Aspects of the Grammar of Luganda

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I declare that this thesis is my own unaided work

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EX BIBL UNIV. EDINBURGEN

TO THE MEMORY

OF

MY MOTHER

AND

BROTHER

Abstract of Thesis

This thesis is a study of the morphology, phonology and phonetics of Luganda. It begins with a general introduction in which previous studies of the language are surveyed and an overview of its grammar is presented, with special emphasis on areas relevant to our investigations.

Part I is devoted to morphology. It examines the claim that Luganda (and Bantu languages in general) is an archetypal agglutinating language which has been made in the past. The morphological model of item and arrangement (IA) which is supposed to be ideal for agglutinating languages is applied to Luganda. It is found to be adequate for the most part, but it is also found that there are many problems which it fails to solve. Next the word and paradigm model (WP) is applied to the data. Although it provides adequate solutions it is rejected for it is too complex: it is ideal for a typical inflecting language like Latin but cumbersome for Luganda which is basically not an inflecting language. The compromise approach of item and process (IP), as used in generative grammar, is found to be the most suitable model.

Besides finding a typological niche for Luganda morphology another goal of Part I is to provide an effective link up between syntax and phonology in a morphology.

Part II, which forms the main body of the thesis

is essentially a discussion of the segmental phonology of Luganda in the context of recent developments in generative phonology. Tone is brought in occasionally to support a claim about segmental phonology.

This part begins with an outline of the phonological model used in this study which differs in several important ways from that proposed by Chomsky and Halle (1968). The main differences are the following:

(1) P-rules are used here only to sort out anomalies. Where there are no anomalies redundancy rules fully specify underlying representations and turn them into surface representations (Brown : 1972).

(2) It is claimed that the raison d'être of all P-rules and many redundancy rules is to avert violations of various output conditions. (Sommerstein : 1974).

(3) Three types of output conditions with varying domains have been recognised: morphophonological constraints, Phonological word structure constraints and phonotactic constraints. Many operations in Luganda phonology have been regarded as conspiracies (Kisseberth : 1970) to avert violations of these output conditions. The formal device of implicational sets (Lass : 1969) has been used to express conspiracies.

This description is essentially synchronic but there is a long diachronic interlude the purpose of which is to

put morphophonology in perspective. Morphophonology-spirantization, consonant strengthening and vowel harmony- is discussed in the light of the abstractness controversy (Kiparsky : 1968b, Hyman 1970).

The main word structure constraints discussed are the prohibition of the occurrence of high vowels initially, vowel length, vowel raising and the Ganda Law. And the main phonotactic constraints investigated are palatalization, nasalization and, above all, syllable structure regulating rules.

Part III is a short sketch of Luganda phonetics, concentrating on the characteristic features of Luganda segmental phonetics rather than on individual segments. The results reported there were obtained using the instrumental techniques of direct palatography, electro-kymography and spectrography.

Appendix I consists of further examples of Ludikya (children's secret language) sentences of the kind cited in the text.

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List of symbols

The phonetic symbols used in this thesis are listed below together with a brief glass of their phonetic quality.

p	voiceless bilabial stop
b	voiced bilabial stop
β	voiced bilabial fricative
w	voiced bilabial approximant
m	voiced bilabial nasal stop
f	voiceless labio-dental fricative
v	voiced labio-dental fricative
ɱ	voiced labio-dental nasal stop
t	voiceless dental stop
d	voiced alveolar stop
l	voiced alveolar lateral approximant
ɺ	voiced alveolar lateral flap
ɾ	voiced alveolar non-lateral flap
s	voiceless alveolar fricative
z	voiced alveolar fricative
n	voiced alveolar nasal stop
c	voiceless palatal affricate
ɟ	voiced palatal affricate
y	voiced palatal approximant
ɲ	voiced palatal nasal stop
k	voiceless velar stop
g	voiced velar stop

ɣ voiced velar approximant

ŋ voiced velar nasal stop

i̝ extra-close front unrounded vowel

i close front unrounded vowel

e half-close front unrounded vowel

a open back unrounded vowel

o half-open back rounded vowel

u close back rounded vowel

u̝ extra-close back rounded vowel

Diacritics

C̩ consonant with a mora value (i.e. with tone bearing capacity)

C: strong (long) consonant

Cʷ rounded consonant

V̩ raised vowel

Ṽ nasalized vowel

V: long vowel

◌́ high tone

◌̀ low tone

◌̂ falling tone

The following symbols are used in the underlying phonological representation:

C consonant

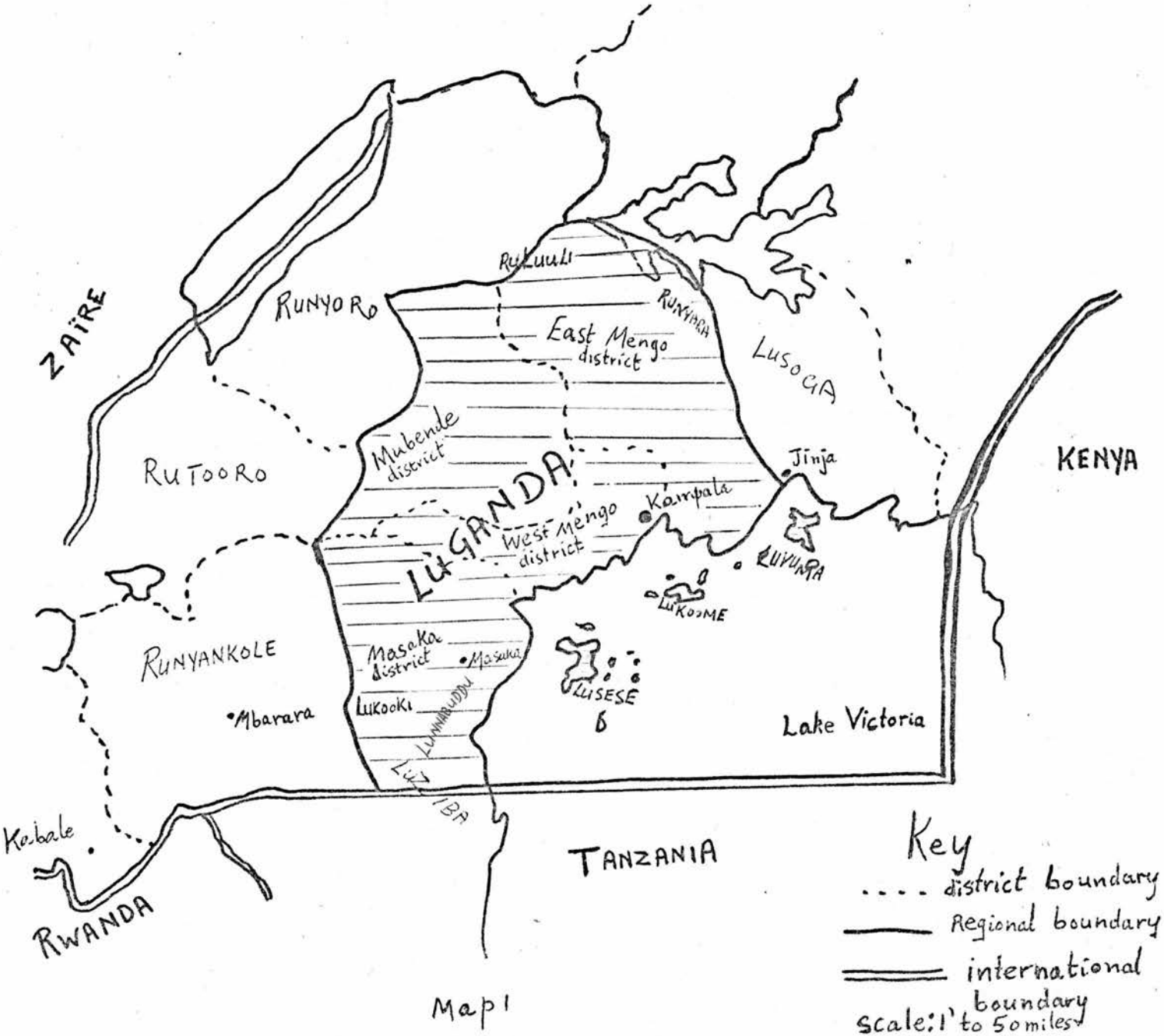
N nasal consonant

NC nasal plus consonant sequence

V vowel

B	archi-segment representing /β/ and /b/ after a consonant
D	archi-segment representing /l/ and /d/ after a consonant
J	archi-segment representing /g/ and /ɟ/ before /i/, and /j/, /ɟ/ and /g/ before /i/ and following a consonant
K	archi-segment representing /k/ and /c/ before /i/

In addition to these there are a few other symbols which are used only to a limited extent. Those shall be described where they are first introduced.


ZAIRE
RUNYORO
RUKUULI
RUNYARA
East Mengo district
LUSOGA
Mubende district
RUTOORO
LUGANDA
West Mengo district
Kampala
Jinja
KENYA
RUYUNGA
LUKOOME
RUNYANKOLE
Masaka district
Masaka
Mbarara
LUKOOKI
LUWABUDDU
LUISESE
Lake Victoria
LIET IBA
Kabale
TANZANIA
RWANDA
Key
district boundary
Regional boundary
international boundary
scale: 1" to 50 miles

Map 1

INTRODUCTION

0.1 THE LUGANDA LANGUAGE

Luganda is a Bantu language of Uganda. It is spoken by 39% of the population of Uganda of whom 16.3% are Baganda (1) (Ladefoged et al, 1972) (2). Buganda region extends for about 100 miles north and west of Lake Victoria. It is surrounded by Bantu speaking districts.

Bantu speaking Uganda constitutes a continuum. This makes it impossible to establish the boundaries of the Luganda language on purely linguistic grounds (Ladefoged et al., op.cit.). Political considerations are always invoked to determine which dialects belong to Luganda and which dialects are varieties of some other language. Although most native speakers of Luganda live in Buganda, Luganda is not the language with the largest first language speakers in every district of Buganda. In East Mengo district Luganda is spoken by 59% of the population, in West Mengo by 49% and in Mubende by a mere 28% of native speakers (3) (Ladefoged et al., op.cit., p.99). Runyarwanda and Runyoro are the most important minority languages.

Luganda itself is not a monolith. It is a conglomeration of several dialects. The major dialects of Luganda are Rulumuli, Runyara, Luvuma, Lukoome, Lusese, Lunnabuddu, Lukooki and 'standard' Luganda. The distribution of these dialects is shown in Map I. The 'standard' dialect is spoken in the central part of Buganda and non-standard dialects in the outlying areas which never got fully incorporated into

(1) Readers unfamiliar with Bantu prefix alternations may note that Luganda is the language; the Baganda (singular Muganda) are the people; and Buganda is the territory

(2) These authors base their statistics on the 1959 census. In 1959 the population of Buganda was 1,815,957 and that of Uganda 6,536,531; in 1969 it had risen to 2,667,332 and that of Uganda to 9,548,847.

(3) Ladefoged et al (1972) should be consulted for an exposition of the complexity of the language situation in Uganda.

the kingdom of Buganda (1). Although they are supposed to be varieties of Luganda, these dialects are in fact less like Luganda and more like the neighbouring languages - Lusoga, Runyoro, Rutooro and Runyankole. On purely linguistic grounds the non-standard dialects should be grouped with these languages rather than with Luganda.

The fact that Luganda has several dialects is seldom mentioned in the literature. All descriptions of Luganda in the past have been based on the 'standard' dialect only (2).

0.2 PREVIOUS STUDIES

Luganda is one of the best documented languages in the Bantu sub-family (3). The earliest grammars of this language were written by missionaries both Anglican and Roman Catholic. They were intended to serve as manuals for missionaries who wanted to learn Luganda. The first Luganda grammar was that of Wilson of the Church Missionary Society. It appeared in 1882. Several other handbooks followed soon after. Of these early missionary efforts Le Veux (1914) was the most remarkable; his dictionary entitled Vocabulaire Luganda-Francais of 1917 was equally brilliant. Indeed all later students of the language have, to varying degrees, drawn on Le Veux's monumental works.

If the first forty years of Luganda linguistic studies can be called the missionary investigator's period, the next forty years could equally well be called the colonial civil servant's era (4).

(1) Buganda was a kingdom until 1966 when kingdoms were abolished in Uganda.

(2) For information on ethnography the reader may consult Roscoe (1965), and Fallers (1960) and for information on history Kiwanuka (1971).

(3) Following Greenberg (1963) we shall regard Bantu as a sub-group within the Niger-Congo family.

(4) The term 'colonial' is not meant to be an emotive cry.

Most of the studies undertaken during the second quarter of this century were written by colonial civil servants to teach fellow colonial civil servants the Luganda language. Handbooks of this period include Kirwan and Gore (1951), Chesswas (1954) and Ashton et al (1954). The last is the most important. It is still the standard description of the whole of Luganda grammar, covering phonology, morphology and syntax (1).

Both the grammars of the missionaries and the civil servants were written with a pedagogic aim in view. They were intended to serve as manuals for Europeans learning Luganda. It was therefore a new departure when, in the 1960's, purely theoretical studies intended not to serve as handbooks but rather to deepen scholars' understanding of Luganda first appeared. The shift from pedagogic to theoretical studies was accompanied by a reduction in the scope of descriptions. Whereas for the preceding three quarters of a century grammarians had attempted to provide sketches of the whole language now they sought to focus on smaller areas and to study them in depth.

Most scholars in recent years have concentrated on phonology in general and on tone in particular (Tucker 1962; Meeussen 1965, 1966; Stevick 1969a; 1969b; Cole 1967; Meny 1971). Of all these works Cole (1967) is the most comprehensive.

