) p m t s b d  
(i) b d g d  
(j) e i e \(\emptyset\)  

   bu'rauka I went  bi'lo he goes  
   bi'\(\emptyset\)a he went  bi're\(\emptyset\)a I will go  
   'rei'rima I understand  bu'ara\(\emptyset\)a you went  
   'bulo I'm going  bi're\(\emptyset\)e will you go?  
   'iria listen!  'bina\(\emptyset\)u we went  
   aluke'loma he killed it  
   'biri 'timilo He brought it down and gave it to me  
   (Note: ' marks stress)  
(a) Are [l] and [r] distinct phonemes? What is the evidence?  
(b) State the distribution of [b] and [\(\emptyset\)]. They are in complementary distribution.  
(c) Explain the natural basis of the alternation of [b] with [\(\emptyset\)].
3. Account for the realisation of the final consonant of the noun root in the data below.

<table>
<thead>
<tr>
<th>singular</th>
<th>genitive</th>
<th>plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>wife</td>
<td>wife’s</td>
<td>wives</td>
</tr>
<tr>
<td>knife</td>
<td>knife’s</td>
<td>knives</td>
</tr>
<tr>
<td>hoof</td>
<td>hoof’s</td>
<td>hooves</td>
</tr>
<tr>
<td>thief</td>
<td>thief’s</td>
<td>thieves</td>
</tr>
</tbody>
</table>