Syntax has not been altogether neglected. A number of syntactic studies, for the most part transformationally inspired, have appeared over the last few years. They include Walusimbi and Givon (1970); Mould (1971) and Dewees (1971).

(1) It is not entirely accurate to describe this book as a colonial civil servants' grammar, though it was intended mainly for British administrators. Two of its authors were Baganda and the other two were on the staff of the London University School of Oriental and African Studies

0.3 THE DATA

The present study, like all previous studies, is based on the 'standard' dialect which is spoken in Central Buganda. In particular this study is based on the speech of the author who has lived most of his life in Kyaddondo and Busiro counties of Buganda, within a fifteen mile radius of Kampala.

Occasionally other informants have been consulted. Wherever data have been elicited from some other speaker this fact is acknowledged in the text.

The data which we shall try to account for in this thesis are almost entirely non-controversial and have been described often in the past, though perhaps not in as much detail. The real novelty will be in the interpretation.

0.4 AN OUTLINE OF LUGANDA GRAMMAR

This thesis is mainly a study in Luganda phonology. Most of the theoretically oriented descriptions of Luganda phonology which have appeared over the last fifteen years have been devoted almost exclusively to tone and segmental phonology has been neglected. In order to redress the balance we shall focus on segmental phonology in this description and only briefly discuss suprasegmental features. Furthermore, in order to link phonology effectively to syntax and phonetics a few short chapters on morphology and phonetic realisation are included.

Before plunging into the description we shall outline the elements of Luganda grammar, knowledge of which is presupposed in the chapters which follow. The remaining sections of the introduction are intended to provide an informal pre-theoretical overview of Luganda grammar.

0.4.1 PHONOLOGY

0.4.1.1 Vowels

There are five vowels in the underlying (also called morphophonemic) representation. They are:- i, e, a, o, u. Usually, but not always, they are realised as syllable peaks. The rules governing the realisation of vowels are informally summarised in Table 0.1. Note that generally, when the first of two abutting underlying vowels is deleted or realised as non-syllabic in the phonetic representation, the second one is lengthened in compensation.

0.4.1.2 Consonants

The underlying consonants postulated in this description are shown in Fig.0.1.

	labial	alveolar	palatal	velar
plosive	p	t	(c)	k
	(b)	(d)	ɟ	g
nasal	m	n	ɲ	(ŋ)
approximant	β	l	j	
fricative	f	s		
	v	z		

Fig.0.1 Underlying consonants.

TABLE 0.1 The phonetic realisation of underlying vowels

Underlying Representation		Phonetic Realisation	Environment	Examples
/i/	→	(ø)	before [i]	/li + iso/ [li:so] 'eye'
		(ø)	after [s] or [z] and preceding another vowel	/zi + a/ [za] 'of'
		(ø)	following a velar or palatal consonant and preceding another vowel	/ki + alo/ [ca:lo] 'village'
		[y]	before any vowel elsewhere	/li + ato/ [lya:to] 'boat'
		[i]	elsewhere	/mi + sili/ [misiɪi] 'fields'
/e/	→	(ø)	before any vowel	/leet + a/ [le:ta] 'bring!'
		[e]	elsewhere	/sek + a/ [seka] 'laugh!'
/a/	→	(ø)	before any vowel	/ka + elu/ [ke:ɪu] 'clearing'
		[a]	elsewhere	/ma + ta/ [mata] 'milk'
/o/	→	(ø)	before any vowel	/tool + a/ [to:la] 'take!'
		[o]	elsewhere	/tu + som + a/ [tusoma] 'we read'
/u/	→	(ø)	before [u]	/tuum + a/ [tu:ma] 'heap up'
		(ø)	after [f] or [v] and preceding another vowel	/o + fu + a/ [ofa:] 'you are dying'
		(ø)	after [m] in final position in a phonological phrase (1) optionally	/mu + limu/ [mulim] 'work'
		[w]	before any vowel elsewhere	/mu + ana/ [mwa:na] 'child'
		[u]	elsewhere	/mu + lulu/ [mulu:lu] 'greed'

(1) A phonological phrase is an utterance which is bounded by a potential pause. It is the maximum domain of certain phonological processes (4.3.3)

In order to bring out the fact that some consonants take part in a very limited number of systematic contrasts at the morphophonemic level, consonants with a very defective distribution in the underlying representation are enclosed in brackets. (1).

Another general point which has to be made is that often the same underlying segment is realised by several different phonetic segments, and conversely, the same phonetic segment may represent several underlying segments. This is the source of many of the phonological problems we shall be discussing. For instance, an underlying /p/ may be realised as [p], [p:], [w] or [y] and an underlying /j/ as [j], [j:] or [y]. Conversely, [y] may represent an underlying /p/, /j/ or /i/ (2). The rules governing the realisation of underlying consonants are informally summarised in Table 0.2. Only the main alternations are shown. Sub-regularities and exceptions are not included.

As Table 0.2 shows, it is not uncommon in Luganda phonology for the opposition between two or more underlying segments to be suspended in the phonetic representation. To represent underlying segments which occur in positions where the opposition between underlying segments is suspended in the phonetic representation capital letters will be used in the informal discussion. Such underlying segments will be called archi-segments. For the archi-segment realised as a nasal homorganic with the following stop the symbol /N/ will be used; nasal plus consonant sequences will be symbolised as /NC/ and /C/ will be the symbol for the first of two identical consonants which abut in the underlying representation. Some informal rules for mapping archi-segments on to

(1) It is important to note that some consonants with very limited distribution in the underlying representation are quite common in the surface representation. For example underlying /ɕ/ is rare but surface [ɕ] occurs frequently as a result of the palatalisation of /K/ before /i/.

(2) For the realisation of /i/ see Table 0.1

phonetic representations are given in Table 0.3.

A number of other symbols are also used in this description. Underlying representations are written between slant lines // and phonetic representations between square brackets [] in informal statements. Formally both are expressed in terms of feature matrices. The symbol + indicates boundaries between formatives and roots or between one formative and another. Word boundaries are shown with the symbol #. Boundaries are included in the underlying representation because they are relevant in the statement of morphophonemic segment sequence constraints. Finally the symbol , will be written below a consonant to show that it has the value of one mora (1). The term mora may be provisionally defined as the tone bearing capacity of a segment (see 11.4.2). A strong consonant and a nasal followed by another consonant will each have one mora.

(1) Short syllabic vowels will have one mora and long syllabic vowels two morae.

TABLE 0.2 The phonetic realisation of underlying consonants

Underlying Representation		Phonetic Realisation	Environment	Examples
/p/	→	[y]	before [i]	/ka + pisi/ [kayisi] 'small hyena'
		[w]	before any other vowel	/mu + pala/ [muwala] 'girl'
		[p:]	when it abuts with /C/[1]	/C + peela/ [p:e:la] 'guava'
		[p]	following /N/	/N + pisi/ [mpisi] 'hyena'
		[p]	initially and intervocalically in some words (see 8.2.1)	/ku + pim+a/ [kupima] 'to measure'
/b/	→	[b]	everywhere	/ku + bam+a/ [kubama] 'to go wild'
/m/	→	[m:]	when it follows /C/ or /N/[2]	/N + mese/ [m:ese] 'rat'
		[m]	elsewhere	/mu + tima/ [mutima] 'heart'
/β/	→	{[b] [β] [ɓ]} or	initially after /N/	/βa + kazi/ [βakazi] or (bakazi) 'women' /N+βuzi/ [mbuzi] 'goat'
		[β]	elsewhere	/ka + βuzi/ [kaβuzi] 'small goat'
		[ɓ:]	after /C/	/C+βuzi/ [ɓ:uzi] 'huge goat'.
/f/	→	[f:]	when it abuts with /C/	/C + fumu/ [f:umu] 'spear'
		[f]	elsewhere	/ku + funa+a/ [kufuna] 'to get'
/v/	→	[v:]	when it abuts with /C/	/C + vuu/ [v:u:] 'ashes'
		[v]	elsewhere	/ku + vuβa+a/ [kuvuβa] 'to fish'
/t/	→	[t:]	when it abuts with /C/	/ku + Ct + a/ [kut:a] 'to kill'
		[s]	before [i] or [e] in certain morphophonological environments (see 9.1.2)	/a + leet + e/ [ale:se] 'he has brought'
		[f]	before [u] in certain morphophonological environments (see 9.1.1)	/Bu + kakat + u/ [βukakafu] 'proof'
		[t]	elsewhere	/ku + ta + a/ [kuta:] 'to let go'

Underlying Representation		Phonetic Realisation	Environment	Examples
/d/	→	[d]	everywhere[3]	/ku + diβ + a/ [kudiβa] 'to become out of date'
/n/	→	[n:]	when it follows /C/ or /N/	/N + naku/ [n:aku] 'days'
		[ɲ]	in morphophonological environments specified in (9.1.3) when followed by [i]	/mu + lu + an + i/ [mulwaːɲi] 'fighter'
		[n]	elsewhere	/mu + naana/ [munaːna] 'eight'
/l/	→	[ø]	following /N/ where the next consonant in the word is a nasal	/N + limi/ [n:imi] 'languages'
		[d] after /N/		/N + laβ + a/ [ndaβa] 'I see'
		[ɾ]	following a front vowel [i] or [e]	/βi + le/ [βiɾe] 'clouds'
		[l]	following a non-front vowel [a,o,u]	/tu + lo/ [tulo] 'sleep'
		[d:] after /C/		/C + liβa/ [d:iβa] 'skin'
		[z]	in morphophonological environments specified in (9.1.2) before [i] or [e]	/mu + kol + i/ [mukozi] 'worker'
		[v]	in morphophonological environments specified in (9.1.1) before [u]	/βu + sual + u/ [βuswaːvu] 'shame'
		[l]	elsewhere	/laβ + a/ [laβa] 'see!'
/s/	→	[s:]	when it abuts with /C/	/C + siga/ [s:iga] 'cooking stone'
		[s]	elsewhere	/sek+a/ [seka] 'laugh!'
/z/	→	[z:]	when it abuts with /C/	/ma + Czi/ [maz:i] 'water'
		[z]	elsewhere	/N + βuzi/ [mbuzi] 'goat'
/c/	→	[c:]	when it abuts with /C/	/C + cupa/ [c:upa] 'bottle'
		[c]	elsewhere	/Ku + cacaɲca + a/ [kucacaɲca] 'to feel elated'
/ʄ/	→	[ʄ:]	when it abuts with /C/ (see table 0.3)	/C + jaβija/ [ʄ:aːmbiya] 'matchet'

Underlying Representation		Phonetic Realisation	Environment	Examples
		[z]	before [i] or [e] in certain morpho-phonological environments (see 9.1.2)	/βa + e + ke ʃ + e/ [βe:keze] 'to make frenzied preparations'
		[v:]	before [u] in certain morphophonological environments (see 9.1.1)	/mu + geC ʃ + u/ [mugev:u] 'fat'
		[ʃ]	elsewhere	/ku + ʃaak + a/ [kuʃa:ka] 'to flatter'
/ɲ/	⟶	[ɲ:]	when it follows /N/ or /C/	/mu + Cɲo/ [muɲ:o] 'salt'
		[ɲ]	elsewhere	/mu + ɲa/ [muɲa] 'lizard'
/j/	⟶	[ʃ:]	when it abuts with /C/ (see table 0.3)	/C + juuni/ [ʃ:u:ni] 'arum lily'
		[ø]	following a nasal when the next consonant in the word is also a nasal	/N + juma/ [ɲ:uma] 'behind'
		[ø]	root initially in many words (see 8.2.2)	/kujela/ [kwe:ɾa] 'to sweep'
		[ʃ]	after /N/	/N+ju/ [ɲ:ju] 'house'
		[y]	elsewhere	/ma + juuni/ [mayu:ni] 'arum lilies'
/k/	⟶	[k:]	when it abuts with /C/	/C + kuβo/ [k:uβo] 'road'
		[s]	before [i] or [e] in morphophono-logical environments specified in (9.1.2)	/mu + sak + i/ [musasi] 'provisioner'
		[f]	before [u] in morpho-phonological environments specified in (9.1.1)	/mu + saɲuk + u/ [musaɲufu] 'cheerful'
		[k]	elsewhere	/mu + kazi/ [mukazi] 'woman'
/g/	⟶	[g:]	when it abuts with /C/	/mu + Cga/ [mug:a] 'river'
		[z]	before [i] or [e] in certain morpho-phonological environments specified in (9.1.2)	/mu + jig + i/ [muyizi] 'pupil, student'

Underlying Representation		Phonetic Realisation	Environment	Examples
		[v]	before [u] in certain morphophonological environments specified in (9.1.1)	/mu + jig + u/ [muyivu] 'learned'
		[ɣ]	sometimes intervocalically (see 13.2)	/ku + goβ+ a/ [kugoβa] or (kuɣoβa) 'to chase'
		[g]	elsewhere	/gul + a/ [gula] 'buy!'
/ŋ/	⟶	[ŋ:]	when it follows /C/ or /N/	/N + ŋo/ [ŋ:o] 'banana bud'
		[ŋ]	elsewhere	/N + ŋaaŋa/ [ŋa:ŋa] 'hornbill'

Notes

(1) Two adjacent identical underlying consonants are realised as one strong consonant in the phonetic representation. Strong consonants have been represented as long because length is the most important feature that distinguished weak from strong consonants. See (9.2) and (13.1)

(2) The distinction between /N/ and /C/ is necessary because /N/ is postulated only in certain morphological environments before consonants.

(3) In principle it is subject to the spirantization rules but no examples have been found so far.

TABLE 0.3 The phonetic realisation of archi-segments

Underlying Representation	Phonetic Realisation	Environment	Neutralised Underlying Segments	Examples
/N/ ⟶	[m]	before labial consonants	/m,n,ɲ,ŋ/	/N+pisi/ [mpisi] 'hyena'
	[ɱ]	before labio-dental consonants		/N+va/ [ɱva] 'relish'
	[n]	before alveolar consonants		/N+te/ [nte] 'cow'
	[ɲ]	before palatal consonants		/N+juki/ [ɲjuci] 'bee'
	[ŋ]	before velar consonats		/N+koko/ [ŋkoko] 'chicken'
/B/ ⟶	[b]	following /N/	/β,b/	/ku+saNB+a/ [kusa:mba] 'to kick'
	[b:]	following /C/		/ku+CB+a/ [kub:a] 'to steal'
/D/ ⟶	[d]	following /N/	/l,d/	/ku+liND+a/ [kuli:nda] 'to wait'
	[d:]	following /C/		/ku+CD+a/ [kud:a] 'to return'
/J/ ⟶	[ʄ]	before /i/	/g,j/	/ma+Ji/ [maji] 'eggs'
	[ʄ]	following /N/	/j,ɟ/and /g/ before /i/	/βu+luNJi/ [βulu:ɲji] 'well'
	[ʄ:]	following /C/	/j,ɟ/ and /g/ before /i/	/ku+CJ+a/ [kuj:a] 'to come'
/K/ ⟶	[c]	before /i/	/k,c/	/Ki+Ntu/ [ci:ntu] 'thing'
	[c:]	following /C/		/CKini/ [c:ini] 'excessive'

Notes

(1) Some details are not shown in this table; for example /B/ may also be realised as [b] word initially. See Table 0.2 and (13.2).

(2) Passim, archi-segments undergo the spirantization rules like the underlyig segments which are neutralized. The voiced lingual archi-segments become [z] and [v] respectively before /i/ and /u/ and the voiceless ones [s] and [f] in the environments specified in (9.1.1) and (9.1.2).

0.4.2 TONE

Luganda is a tone language. Tone is used to convey both lexical and grammatical distinctions. There are two level tones high (´) and low (`) and a falling tone which is a combination of high plus low (^)[1]. The distinction between high and low is a relative one; a tone is high or low in relation to the preceding tone. Consecutive high or low tones are perceived as having the same pitch.

Examples of lexical minimal pairs distinguished by tone:

/kù + pél + á/ [kùwéɾá] 'to ban' /kù + pél + à/ [kùwéɾà] 'to become numerous'

/kù + pól + á/ [kùwóɾá] 'to lend' /kù + pól + à/ [kùwóɾà] 'to grow cold'

/kù + βál + á/ [kùβáɾá] 'to count' /kù + βál + à/ [kùβáɾà] 'to produce fruit'

The use of tone alone to make lexical distinctions is rather rare. Usually it is used in conjunction with length for this purpose e.g.

/kù + súl + à/ [kùsúɾà] 'to remain, dwell' /kù + súúl + á/ [kùsûːɾá] 'to throw away'

/βùlálá/ [βùlálá] 'otherwise' /βùlálálá/ [βùlálːɾâː] 'stale'

/kù + sál + à/ [kùsálà] 'to cut' /kù + sáál + á/ [kùsâːɾá] 'to pray in the Moslem way'

More frequently, however, tone is used to make grammatical distinctions, sometimes on its own e.g.

/à + máál + á/ [àmáːɾá] 'he plasters' /à + máál + à/ [àmâːɾà] 'anyone who plasters'

/à + síí β + á/ [àsíːβá] 'he fasts' /à + síí β + á/ [àsîːβá] 'anyone who fasts'

Sometimes tone is used together with length differences:

/à + lím + á/ [àlímá] 'he cultivates' /à + lím + á + à/ [àlímâː] 'anyone who cultivates'

/à + sí β + á/ [àsíβá] 'he ties' /à + sí β + á + à/ [àsíβâː] 'anyone who ties'

Sometimes tone is also used together with length and quality differences:

1 Tone is not marked in the standard orthography. Snoxall's 1967 dictionary includes tone; it is an improvement on standard practice.

/à + lím + á/ [à↓íma] 'he cultivates'

/à + lím + á + è/ [à↓íméː] 'let him cultivate'

/à + síβ + á/ [àsíβá] 'he ties'

/à + síβ + á + è/ [àsíβéː] 'let him tie'

More will be said about tone in 11.4

In the next section we shall outline those aspects of Luganda morphology and syntax which are relevant to our phonological discussion.

0.4.3 MORPHOLOGY AND SYNTAX

0.4.3.1 The noun phrase

The noun may consist of the following:

$$(\text{preprefix}) + \left\{\begin{matrix}\text{Class prefix}\\ \text{Independent prefix}\end{matrix}\right\} + (\text{Class prefix}) + \left\{\begin{matrix}\text{Stem}\\ \text{root + suffix}\end{matrix}\right\}^{1}$$

Examples

Class prefix + stem

/mu + kazi/ [mukazi] 'woman'

/mu + Ntu/ [muːntu] 'person'

class prefix + root + suffix

/mu + kol + i/ [mukozi] 'worker'

/mu + jig + i/ [muyizi] 'pupil, student'

preprefix + class prefix + stem

/V + mu + kazi/ [omukazi] 'woman'[2]

/V + mu + Ntu/ [omuːntu] 'person'

1 In the discussion of the noun the term base is used to refer both to an analysable base like /-kazi/ as well as to a root plus a suffix like /kol + i/. The stem is the unit to which prefixes are added. Another thing to note is that parentheses indicate optional constituents which may or may not be present. Curly brackets mean that one of the constituents must be selected. The overly simple view of Luganda morphology presented here will be corrected in Part I.

2 The use of /V/ to represent the preprefix is explained in the next paragraph.

preprefix + Independent prefix + stem

/V	+ ka	+ kazi/[akakazi]	'a small woman'
/V	+ gu	+ kazi/[ogukazi]	'a big, horrible woman'

Independent prefix + stem

/ka	+ kazi/[kakazi]	'a small woman'
/gu	+ kazi/[gukazi]	'a big horrible women'

Independent prefix + class prefix + stem

/ʊa	+ mu	+ sota/[wamusota]	'Mr.Snake'
/ʊa	+ N	+ ɓuzi/[wa:ᵐbuzi]	'Mr.Goat'

Class prefix + class prefix + stem

/mu	+ N	+ ɓuti/[mu:ᵐbuti]	'pigmy'
/mu	+ N	+ kuseele/[mu:ᵑkuseːɾe]	'destitute person'

Preprefix + class prefix + class prefix + stem

/V	+ mu	+ N	+ ɓuti/ [omu:ᵐbuti]	'pigmy'
/V	+ mu	+ N	+ kuseele/[omu:ᵑkuseːɾe]	'destitute person'

We shall not discuss the elements which make up the noun in turn. The preprefix (which is also referred to as the initial vowel in the literature) is the phonological representation of a syntactic element (or elements) which is (are) very difficult to characterise. We shall refer to that (those) elusive element(s) as X at the syntactic level. Syntactic constraints on the realisation of X have traditionally been stated in terms of definiteness (see Ashton et al 1954: 402 ff). The correctness or otherwise of this view will not concern us here.

What we shall be concerned with are the rules governing the phonological realisation of the syntactic element X as a preprefix (1).

(1) For discussion of the semantic/syntactic role of the preprefix in addition to Ashton et al (1954) see also Johnson (1904:893), Carter (1963), Givón (1969), Mould (1972) and Dewees (1971).

In the example below the preprefix is one of the vowels [e, a, o]; there is vowel harmony and the choice of the preprefix depends on the next vowel in the word (the prefix vowel):

(eci:ntu) 'thing'

(a βa:ntu) 'people'

(omu:ntu) 'person'

Because of this vowel harmony the choice of the initial vowel is predictable by rule. It will therefore be simply shown as /V/ in the underlying representation. The three forms above will, for example, have the following underlying representations:

/V + KiNtu/

/V + βaNtu/

/V + muNtu/

We shall come back to this in (9.3.1)

The Class prefix (1)

The noun stem must always be preceded by a prefix which forms an integral part of the noun. Two types of noun prefixes may be distinguished: the noun class prefix and the independent prefix.

Noun stems have an inherent feature ascribed to them in the lexicon which specifies which class prefixes they can co-occur with (2). Traditionally 21 class prefixes are recognised and they tend to pair for singular and plural e.g. classes 1/2; 3/4, 9/10 etc. The system of numbering Bantu class prefixes was first introduced by Bleek in the middle of the last century. It is convenient for doing comparative studies because the class pairings for number differ sometimes between

(1) The abbreviation 'Cl' will be used for 'Class'.

(2) This is a pre-theoretical chapter. The description of the lexicon presented here will be modified in (3.2.1)

languages: in one language class 9 may have a class 6 plural and in another a class 10 plural. However the Bleek-Meinhof (1) system of class numbering has the unfortunate effect of obscuring the fact that classes 1/2, 3/4 etc., which go together as singular and plural have a more intimate relation with each other than with the rest of the class prefixes.

Another point about these prefixes which should be noted is that in addition to being syntactic classifiers they are also involved in a vague semantic subcategorisation of noun stems. There is some degree of semantic cohesion among stems belonging to the same noun class. Thus classes 1/2 contain mainly humans; 9/10 mainly animals; 14 abstract nouns; 15 almost exclusively infinitives and 15, 16, and 17 contain only locatives. But the semantic content is not very high in all classes; in some it is negligible. Thus classes 3/4, for example, contain rivers, ghosts, corpses, fire and trees.

Noun class prefixes are shown in Table 0.4.

(1) Meinhof (1932) modified Bleek's system. Bleek reconstructed 18 classes for Ur-Bantu; Meinhof added 3 new ones.

TABLE 0.4 Luganda noun class prefixes

Bleek-Meinhof number	Noun class prefix	Number	Example	Semantic sub-classification
1	/mu/	sing.	/mu + kazi/ [mukazi] 'woman'	human
2	/βa/	pl.	/βa + kazi/ [βakazi] 'women'	human
1a	/Ki/	sing.	/Ki + tatge [citaːŋge] 'my father'	human
	/Cse/	sing.	/Cse + makula/ [sːemakuɗa] 'man's name'	human
	/Cna/	sing.	/Cna + makula/ [nːemakuɗa] 'girl's name'	human
	/ϕ/	sing.	/ϕ + matovu/ [matovu] 'man's name'	human
2a	/βa/	pl.	/βa + Cse + makula/ [βasːemakuɗa] 'Ssemakula and others'	human
3	/mu/	sing.	/mu + tii/ [mutiː] 'tree'	
4	/mi/	pl.	/mi + tii/ [mitiː] 'trees'	
5	/li/	sing.	/li+ato/ [lyaːto] 'boat'	
	/C/	sing.	/C + taβi/ [tːaβi] 'branch'	
6	/ma/	pl.	/ma + ato/ [maːto] 'boats'	
7	/Ki/	sing.	/Ki + Ntu/ [Ciːntu] 'thing'	
8	/βi/	pl.	/βi + Ntu/ [βiːntu] 'things'	
9	/N/	sing.	/N + te/ [nte] 'cow'	animals
10	/N/	pl.	/N + te/ [nte] 'cows'	
11	/lu/	sing.	/lu + βuto/ [luβuto] 'stomach'	
10	/N/	pl.	/N + βuto/ [mbuto] 'stomachs'	
12	/Ka/	sing.	/ka + tale/ [kataɗe] 'market'	
14	/βu/	pl.	/βu + tale/ [βutaɗe] 'markets'	
13	/tu/	sing.	/tu + lo/ [tuɗo] 'sleep'	
15	/Ku/	sing.	/Ku + gulu/ [kuguɗu] 'leg'	

Bleek-Meinhof number	Noun class prefix	Number	Example	Semantic sub-classification
	/ku/	sing.	/ku + som + a/ [kusoma] 'to read'	verb infinitive
6	/ma/	pl.	/ma + gulu/ [magudu] 'legs'	
16	/pa/		/pa + no/ [vano] 'here'	locative
17	/ku/		/ku + N + teβe/ [kuːnteβe] 'on the chair'	locative
18	/mu/		/mu + no/ [muno] 'in here'	locative
23	/e/		/e + βu + ganda/ [eβugaːnda] 'in Buganda'	locative

Notes

(1) Where there is very little cohesion in the semantic content of a class no information is filled in.

(2) No attempt has been made to show phonologically conditioned alternation in the realisation of prefixes and the list of the suppletive class 1a prefixes is not exhaustive.

The Independent Prefix has to be distinguished from the noun class prefix (cf. Gregersen 1967). The class prefix is the unmarked prefix that a noun stem may take: it is merely the locus of the inherent syntactic feature (+ class X). The independent prefix, however, has its own semantic/syntactic content. It recategorises any noun it goes with syntactically and semantically, shifting it from its inherent class to a new one imposed by the independent prefix. Though both class and independent prefixes have usually the same form, they have to be regarded as different because their roles in the grammar are different. Let us take the stem of the /mu + kazi/ (mukazi) 'woman' which is

inherently class 1/2 and place it after independent prefixes: (1)

(i) Diminutive

/ka + kazi/ [kakazi] 'small woman' (Cl.12)

/βa + kazi/ [βakazi] 'small women' (Cl.14)

(ii) Elongating

/lu + kazi/ [lukazi] 'lanky woman (Cl.11)

/N + kazi/ [ŋ́kazi] 'lanky women' (Cl.10)

(iii) Augmentative

/βi + kazi/ [cikazi] 'big, fat woman' (Cl.7)

/βi + kazi/ [βikazi] 'big, fat women' (Cl.8)

(iv) Augmentative and pejorative

(/C + kazi/ [ɟ:azi] 'huge, horrible woman' (Cl.5)
(/gu + kazi/ [gukazi] -"- (Cl.20)

/ga + kazi/ [gakazi] 'huge, horrible women' (Cl.22)

(v) The class 13 prefix/tu/ may also be used as a diminutive independent prefix to denote very small quantities of liquids e.g.

/ma + ta/ [mata] 'milk' (Cl.6)

/tu + ta/ [tuta] 'a drop of milk' (Cl.13)

/mu + eŋge/ [mweŋ́ge] 'beer' (Cl.3)

/tu + eŋge/ [twe:ŋ́ge] 'a drop of beer' (Cl.13)

Noun Suffixes In some noun stems a suffix can be isolated from the root. The suffix is always a vowel. The noun suffix plays an important role in nominalisation (Ashton ~~et al~~ 1954:373 ff). Here we shall be concerned only with those suffixes which cause morphophonemic alternations

(1) For detailed discussion of independent prefixes see Ashton et al (1954) and Cole (1967). These prefixes may have an ameliorative or pejorative import depending on the situation. The labels here do not cover all the senses in which they may be used.

(i) The agentive noun suffix /i/ (1)

verb infinitive	agentive noun
/ku + kolɬa/ [kukola] 'to work'	/mu + kol + i/ [mukozi] 'worker'
/ku + leet + a [kule:ta] 'to bring'	/mu + leet + i/ [mule:si] 'bringer'
/ku + laβ + a/ [kulaβa] 'to see'	/mu + laβ + i/ [mulaβi] 'viewer'

(ii) The abstract noun suffix /u/

verb infinitive	abstract noun
/ku + saɲuk + a/ [kusaɲuka] 'to be glad'	/βu + saɲuk + u/ [βusaɲuɦu] 'gladness'
/ku + koCg + a/ [kukog:a] 'to be lean'	/βu + koCg + u/ [βukov:u] 'leanness'

(iii) The stative noun suffix

verb infinitive	stative noun
/ku + lual + a [kuɻwa:ɻa] 'to fall sick'	/mu + lual + e/ [muɻwa:ze] 'infirm person'
/ku + seŋg + a/ [kuse:ŋga] 'to become a tenant'	/mu + seŋg + e/ [muse:nze] 'tenant'

The concordial system

This is a very much discussed aspect of Bantu grammar in general and of Luganda in particular. The reader is referred to Gregersen (1967), Ashton et al (1954), and Chesswase (1954) for detailed discussion and exemplification. Only the barest outline is given in these paragraphs.

Every noun stem must be preceded by at least one class prefix or independent prefix. Any adjective, demonstrative or numeral that modifies that noun must also have the same prefix. And so must pronouns which anaphorically refer to that noun. Sometimes the concord is 'alliterative', with the same prefix form occurring before all the

(1) Note that the appropriate prefix has to be selected in nominalisation: class 1/2/mu/ for human agents, class 14/βu/ for abstractions etc.

numerals, adjectives and verbs that agree with a noun, e.g.

Class 1 /V + mu + kazi ## Ø + n + o ## V + mu + nene ## 0 + mu + laβ + a/

[omukazo:no: muneno: mulaβa] 'do you see this big woman?'

Class 2 /V + βa + kazi## Ø + βa + o## V + βa + nene## 0 + βa + laβ + a/

[aβaknza: βa:βaneno: βalaβa] 'do you see those big women?'

Class 7 /V + Ki + taβo## V + Ki + o## V + Ki + nene## 0 + Ki + laβ + a/

[e citaβe: ce: cineno: cilaβa] 'do you see that big book?'

Class 8 /V + βi + taβo## V + βi + o## V + βi + nene## o + βi + laβ + a/

[eβitaβe: βyo: βineno: βilaβa] 'do you see those big books?'

However, concord is not always alliterative e.g.

Class 10 /V + N + koko## V + zito## V + N + nene## 0 + zi + laβ + a/

[e: ŋkoke: zen: eno: zilaβa] 'do you see those big chickens?'

In possessives the agreement is with the possessed noun: the prefix of the possessed noun is copied before the possessive marker /-a/:

Class 1 possessed /mu + kazi## u + a## ϕ + Mukasa/

[mukaziwa: Mukasa] 'Mukasa's wife'

Class 7 possessed /Ki + taβo## Ki + a## Mukasa/

[citaβoca: Mukasa] 'Mukasa's book'

Class 9 possessed /N + koko## ji + a## Mukasa/

[ŋkokoya: Mukasa] 'Mukasa's chicken'

0.4.3.2. The verb phrase

0.4.3.2.1 The Verb

The morphology of the verb is much more complex than that of the noun. The verb may take a long chain of prefixes and suffixes.

Prefixes Discussions and tables of verbal prefixes can be found in any good grammar of Luganda (e.g. Chesswas :1954, Cole: 1967, Ashton et al 1954). In this study little will be said about verbal prefixes.

Table 0.5 below is intended to show the order in which they are arranged and to give some idea of the possibilities of combination.

TABLE 0.5 Verbal prefixes

Neg	Subj. Pron.	Tense/ Aspect	Direct Object (1)	Direct Object (2)	Indirect Object	Stem	Phonetic realisation	
						/kuβ+a/	[kuβa]	'hit!'
	/mu/					/kuβ+a/	[mukuβa]	'you (pl.) hit'
	/mu/	/li/				/kuβ+a/	[mulikuβa]	'you (pl.) will hit'
	/mu/	/li/	/βa/			/kuβ+a/	[muliβakuβa]	'you (pl.) will hit them'
	/mu/	/li/	/βa/	/tu/		/tum+a/	[muliβatutuma]	'you will send us to get them'
	/mu/	/li/			/N/	/pa+a/	[muli:mpa] '	'you will give me'
/te/	/mu/	/li/	/βa/		/N/	/pa+a/	[temuliβa:mpa] '	'you will not give them to me'
/te/	/mu/	/Ø/	/βa/			/kuβ+a/	[temuβakuβa]	'do not hit them'
/te/	/mu/	/li/	/βa/	/tu/		/kuβ+a/	[temuliβatukuβa]	'you will not hit us with them'

Notes

(1) The verb stem can occur without prefixes in the imperative.

(2) If there are any prefixes at all, one of them must be either the subject pronoun (1) or the negation operator.

(1) In a more theoretical context what have been described here as subject and object relations should more appropriately be examined in terms of case relations like agent or experiencer for subject; instrument for direct object (2) etc. (See Fillmore 1968)

(3) The negation operator can precede any prefix

Suffixes In Luganda, and in Bantu generally, it is necessary to distinguish between basic and extended verb forms. The basic verb stem consists of a root followed by one of the suffixes /a/, /e/ or /ie/.

Usually the root is followed by the suffix /a/ which may be referred to as the basic verbal suffix.

Examples

/laβ + a/ [laβa] 'see!'

/ku + laβ +a/ [kulaβa] 'to see'

/mu + li + βa + laβ + a/ [mulíβalaβa] 'you will see them'

Sometimes instead of the basic verbal suffix the formative /e/ or /ie/ occurs. The distribution of these suffixes is grammatically determined. The suffix /ie/ occurs after the root in the perfective form of the verb:

/mu + laβ + ie/ [mulaβye] 'you (pl.) have seen'

/mu + goβ + ie/ [mugoβye] 'you have chased'

/mu : som + ie/ [musomye] 'you have read'

The suffix /e/ occurs after the root in the following cases:

a) in the near future, indicative, negative form of the verb:(1)

Examples

/te + mu + u + laβ + e/ [temu:laβe] 'you (pl.) will not see'

/te + βa + a + goβ + e/ [teβa:goβe] 'they will not chase'

/te + mu + u + som + e/ [temu:some] 'you (pl.) will not read'

(1) The near future formative should preferably be regarded as length. Several problems are raised by the morphological analysis in this chapter. Discussion of possible solutions will be postponed until the following chapter.

b) in the present subjunctive, positive:

Examples

/ a + laβ + e/ [adaβe] 'let him see'

/ a + goβ + e/ [agoβe] 'let him chase'

/tu + som + e/ [tusome] 'let us read'

c) in the imperative when there are direct object prefixes other than the first person singular:

Examples

/mu + laβ + e/ [mudaβe] 'see him!'

/βa + goβ + e/ [βagoβe] 'chase them!'

/Ki + som + e/ (cisome) 'read it!'

Elsewhere the basic verbal suffix /a/ follows the root:

Examples

/N + goβ + a/ [ŋgoβa] 'chase me!'

/a + goβ + a/ [ágoβa] 'he chases'

/a + naa + goβ + a/ [ana:goβa] 'he will chase (in the near future)

The suffixes /ie/, /e/ and /a/ which occur with the root to form basic verb stems are always the right-handmost formatives in a verb form; where the root is followed by other suffixes they must be inserted before those suffixes. This brings us to extended verb forms.

Extended verb stems consist of a verb root followed by several suffixes. One of the suffixes /ie/, /e/ or /a/ is always the right-handmost suffix; any formative which separates the root from the suffixes which occur in the basic form of the verb is called an 'extension'. Verbal extensions play a vital role in Luganda grammar (see Ashton et al, op.cit.). We shall focus on extensions which are involved in morphophonemic alternation

(1) Infinitive: (X) + verb root + basic suffix [1]

/Ku + siNB + a/ [Kusi:ᵐba] 'to plant'

/ku + tem + a/ [Kutema] 'to cut'

/ku + laβ + a/ [Kuɻaβa] 'to see'

/ku + kol + a/ [Kukoɻa] 'to work'

/ku + tuNg + a/ [Kutu:ᵑga] 'to sew'

(2) Causative (X) + root + causative + basic suffix

/βa + siNB + Vs + a/ [βasi:ᵐbisa] 'they cause to plant'

/βa + tem + Vs + a/ [βatemesa] 'they cause to cut'

/βa + laβ + Vs + a/ [βaɻaβisa] 'they cause to see'

/βa + kol + Vs + a/ [βakozesa] 'they cause to work'

/βa + tuNg + Vs + a/ [βatu:ⁿzisa] 'they cause to sew'

or [βatu:ᶮʃisa]

(3) Stative/inchoative (X) + root + stative/inchoative + basic suffix

/βa + laβ + Vk + a/ [βaɻaβika] 'they are visible'

/βi + kol + Vk + a/ [βikoɻeka] 'they can be done'

/βi + tuNg + Vk + a/ [βitu:ᶮʃika] 'they can be sewn'

(4) Passive: (X) + root + passive + basic suffix

/βa + laβ + Vβu + a/ [βaɻaβiβwa] 'they are seen'

/βi + tem + Vβu + a/ [βitemeβwa] 'they are cut'

/βi + tu Ng + Vβu + a/ [βitu:ᶮʃiβwa] 'they are sewn'

(5) Applied/prepositional: (X) + root + applied/prepositional + basic suffix

/βa + siNB + Vl + a/ [βasi:ᵐbiɾa] 'they sew for/at'

/βa + kol + Vl + a/ [βakoɻeɾa) 'they work for/at'

/βa + tuNg + Vl + a/ [βatu:ᶮʃiɾa] 'they sew for'

(6) Reversive: (X) + root + reversive + basic suffix

/βa + siNB + Vl + a/ [βasi:ᵐbuɻa] 'they uproot'

/βa + tuNg + Vl + a/ [βatu:ᵑguɻa] 'they unsew'

1 The symbol 'X' stands for any prefixes and the brackets show that they are optional

From these examples it is clear that some suffixes trigger off mutations in the preceding consonant; it is also clear that vowels which have been left as unspecified /V/ in the underlying representation may be fully specified in terms of some vowel harmony rule. The precise nature of the rules required to characterise these phonological processes will be the subject of Chapter 9.

The aim of this section has been to prepare the ground for the more theoretical discussion. The emphasis has been placed on providing information about Luganda rather than on theoretical elegance. In the rest of this study we shall attempt to reconcile these two goals.

PART 1.

MORPHOLOGY

I. The case against IA.

1.1 Preliminaries

In the past, studies of Luganda, and indeed of Bantu in general, have seldom gone further than morphology. Almost any average grammar of a Bantu language will contain a fairly thorough study of affixes, particularly nominal and verbal prefixes and extended verb forms (see Cole 1955, Ashton et al 1954, Chesswass 1954). Most descriptions of Bantu languages have not been done within the framework of modern linguistics and they are as a rule written by scholars who are not primarily interested in theoretical issues. Yet even from the most superficial glance at these grammars one point emerges: the consensus of opinion is that Bantu languages are agglutinative.

This belief has crept into theoretical linguistics. It is not rare to find a Bantu language cited in the company of Turkish as an archetypal agglutinative language. Thus we read in Palmer (1971:54) that

> "In these languages the forms are always made up of clearly identifiable parts. In Swahili, for example, the translation of 'he saw you' is alikwona, which seems to be a single word. But it is in fact composed of four parts, a 'he', li past tense, ku 'you' and ona 'see'.....All we have to do is to put the correct elements together in the right order".

Linguists interested in typologies have suggested that languages could be classified on the basis of the morphological model most appropriate for the description of their structure (Robins 1959, Matthews 1972a,147ff). Languages which can be adequately described using the item and arrangement model (IA)[1] are classified as agglutinating. If the view

1 The labels item and arrangement (IA), item and process (IP) and word and paradigm (WP) which are used by linguists to denote the main morphological models in use are all due to Hockett (1954).

that Bantu languages are agglutinative is correct it should be possible to describe them using IA. If, however, IA fails to provide an adequate framework for their description the claim that they are agglutinative will be questioned[1].

From the outset it is important to note that no water-tight compartmentalization is envisaged. It is very unlikely that there are any pure breeds of agglutinative, isolating or inflecting languages. This is a fact well-known to scholars, including Bantuists. Thus Werner (1919:12) remarked about Bantu languages that "it would be nearer the truth to call them 'partially inflected languages', or 'languages in course of acquiring inflection." Although the existence of a non-agglutinative ingredient has been recognised for a long time, it has not received the attention that it deserves. In this chapter the failure of IA to provide a satisfactory framework for the description of Luganda morphology will be taken as a measure of the degree to which Luganda and Bantu in general (since this language is so typical of the family) is non-agglutinative.

1.2 Item and arrangement

None of the theoretical points which will be made in this chapter is new. Yet they are worth making because, as far as I know, they have never been made in connection with a Bantu language.

Let us begin by summarising the main characteristics of IA[2].

1 The other theoretical conclusion which could be reached is that IA is inadequate for describing agglutinative languages.

2 There is plenty of literature expounding IA (Harris 1942, Hockett 1947, Nida 1949) as well as criticising it (Hockett 1954, Kontsondas 1963, Robins 1959, Matthews 1972a). Our discussion of IA and general outlook on morphology is based on Matthews 1972a. The objections against IA which are raised here are mainly applicable to the model outlined in Gleason (1961:51ff). Some versions of IA e.g. Nida (1949), Harris (1951), Hockett (1947) overcome the shortcomings of IA by smuggling in some process ideas.

(i) The morpheme is set up as the unique morphological prime.

(ii) The only relation between morphemes which is recognised is one of sequence. Morphemes are assumed to be linearly ordered like beads on a string.

(iii) An allomorph or alternancy relation is said to hold between phoneme sequences (morphs) and morphemes. Every minimal distributional unit is a morph. All morphs, except zero morphs are composed of phoneme sequences. Morphs which are representations of the same morpheme are called allomorphs or alternants of that morpheme. The allomorph is the bridge between morphemes and phonemes. The distribution of allomorphs may be phonologically or morphologically conditioned.

(iv) Process type statements whereby basic forms are postulated and other forms derived from them by rule are very strongly objected to by proponents of IA. They argue that statements which involve basic forms and processes are either arbitrary or of only historical interest and in either case both irrelevant and misleading in a synchronic description (Hockett 1954, Lamb 1966, Sampson 1970).

An IA analysis of the Luganda sentence tetuligoba 'we shall not chase' [1] is exemplified in fig.1.1 below. The morphemes and the morphs which represent them are both sequentially ordered and the experience (i.e. allomorph) relation is shown by arrows which point from morphemes to morphs which represent them

1 Only orthographic forms are given and no underlying representations are postulated in order to avoid confusion since no basic (underlying) forms are allowed in IA. The orthographic forms can roughly be regarded as phonemic representations as the Luganda orthography is very largely phonemic. This practice will be used only in Part I.

Morphological Representation:	Negative	+	1st person plural	+	general future	+	GOB	+	basic verbal suffix [1]
	↓		↓		↓		↓		↓
Phonemic Representation:	te		tu		li		gob		a

Fig.1.1

That kind of analysis is commonly found in Bantu grammars. At first sight it seems to represent the facts of Luganda satisfactorily and Luganda looks like a classical example of an agglutinative type. Although it is true to some extent that this language is agglutinative it is also equally true that it has a considerable synthetic element. It is this latter element that will be focussed on in the rest of this chapter. This will be done by highlighting problems of Luganda morphology which cannot be solved by an IA model which assumes that it is simply agglutinative.

1.3 Problems IA cannot solve

The problems which IA fails to solve have been discussed in the literature under the following five headings:

1.3.1 Fusion

In IA it is assumed that morphs will always be strung out like beads on a string, with each morph having clearly demarcated boundaries. The possibility of morphs fusing as a result of phonological processes is not envisaged [2]. Where all morphs have determinate boundaries as in fig.1.1 above IA works without any problems. Where morphs have no

1 The syntactic function of this suffix is very unclear. See Cole (1967:125) for a statement about its distribution; cf.also (0.4.2.2)

2 This is not altogether accurate. See (1.3.2)

discrete boundaries, however, IA is faced with severe problems.

Let us illustrate with these examples:

Infinitive

kugoba [kugoβa] 'to chase'

kuloopa [kuɭo:pa] 'to accuse'

kutunda [kutu:nda] 'to sell'

kuleeta [kule:ta] 'to bring'

kulaga [kuɭaga] 'to show'

kuseka [kuseka] 'to laugh'

These infinitive forms are all easy to segment according to IA principles, for example kugoba is analysable as follows:

Morphological Representation: Infinitive + GOB + basic verbal suffix

Phonemic Representation: ku + gob + a

Fig.1.2

Other infinitives too may be segmented in similar fashion.

Now let us consider the present perfect forms of the same verbs in the 2nd person singular and 3rd person plural.

(Class 1/2)

Present perfect

2nd person singular	3rd person plural
ogobye [ogobye] 'you have chased'	βaloopye [βaɭo:pye] 'they have accused'
otunze [otu:nze] 'you have sold'	βatunze [βatu:nze] 'they have sold'
olaze [oɭaze] 'you have shown'	βasese [βasese] 'they have laughed'

Any attempt to segment perfective forms in the way in which infinitives were segmented above soon runs into difficulties after

isolating o and ba as 2nd person singular and 3rd person plural subject pronouns respectively [1] and segmenting ye as the perfective formative which occurs where verb roots end in labial consonants. In the remaining examples segmentation does not work smoothly because the boundaries between verb roots and the perfective allomorphs are not discrete; the final root consonant fuses with the perfective morph in each example where the final root consonant is non-labial. Thus, for example the s of aleese belongs as much to the verb root as to the suffix. It would be arbitrary to assign it either to the suffix or to the root. Discussion of the operation of the spirantization rule which causes fusion is postponed until (9.1). The point we want to make here is that the principle that boundaries between morphs are always discrete in Luganda is untenable.

To deal with the problems raised by fusion the linguist must be prepared to accept the possibility of one phonological bit representing simultaneously several morphological bits. In addition to bi-unique relations between morphs and morphemes shown in fig.1.1 and fig.1.2. a grammar of Luganda should be able to account for fusion for situations of the kind shown in fig.1.3 where one phonological bit is related to more than one morphological bit are not rare in Luganda.

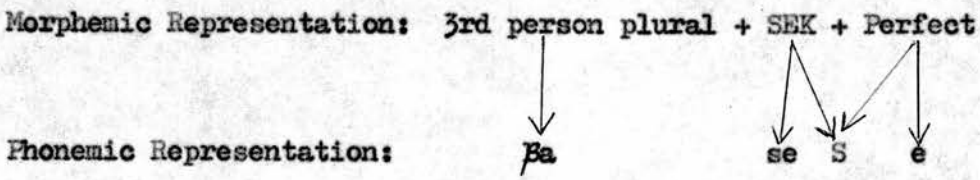


Fig.1.3

The perfective examples also reveal another fundamental weakness.

1 We are glossing over the problem of cumulation (see 1.3.2)

The allomorph relation fails to bring out the fact that there is some regularity of formation: where the verb root ends in a labial consonant the perfective is formed by adding ye and where the infinitive ends in a non-labial consonant that consonant alternates with an alveolar sibilant with the same value for voicing and an e is added at the end. Lists of allomorphs of the kind one finds in IA fail to distinguish this kind of rule governed alternation from the capricious alternation which occurs in suppletion[1].

In brief, one trouble with IA is that it focusses on the paradigmatic relations at the expense of the syntagmatic. Consequently it is unilluminating where morphs behave like "A series of WAVES flowing into one another, fusing at their boundaries, with the ending point of one unit and the beginning of the next frequently indeterminate" (Pike:1967:546)

1.3.2 Cumulation

While in fusion as a result of a phonological or morphophonemic process contiguous morphs in adjusting to the phonological properties of their neighbours end up by partially or completely assimilating to them, in cumulation there is no assimilation process at work. One phonemic sequence is always simultaneously paired with several morphemes.

One place to look for cumulation is in the concordial/pronominal system.

1 The problem of fusion also arises elsewhere. For instance the root initial consonant fuses with the nasal in the Ganda law e.g. lulimi [luɭimi] 'tongue' (lu = class 11 prefix), nnimi [n:imi] 'tongues'. The initial l of the root limi fuses with the class 10 nasal prefix in the plural. See (10.2.1).

Examples

(i) agoba [agoβa] 'he chases' (a is the class I, 3rd person singular, agentive pronominal prefix) 1

bagoba [βagoβa] 'they chase' (ba is the class I, 3rd person plural, agentive pronominal prefix)

gugoba [gugoβa] 'it chases' (gu is the class 3, 3rd person singular, agentive pronominal prefix)

gigoba [ɟigoβa] 'they chase' (gi is the class 4, 3rd person plural agentive pronominal prefix)

egoba [egoβa] 'it chases' (e is the class 9, 3rd person singular, agentive pronominal prefix)

(ii) ogoba [ogoβa] 'you chase' (o is the 2nd person singular, agentive pronominal prefix)

akugoba [akugoβa] 'he chases you' (ku is the 2nd person singular objective pronominal prefix)

amugoba [amugoβa] 'he chases him' (mu is the 3rd person singular objective pronominal prefix)

These words would probably be segmented as prefix + (prefix) + GOB + basic verbal suffix morpheme. It is only the prefix that we shall be concerned with. From these examples it is clear that the concordial prefix cumulatively represents several morpheme in each case. There is no bi-unique relation between morphemes and morphs. The examples in (i) show that the prefix represents noun class and number[2] when (i) is compared with (ii) it becomes clear that the prefix also signals person distinctions and when (iii) is taken into account it may be realized that the prefix furthermore represents case. Cumulation is shown in fig.1.4. Contrast it with agglutination (fig.1.1)

1 Recall that classes generally pair for singular and plural, for example, 1/2, 3/4. It is customary to regard such pairs as distinct classes because that facilitates cross-language comparison (cf.0.4.2.2)

2 The customary Meinhofian way of listing classes obscures the fact that classes 1/2, 9/10 etc., which pair for singular and plural are in fact the same class differing only in number. The advantage of the standard practice is that it facilitates comparative studies. For the prefix pairing differs sometimes between languages; the same noun root may have classes 9/10 prefixes in one language and 9/6 prefixes in another.

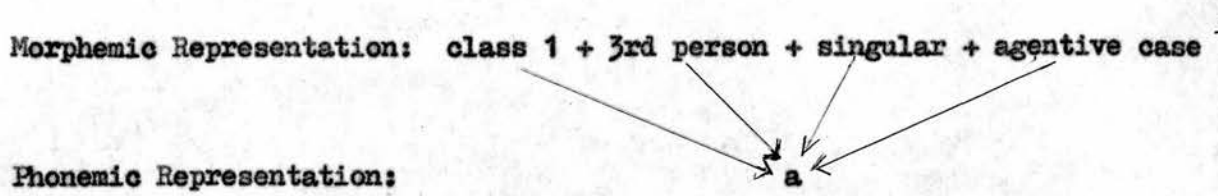


Fig.1.4

There is much arbitrariness in the ordering of morphemic elements in fig.1.4. There is no evidence to suggest that morphemes which are cumulatively realized by a single morph are sequentially ordered at the morphological level. This point will not be pursued any further. The point we want to emphasize is that examples of the kind discussed in this section are a strong counter-example to the claim that in Bantu there is a straightforward one-to-one pairing of morphs and morphemes and that therefore these languages can be adequately described using IA.

Of course, it may be argued that the case against IA is not proven by cumulation for there are versions of IA where cumulation is envisaged. Hockett (1947:236) introduced the construct of portmanteau morphs "which belong simultaneously to two (or theoretically, more) morphemes and have simultaneously the meanings of both". But surely, postulating portmanteau morphs is tantamount to conceding that the biuniqueness principle is not absolute: that sometimes one morph may represent several morphemes.

While the portmanteau morph is a step in the right direction, it is objectionable because it obscures the distinction between fusion and cumulation. The portmanteau brings out the fact that one morph

1 Obviously class and person are intimately linked. Normally only classes 1/2 nouns may be 1st or 2nd person

represents several morphemes but fails to show that in the case of fusion this is a result of phonological processes while in cumulation there is no phonological explanation - it is all due to capricious rules mapping several morphemes on to the same phonemic sequence (Matthews 1972a,65ff).

1.3.3 Neutralization

Neutralization is another kind of situation where one phonological bit is always pairable with several morphemic bits. Unlike fusion (1.3.1) and cumulation (1.3.2) neutralization causes no technical problems for IA. Allomorphs may be isolated and assigned to the appropriate morpheme without any difficulty. In the forms below, for example mu would be treated as follows:

mukazi [mukazi] 'woman'	mu - class 1 noun prefix
muti [muti] 'tree'	mu - class 3 noun prefix
mugoba [mugoβa] 'you chase'	mu - class 1, 2nd person plural, agentive prefix
amugoba [amugoβa] 'he chases him'	mu class 1, 3rd person singular objective prefix

The segmentation is not controversial. However these data offer a counter-example to the IA principle that the morph is the only signalling unit at the morphological level. If that were the case then the morph mu - would be ambiguous in all the words above. But there is no ambiguity. The combination of the prefix and the stem taken as a whole excludes the possibility of ambiguity. The fact that the ambiguity of a morph may evaporate once that morph is placed in a word indicates that the word, in addition to the morph, has an important role to play in morphological signalling (Matthews 1972a,96).

1.3.4 Empty morphs

Fusion, cumulation and neutralization pose essentially problems of the same kind: there are too many morphemes and too few morphs to

match them with. Empty morphs involve a problem of the reverse kind: there are too few morphemes and too many morphs. This makes it difficult to adhere to the 'total accountability' principle which requires that every morph must be paired with some morpheme leaving no residue. This principle is expounded in Hockett (1947). Rather inconsistently Hockett in that same paper also introduces the notion of 'empty morphs' which "have no meaning and belong to no morpheme." The contradiction in the IA position of maintaining total accountability may be illustrated by this fragment of a Luganda verb paradigm:

(i)	mbala [mbaɭa] 'I count'	kubala [kuβaɭa] 'to count'
	ntema [ntema] 'I cut'	kutema [kutema] 'to cut'
	ngoba [ŋgoβa] 'I chase'	kugoba [kugoβa] 'to chase'

In these forms the morphs can easily be isolated, leaving no residue. The morphs [m,n,ŋ] are allomorphs of the 1st person singular pronoun; [ku] is the morph representing the infinitive morpheme, (a) at the end of each form represents the basic verbal suffix and [-bal,βal-], [-tem-] and [-goβ-] represent the verb roots.

(ii)	nziba [nziβa] 'I steal'	kubba [kub:a] 'to steal'
	nzita [nzita] 'I kill'	kutta [kut:a] 'to kill'
	nzigula [nziguɭa] 'I open'	kuggula [kug:uɭa] 'to open'

In these examples [ku] and [a] would again be isolated as the representation of the infinitive and the basic verbal suffix morphemes respectively. The segmentation of the 1st person prefix from the root, however, would be problematic. On the basis of what happens in (i) there would be a strong temptation to isolate [m,n,ŋ] as allomorphs of the morpheme first person pronoun. But then the segmentation of the

root would cause difficulties[1]. If the 1st person is said to be realized by simply the homorganic nasal then one would have to postulate verb roots with two allomorphs: [-β-], [-l-] and [-guɹ-][2] after the 1st person prefix and [-ḅ:-], [-ṭ:-] and [ġ:uɹ] after the infinitive for the roots "steal", "kill" and "open". If this analysis is used [-zi-] remains as a residue unassigned to any morpheme i.e. an empty morph.

As we pointed out above solutions using empty morphs are inconsistent with the IA principle of total accountability. Their use in IA entails contradiction. The alternative to empty morphs within this framework is not satisfactory either because it is ad hoc. What we are considering is a solution where the nasals [m,n,ŋ] are regarded as allomorphs of the 1st person singular morpheme and the verb root morphemes are said to have the allmorphs [-ẓiβ-], [-ẓit-] and [-ẓigul-] and [-ḅ:-], [-ṭ:-] and [ġ:ul-] respectively before 1st person singular on the one hand and the infinitive on the other. The assignment of [-zi-] to the root is arbitrary. It could indeed be equally arbitrarily assigned to the first person morpheme so that it is regarded as having the allomorph [ṇzi-] in addition to the allomorphs [m,n,ŋ] already recognised. There is no principled way of deciding to which morpheme the [-zi-] morph should be assigned.

1.3.5 Overlapping exponence

Finally sometimes there occurs in Luganda interlocking exponence whereby morphs representing different morphemes overlap to such an

1 This is a major problem in Luganda phonology. See too (9.2.2) and (11.4.3.2)

2 -gul- is further analysable: -ul- can be isolated as an allomorph of the reversive morpheme.

extent that any attempt to segment a word into morphs cannot get very far. Let me illustrate with the verb kutema [kutema] 'to cut':

(i) tutema [tutema] 'we cut' (present tense)

tunaatema [tuna:tema] 'we shall cut' 'near future)

tulitema [tuɭitema] 'we shall cut' (general future)

(ii) tetutema [tetutema] 'we do not cut' (present tense)

tetu:teme [tetu:teme] 'we shall not cut' (near future)

tetulitema [tetuɭitema] 'we shall not cut' (general future)

An IA analysis would work for the forms in (i) as shown in fig.1.5. Unessential details are omitted.

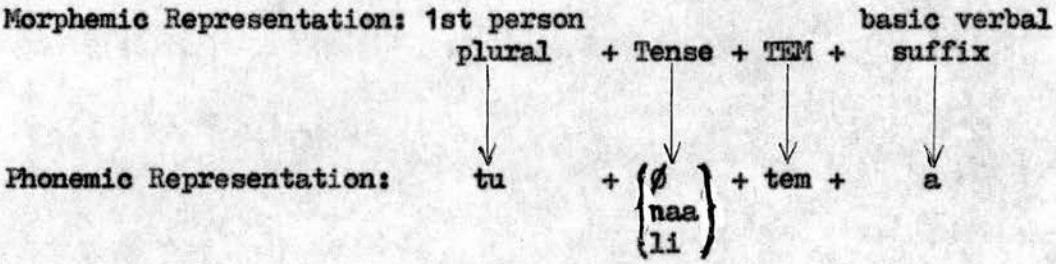
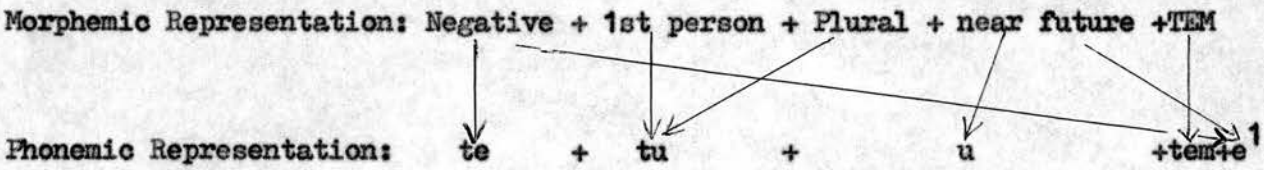


Fig.1.5

The forms in (ii), with one exception, may also be as easily segmented as those in (i). The exception is the negative near future form. There is overlapping exponence in the representation of the near future negative [illegible] which is a product of cumulation and discontinuity in the representation of morphemes. This is shown in fig.1.6



1 The vowel of the morph representing the subject pronoun is always realised as long in the near future negative form of the verb. We shall claim that the vowel which represents the near future negative morpheme is simply a copy of the underlying vowel of the subject pronoun morph which is dropped by vowel deletion rules, leaving behind its copy which is realised as long (11.4.3.1).

Clearly the common belief that Luganda generally has a simple agglutinative morphology is untenable. But this is not to say that there is no agglutinative element at all in this language. The fact that bits of it can be analysed adequately using IA suggests that Luganda is to some degree agglutinative. The point of this chapter has been simply to show that Luganda (and Bantu generally) is less agglutinative than people usually say. In the process it might have appeared that our goal was to discredit IA altogether. That is not the case. Although IA is inadequate as a framework for analysing the whole of Luganda morphology it is not without value. Chief among its virtues is simplicity. It has only one prime: the morpheme and only two relations, composition (or representation in the more sophisticated forms) and sequence. Where an adequate description is feasible using such a model it would be unwise to reject it and seek a more complex one. It has been argued in this chapter that there are many occasions when IA fails to provide a satisfactory model for the analysis of Luganda.

It is arguable that although IA may not provide the devices required for describing the whole of Luganda morphology it should still be used to describe the agglutinative parts of the language, supplementing it where it fails by a more satisfactory approach. A proposal of this kind has been made by Pike (1967:547). Pike observes that neither IA nor its rival IP[1] gives a comprehensive view of language. He therefore suggests that they should complement each other in a description. Sticking dogmatically to one or the other, he argues, leads to distortions.

1 IP is short for item and process. see Chapter 2.

Such eclectism may be commendable from a pragmatic point of view, but it is not theoretically feasible. No compromise between IA and IP is possible because some of their fundamental postulates are incompatible. This has been noted by several writers. Hockett (1954:394), for example, remarks that if IA borrows the process notions of replacive and subtractive morphs to account for recalcitrant cases which cannot be dealt with in terms of morphs and their arrangements contradiction sets in and the whole IA edifice collapses.

One cannot avoid the choice between IA on the one hand and process morphology on the other. In this chapter we have demonstrated the degree to which Luganda is non-agglutinating. We have argued that in so far as Luganda morphology is not agglutinating it cannot be accounted for using an item and arrangement model. In the next two chapters we shall consider two alternative approaches which do not have the shortcomings of IA.

2. A WORD AND PARADIGM APPROACH

2.1 Word and paradigm

The first alternative to IA which we shall consider is word and paradigm (WP). As its name suggests, WP morphology gives a central place to the word. Since the term 'word' is used in a variety of senses, attempts to formalise WP must be preceded by a clarification of the sense in which that term is used. Before doing that, however, we shall first survey the literature on this subject in Bantu linguistics.

2.1.1 The word in Bantu

A considerable literature has grown around the problem of defining the word in Bantu. Much of it has arisen in connection with the practical task of devising orthographies and seldom has it been viewed as a purely theoretical question.

Some scholars have considered word division a crucial issue in Bantu grammar. Opinion is polarised in two camps: the disjunctivist and the conjunctivist (Gregersen 1967:49ff). Disjunctivits define the word mainly in semantic and syntactic terms and pay scanty regard to its phonological properties. Thus van Wyk (1958)[1] using the criteria of isolatability, movability and substitutability arrives at a disjunctive word division for Zulu and Northern Sotho. He isolates locative prefixes, adjectival (but not nominal) preprefixes, copulas and possessive pronouns as words.

Disjunctivism has never been universally accepted. Already Jones and Plaatje (1916:xxxii) state that many groups of syllables which would be written as two or more words in other orthographies

1 Van Wyk's work is reported by Gregersen (op.cit.p.51) and not seen by the writer.

should be written as single words in Bechuana. As a concession to disjunctive usage which was widespread at the time Jones and Plaatje divide off "by hyphens those parts of the word which would in other orthographies be written as single words".

This view gradually hardened into what came to be known as conjunctivism. Leading Bantuists today, particularly those influenced by Doke, generally prefer this view. They argue that disjunctivism imposes alien preconceptions about the word and as a result distorts the facts of Bantu. Whereas disjunctivists use mainly semantic/ syntactic criteria to isolate words, conjunctivists employ predominantly phonological ones. Doke (1929:12), for example, categorically states that "stress is the word-builder in Bantu" and that "in each word or word group in Bantu there is one and only one main stress".

This principle of word division has been queried. Gregersen (1967:49) has observed that in view of the fact that the existence of stress is not yet established for many Bantu languages it is not easy to see the justification for Doke's claim that stress is <u>the</u> criterion for word division. If Guthrie's suggestion that there is no word prominence of any kind in his zones N (10,20,40) and P(20,30) is correct Conjunctivists would have to find an alternative criteria or admit that stress is not always and everywhere the crucial criterion for recognising words in the Bantu field.

Guthrie has provided non-phonological basis for conjunctivism. Guthrie (1948a:18) has argued for conjunctivism on syntactic and morphological grounds. He arrives at an extreme form of conjunctivism by pushing the criteria of isolatibility, interruptability and substitutability. Guthrie is not satisfied with the standard orthography which is disjunctive. He rewrites the Swahili sentence <u>visu vya watotô</u>

ni vikubwa 'the children's knives are big' in just two words: visuvyawatoto nivikubwa. The average conjunctivist would be willing to divide the sentence into three words: visu vyawatoto nivikubwa

Another kind of argument for conjunctivism to which some writers have given much weight goes like this: the conjunctivist's words are the kind of words which even an unsophisticated native speaker would recognize. Thus we read in Cole (1955:xxxiv) an anecdote about an illiterate Sotho woman who, having been taught to write her language in the standard orthography which is disjunctive a few days later, turned out a conjunctively written piece and was shocked when her instructor said she had failed to divide the words correctly. Cole triumphantly concludes, "More conclusive evidence of the inherent correctness of conjunctive writing for Bantu languages could hardly be desired". (Cole op.cit.xxxiv)

From this brief survey it is clear that the kind of conclusions one reaches depend largely on the criteria used to isolate words. The issue of criteria for defining words has received much attention in linguistic theory (Bloomfield 1933, Nida 1949, Hockett 1958, Pike 1967, Lyons 1968). We shall only briefly mention them. They are constancy of meaning at the semantic level; isolatability, positional mobility and uninterruptability at the syntactic level and possibly phonological criteria like the use of prosodic or segmental features to mark word boundaries and the limitation of some phonological processes to the domain of the word.

2.1.2 The word in WP

Using the criteria sketched in (2.1.1) WP linguists distinguish three senses of the term word which are not always kept separate in the literature (Lyons 1968. Matthews 1972a):

(i) The phonological representation of a linguistic form. In this sense the following are different words:

tusoma [tusoma] 'we read'

musomi [musomi] 'reader (person who reads)'

masomo [masomo] 'chapters'

(ii) The grammatical unit which such a phonological sequence represents. In this sense tusoma may be referred to as the first person, plural, agentive form of the verb kusoma 'to read'; musomi as the class 1, singular, agentive nominalization of the verb kusoma and masomo as the class 6, plural, locative nominalization of the verb kusoma 'to read'.

(iii) The abstract lexical item to which the grammatical words in a paradigm may be said to belong. Thus tusoma, musomi and masomo can all be said to belong to the abstract item -SOM- 'read'.

In WP the word in sense (i) is referred to as the 'phonological word' (Lyons 1968:196)[1]. The word in sense (ii) is called the 'grammatical word' and the word in sense (iii) is referred to as the 'lexeme'. Following Lyons (op.cit.) we shall write lexemes in upper case letters.

2.2.1 Primitives and relations

Matthews (1972) postulates the following basic terms and relations.[2]

(a) A set of lexemes

e.g. -SOM- 'read'

1 Matthews (1972a:161) suggests instead of the term 'phonological word' the use of the term 'word-form' because the label 'phonological word' is used by other linguists to refer to the word defined by phonological criteria.

2 This outline of WP is based on Robins (1959) and Matthews (1965a, 1965b, 1967, 1970 and above all 1972a). Matthews' model is somewhat simplified here.

(b) A set of morphosyntactic categories

The term morphosyntactic is used to denote elements which have both a morphological and a syntactic role. The term morphosyntactic category is used to refer to morphosyntactic elements which contrast within a single paradigm. Morphosyntactic categories are usually referred to in traditional grammar as 'minor grammatical categories' e.g. tense, mood and aspect in the verbal paradigm; number and class in the nominal paradigm and person in the pronominal paradigm.

(c) A set of morphosyntactic properties.

Morphosyntactic properties are items which contrast within the same morphosyntactic category. In the morphosyntactic category tense, for example, the properties past and non-past may be recognised, and in the category number the properties singular and plural may be distinguished.

(d) A relation 'is a term in'

Every property must be a term in one category and one category only.[1] The condition means that one could not simultaneously assign the property singular to both the category number and the category tense. Furthermore, there must be at least two properties in any category because properties in a category must contrast and contrast presupposes the existence of at least two terms.

(e) A set of grammatical words

For each grammatical word two relations have to be specified:

(i) A relation 'belongs to'

(ii) A relation 'has the property'

1 Morphosyntactic properties and morphosyntactic categories will also be referred to respectively as properties and categories for short

Every grammatical word 'belongs to' some lexeme. Thus the agentive, first person, plural, present tense form of the verb kusoma 'to read' and the class 1, singular, nominalized agentive form of the verb kusoma 'to read' both belong to the lexeme -SOM- 'read'. In the former the grammatical word has the properties agentive, first person, plural and present while in the latter it has the properties class 1, singular, agentive nominalization.

Having postulated these basic terms and relations at the grammatical level Matthews then goes on to posit the following terms and relations at the phonological level:

(f) A set of phonemes

(g) A set of word-forms (i.e. phonological words)

Each word-form is a continuous sequence of phonemes

(h) A relation of realisation.

Every word-form is a realisation of some grammatical word. Thus, for example, the agentive, first person, plural present tense form of the verb kusoma 'to read' is realised by the word-form tusoma[1].

2.2.2 Morpholexical rules

Traditionally linguists distinguish between phonological conditioning on the one hand and morphological conditioning on the other. The alternation in the realisation of the nasal in class 9/10 which ensures that the nasal is always homorganic with the following consonant is described in terms of phonological conditioning while the suppletive representation of the Luganda verb 'to be' which is /-li/ in some environments and /-β-/ in others is described in terms of morphological conditioning[2]. Matthews uses the term morpholexical rule

1 The orthography is phonemic

2 Of course, the boundary between morpholexics and morphophonemics is fuzzy, see Chapters 8 and 9.

to characterise rules of the latter kind which specify separate morphologically or lexically conditioned morphological alternation.

The morpholexical rule system has the following components:

(a) A reference component which states the syntactic class to which the output will belong e.g. noun-forms, verb-forms.

(b) A limitation component which stipulates the contexts and subsets of lexemes to which a given morpholexical rule applies. The limitation component will, for example, stipulate that in the formation of class 1a noun-forms the choice of the prefix which may be sse-, ∅, ki-, wa-, nna- etc... depends on the subset of lexeme to which the grammatical word belongs: the prefix is zero before roots of proper nouns, sse- before roots of some masculine proper nouns and honorific titles, nna- before most feminine proper nouns and honorific titles etc..[1]

(c) An operand component which states the syntactic class to which the input belongs

(d) An operation component which specifies the precise change to be effected e.g. prefixation of sse- before certain roots in the formation of class 1a nouns.

Before illustrating the way morpholexical rules operate we shall mention two more relations which Matthews considers fundamental to WP.

(1) Exponence is the most important relation in a WP model. It holds between one or more morphological elements on the one hand and phonological elements on the other. Such phonological elements are referred to as formatives: a formative is an exponent of one or more morphological elements introduced by a morpholexical rule. Thus the

1 This sub-classification is broadly correct but there are many exceptions

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sequence sse- in the word-form ssebo 'sir' is a formative; it is an exponent of the morphosyntactic properties class 1a and singular.

(2) Formation. The term formation is used in the traditional sense to denote formatives which are exponents of the same morphosyntactic property. And the expression 'focal terms' is used to refer to any class of lexemes, syntactic class or grammatical words in the context of which a given morphosyntactic property is realised by, or in more traditional phrasing formed by, a given formative. Thus the formatives sse-, ki-, nna- and wa- are all formations of class 1a, singular. The choice of any one of these formations is determined by the focal class of the root. Thus, sse- is the formation of class 1a singular for those noun roots which belong to the focal class which includes masculine honorific titles and many masculine proper nouns; nna- is the formation of class 1a, singular for those noun roots which belong to the focal class which includes feminine honorific titles and most feminine proper nouns, etc....

As Matthews himself points out, the formation relation is roughly equivalent to the allomorph notion in IA. It is used to group together formatives which function as exponents of the same morphosyntactic property.

2.2.3 A word and paradigm sketch of Luganda morphology

The operation of a word and paradigm grammar will be briefly illustrated with Luganda examples:

(1) The derivation of the phonological word mukazi 'woman' from the grammatical word which may be represented as

class 1, sg, KAZI

would take this form:

(a) Reference: class 1, sg, KAZI

(b) Limitation: none

(c) Operand: the root /-kazi/

(d) Operation: prefix /mu-/ before the root. This yields the morphophonemic representation /mu + kazi/

(2) The derivation of katonda 'god' from the grammatical word class 1a, sg. TONDA is slightly more complicated. It involves use of the limitation component:

(a) Reference: class 1a, sg. TONDA

(b) Limitation: noun roots with an index in the lexicon which indicates that they are members of focal class X [1].

(c) Operand: the root /-toNDa/

(d) Operation: introduce the formative /ka-/ before the root. The result is the morphophonemic representation /ka + toNDa/

(3) The derivation of taata 'dad' will be almost the same as that of katonda; the only difference will be in the focal class stated in the limitation:

(a) Reference: class 1a, sg. TAATA

(b) Limitation: noun roots with an index in the lexicon which indicates that they are members of focal class y[2]

(c) Operand: the root /-taata/

(d) Operation: prefix ∅ to the root. This yields the morphophonemic representation /∅ + taata/

The derivations we have demonstrated up to this point are relatively straightforward. It is simply the cumulative exponence of class 1 and singular that is involved in (1); and in (2) and (3), in

1 Many nouns which belong to this focal class refer to individuals of high social status e.g. kabaka 'king', kabona 'priest', katikkiro prime minister, and so on.

2 Most members of this class are proper nouns e.g. Male, Zirimmenya etc..

addition to cumulation in the experience of class and number there is the problem of morphological conditioning of formations. These solutions cannot be taken as compelling evidence for a WP analysis of Luganda because even a model in which the word is not given any theoretical status, but where the possibility of cumulative exponence is envisaged, would facilitate that kind of analysis. The case for WP will be strengthened, however, where, due to interlocking exponence, morphological analysis is best done in terms of the word as a whole.

The reader will recall that it was claimed in (1.3.5) that the overlapping exponence of the kind shown in fig.1.6 cannot be adequately accounted for in IA terms. Fig.1.6 is repeated here for convenience:

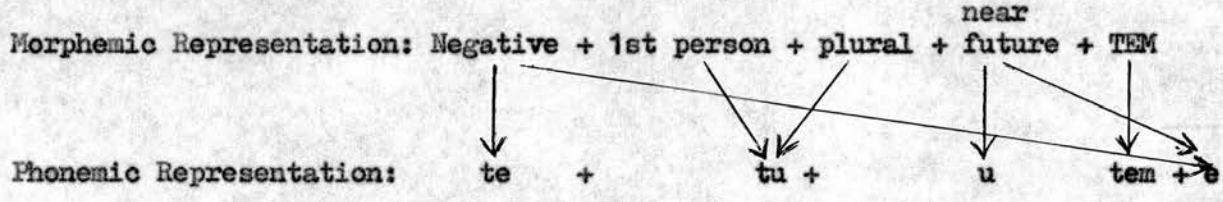


Fig.1.6

The chief merit of WP is that it provides an adequate framework for the description of overlapping exponence; one of the main weaknesses of IA is that it fails to account for overlapping exponence of the kind found in tetuuteme 'we shall not cut'. A WP derivation of this word would take this form:

Stage 1: Introduce the formative /tu/, the exponent of the 1st person, plural subject pronoun:

(a) Reference: 1st person, plural TEM

(b) Limitation: none

(c) Operand: /tem/

(d) Operation: prefix /tu/ to the root yielding /tutem/

Stage 2: The near future negative form of the verb is formed by suffixing /e/ to the root of the verb, copying to its right the vowel of the subject pronoun and prefixing /te/ before that subject pronoun:

(a) Reference: negative, near future Primary stem of TEM [1]

(b) Limitation: none

(c) Operand: /tutem/

(d) Operations: (i) prefix /te/ to the stem yielding /tetutem/

(ii) copy to its right the vowel of the subject pronoun to yield /tetutem/[2]

(iii) Suffix /e/ to the stem yielding /tetuuteme/.

The important point to note here is that in stage 2 of this derivation all the morphosyntactic properties which belong to this grammatical word are focal terms in the formation of the negative, 1st person, plural form of the verb and the exponence relation has to be stated in terms of the word as a whole.

In chapter I it was argued that in as far as Luganda morphology is non-agglutinating, it cannot be adequately characterised using IA which was designed for agglutinating languages. In this chapter it has been claimed that WP has the power to deal with all the problems IA can solve as well as those IA fails to solve. Although this is the case, we shall not use WP in the rest of the description for it introduces more complexity into the grammar than is needed in a description of Luganda. For WP is ideal for an archetypal inflecting language like Latin but is cumbersome for Luganda which has relatively

1 The term 'primary stem' is used for want of a better name for the form of the verb at the point in the derivation where it consists of a subject pronoun followed by a verb root. It is not a term current in Bantu linguistics.

2 This is realised as [tetu:teme]. See (11.4.3.1) for the vowel realisation rules.

few inflecting elements. A more appropriate model, simpler than WP and more adequate than IA will be sought in the next chapter[1].

[1] See Matthews (1972:147ff) for a discussion of the non-universal nature of morphological models and suggestions about setting up language typologies on the basis of the model most appropriate for the description of particular languages; IA is ideal for simple agglutinating languages and WP for predominantly inflecting languages.

3 ITEM AND PROCESS

3.1 Preliminaries

Like IA and WP the label item and process (IP) was introduced by Hockett (1954). Like WP and unlike IA, the model characterised by this label does not postulate that morphs must have discrete boundaries and that they must be in a biunique relation with morphemes. In this approach two types of morphemes are recognised: (i) morphemes which have one or more basic (underlying) form which may be realised in a variety of forms depending on the phonological environment in which they occur as a result of the operation of phonological processes; (ii) morphemes which may or may not have any basic form but whose presence triggers off phonological processes.[1]

An example of (i) can be seen in the alternation involved in the realisation of the class 9, singular morphemes. An IP linguist seeing the alternation in

[mpisi] 'hyena'

[nte] 'cow'

[ŋkoko] 'chicken'

would posit an underlying /N/ and derives the morphs [m,n,ŋ] from it by synchronic phonological processes of this kind: /N/ is realised as a nasal homorganic with the following consonant for reasons that can be specified by the articulatory phonetician. This general statement is to be preferred to the IA listing of [m,n,ŋ] as allomorphs of the morphemes in question which would fail to distinguish between the phonetically motivated alternation and the synchronically totally suppletive alternation as is found in the realisation of the Luganda

1 For further discussion of IP the reader may consult Hockett (1954); Koutsondas (1963), Pike (1967) and Matthews (1970, 1972a).

verb 'to be' as [-βa] in some environments and [-ʃi] or [-ɲi] in others. On the other hand a WP statement in terms of the primitives and relations discussed in Chapter 2 would be cumbersome though certainly adequate.

The use of morphemes which trigger off phonological processes can be illustrated with the class 5 and singular morphosyntactic properties. The presence of these two morphosyntactic features in the derivation of a noun or adjective with a root beginning with a consonant triggers off the strengthening of that consonant. Thus in its class 5, singular form the word for branch, for example, is [ʈ: aβi] with a strong [ʈ:] but in its class 6, plural form it is [mataβi] with a weak [ʈ] (see 9.2.2 and 13 passim).

3.2. Morphology in transformational grammar

Hockett (1954) remarked that one of the major drawbacks of IP compared to IA at the time was that the former was not as formalised as the latter. Since then a lot of progress has been made towards formalising IP, most of it within the theory of generative grammar. This is rather surprising in view of the fact that morphology is not recognised as a separate level in generative grammar but is instead partitioned between syntax and phonology.

The present account of generative morphology will differ at some points from the standard generative model[1]. Differences will be pointed out as we go along.

3.2.1 The lexicon

In the standard theory of generative grammar the lexicon is an

1 The version of generative grammar presented in Chomsky (1965) will be referred to in this Chapter as the 'standard' model.

inventory of all the lexical items of a language. Each lexical entry is a complex of semantic, syntactic and phonological features; it also contains information about any idiosyncratic properties a lexical item may have which cannot be predicted by general rules.

One possible objection to this view of the lexicon is that it obscures the fact that at the highest level of abstraction human language is medium free[1]. By introducing phonological matrices into lexical entries generative linguists fail to reflect in their grammars the fact that language is essentially an abstract system independent of the modes in which it may be realised on particular occasions. Language is not speech; speech is only one of many modes in which language may be realised and a given deep structure can equally well be realised as a spoken utterance or as a smoke signal. It is arguable, therefore, that pairing semantic/syntactic matrices with phonological matrices at the highest level of abstraction in the lexicon gives speech primacy over all other modes of realisation which in principle appears unwarranted. (Lyons 1968:59ff).

These objections to the introduction of phonological matrices, though serious, are not overwhelming. One implicit assumption underlying the decision not to include phonological matrices in the lexicon is that phonological matrices never have any role to play in syntactic derivations and therefore it is unnecessary to drag them through syntactic operations.

Several recent studies have shown that this assumption is not well-founded. Bresnan (1971) and Zwicky (1973) among others have produced

1 Saussure (1916) writes, "language is a form not a substance". This insight has been most fruitfully explored by the glossematicians (cf. Hjelmslev 1943).

strong evidence pointing to intrusions of phonological information into syntax. Zwicky has shown invasions of phonology into syntax in examples like these:

(1) Noam has, and Morris will, put up with critcisms of SPE.

(2) * John has, and Mary will, bought that book.

(3) * John has, and Mary will, buy that book.

Conjunction reduction produces a grammatical sentence in (1) because the past and future tense forms of the verb 'put' are homophonous. In (2) and (3), however, conjunction reduction produces ungrammatical sentences because the past and future tense forms of the verb 'buy' are not homophonous. Analogous invasions of phonology into syntax also occur in Luganda. For example, homophonous epistemic and deontic modal verbs may not be juxtaposed.

(1) Asobola okugenda 'he may go' (possibility, probability or permission/ability)

(2) Ayinza okugenda 'he may go' (possibility/probability or permission/ability)

(3) Ayinza okusobola okugenda 'he may be able to go' (possibility and ability)

(4) Asobola okuyinza okugenda 'he may be able to go' (possibility and ability)

(5) * Ayinza okuyinza okugenda 'he may be able to go' (possibility and ability)

(6) * Asobola okusobola okugenda 'he may be able to go' (possibility and ability)

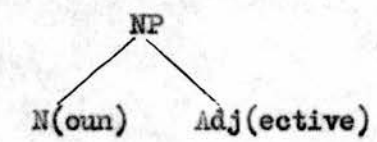
In view of facts like these the lexicon incorporated in this grammar will include phonological information, like the lexicon in the standard theory. However, it will differ from the standard theory lexicon in one important respect. Unlike the lexicon in Chomsky (1965) our lexicon will consist of two parts which, following Schachter and Fromkin (1968) we shall call the first and second lexicon respectively.

The first lexicon will contain entries of lexical items. Each entry will be a pairing of syntactic and semantic feature complexes with a phonological representation. It will also include any idiosyncratic properties of that lexical item e.g. rules to which it is an exception[1]. The second lexicon on the other hand will contain the morphophonemic representation of grammatical formatives. As in the standard model transformations can introduce grammatical morphemes which are not entered in the first lexicon. The second lexicon will incorporate the phonological matrices of such morphemes (Jacobs and Rosenbaum, 1968). Furthermore, it also turns out that in Luganda there are different constraints on morphophonemic segment sequence regulating the input to these two lexicons (4.2.2).

3.2.2 IP morphological derivations

In generative grammar morphology is not recognised as a separate level: morphological derivations take place partly in the syntactic component and partly in the phonological component. Morphological operations will be performed in the following way in the present version of generative grammar which incorporates the Jacobs and Rosenbaum's (1968) proposal to have two lexical passes and Schachter and Fromkin's (1968) proposal for a second lexicon:

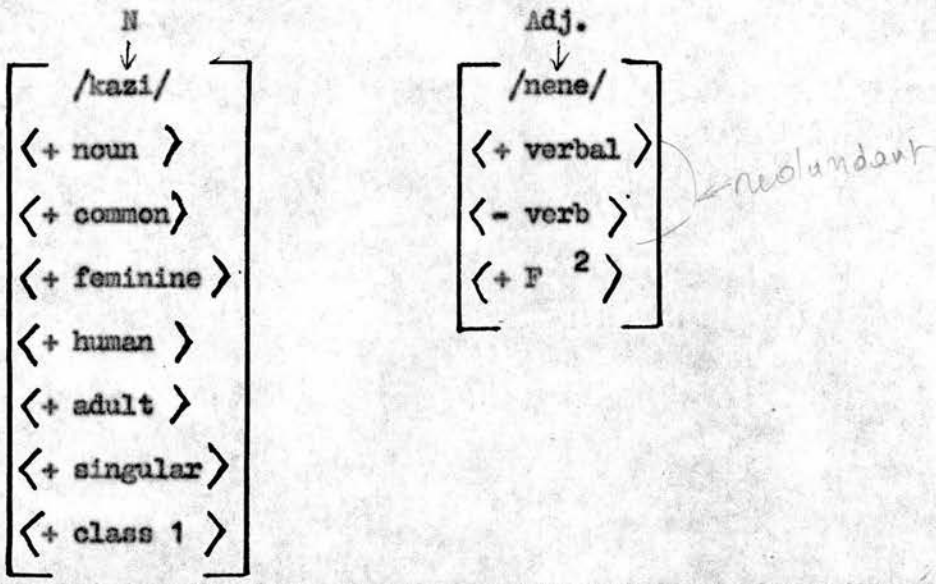
(1) Categorial rules of the base generate underlying phrase markers e.g.



(2) At the conclusion of the categorial rules lexical insertion rules

1 The complex of semantic and syntactic features is equivalent to the WP lexeme and the phonological representation of a lexical item in the dictionary is equivalent to the root in WP.

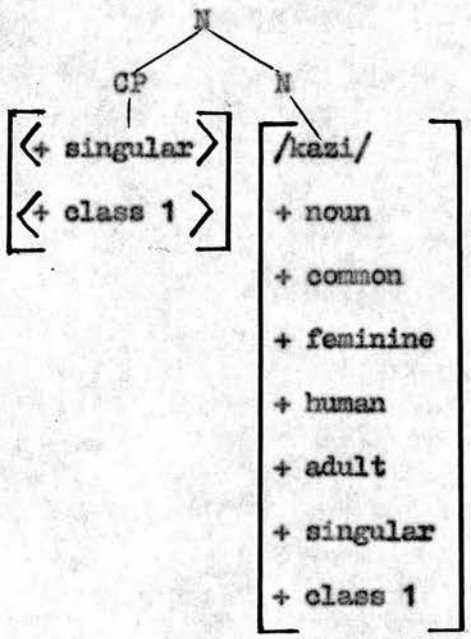
introduce lexical items into underlying phrase markers. This is the first lexical pass[1]:



This constitutes the deep structure representation of our NP.

(3) Two transformational rules operate on that deep structure to convert it into a surface structure

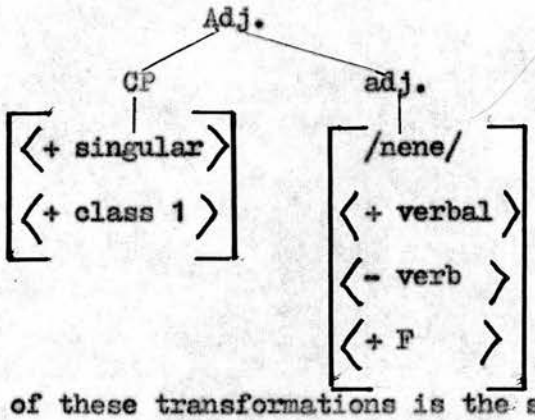
(i) The class prefix (CP) transformation rule copies out the features ⟨+ singular⟩ and ⟨+ class 1⟩ to the left of the noun.



1 The phonological representation of lexical entries in a more formal representation would be in terms of feature matrices.

2 ⟨+ F⟩ stands for any other features this item may have

(ii) The agreement transformation copies the class prefix before any constituent that is in agreement with the noun. Adjectives, quantifiers, pronouns, demonstratives and verbs.



The output of these transformations is the syntactic surface structure.

(4) Where the syntactic surface structure bracketing is too complex for production as speech it is reanalysed and simplified by readjustment rules (4.2.3)

(5) Next phonological matrix insertion rules (PMIRs)[1] introduce the phonological representation of grammatical morphemes created by transformational rules from the second lexicon. This is what Jacobs and Rosenbaum (1968) refer to as the second lexical pass. In our example

$$\begin{bmatrix}\text{class 1}\\ \text{singular}\end{bmatrix} \rightarrow \text{mu/- noun root}$$

the result of making the first and the second lexical pass is the morphophonemic representation.

In part I we have discussed the transduction from syntax/ semantics to morphophonemics. In part II we shall discuss the transduction from morphophonemic to surface phonetic representations.

1 The term PMIR is borrowed from Vanek (1970)

PART II

PHONOLOGY

4. THE PHONOLOGICAL MODEL

4.1 Standard generative phonology

This description of Luganda phonology is made within the framework of generative phonology developed by Chomsky and Halle and their collaborators[1]. In this theory phonology is not an autonomous component: it cannot be discussed in isolation from the rest of the grammar. Before sketching the phonological component, therefore, we shall present an overview of the whole grammar[2].

(i) The lexicon. The lexicon is an inventory of all the lexical items of a language. It contains all the idiosyncratic information about lexical items which a competent speaker must have. It incorporates on the one hand the semantic and morphological/syntactic characteristics of each lexical item and its phonological representation on the other (3.2.1). The phonological part of a lexical representation consists of maximally non-redundant distinctive feature matrices in which columns represent systematic phonemes and rows list features.

(ii) The semantic component. The semantic component is purely interpretive. It supplies semantic readings for deep structures using projection rules.

(iii) The syntactic component. Syntax is the central component. There are two levels of syntactic representation, namely deep and surface

1 We shall refer to studies in generative phonology until (1968) as 'standard generative phonology' or 'the standard theory'. The leading references are Halle (1959, 1962, 1964); Chomsky (1964); Chomsky and Halle (1965, 1968); Stanley (1967); Harms (1968); Kiparsky (1968) and Postal (1968). Of all these studies Chomsky and Halle (1968) is the most important.

2 In its short career generative grammar has undergone many modifications. The version sketched here is based on Chomsky (1965).

structure. Deep structures are generated by the categorial and the lexical insertion rules of the base. The categorial rules of the base generate underlying phrase markers. They apply recursively in order to account for the creative aspect of language. Lexical insertion rules introduce lexical items into the phrase markers generated by the categorial rules. The output of these base rules is the deep structure of the sentence.

Next transformation rules apply to phrase markers which satisfy their structural description in order to map deep structures on to surface structures. Some grammatical morphemes not present in the deep structure may be introduced by transformational rules into the surface structure.

iv) The phonological component. Like the semantic component, the phonological component is interpretive; it supplies the phonological interpretation of syntactic surface structures. The following rule systems are used to convert surface syntactic representations into phonological representations.

a) Readjustment rules. The surface syntactic representation on entering the phonological component goes to the readjustment rules. Where necessary readjustment rules simplify syntactic bracketing, breaking complex phrases into smaller units which can be produced as phonological phrases. The other functions of readjustment rules will be mentioned presently.

b) Boundaries. The morphophonemic representation consists of segments and boundaries (or junctures). The formal representation of boundaries is similar to that of segments. The feature 'segment' is used to characterise both; segments are specified as [+ segment] and boundaries as [- segment]. The only difference is that if an item is specified

as (+ segment) this also implies that it is also specified for some other feature which have phonetic content while an item specified as (- segment) must necessarily lack any features with phonetic content.

Three kinds of boundaries are recognised: formative boundaries, word boundaries and phonological phrase boundaries. Formative boundaries are characterised by the features $\begin{bmatrix} - \text{ segment} \\ + \text{ formative boundary} \end{bmatrix}$. They differ from other boundaries in that they are an integral part of all lexical items and grammatical formatives. Phonological phrase and phonological word boundaries are introduced by readjustment rules.

c) Lexical redundancy rules. There are two kinds of lexical redundancy rules[1]:

(i) Segment structure rules which predict the redundant feature values of systematic phonemes on the basis of well-formedness conditions which apply to individual segments everywhere in the language

(ii) Sequence structure rules (also called sequential constraints) which predict redundant feature values on the basis of the environment in which a segment occurs in the underlying representation.

In the standard theory the domain of redundancy rules is limited to a single morpheme; they are not allowed to apply across morpheme boundaries. Furthermore, the range of operations redundancy rules can perform is limited. They can only add features and feature values; they are not allowed to delete or permute them at all.

Lexical redundancy rules fully specify lexical representations before the application of phonological rules and turn maximally non-redundant lexical representations into fully specified systematic

1 The term 'lexical redundancy rule' was introduced by Chomsky and Halle (1968). Before 1968 they were also variously referred to as 'morpheme structure rules' by Halle (1959) and as 'morpheme structure conditions' by Stanley (1967).

phonemes. Lexical representations are fully specified by redundancy rules and turned into systematic phonemic representations before phonological rules (P-rules) apply because Stanley (1967) argued against the practice in early generative phonology of showing a plus or minus value for every distinctive feature, and a zero for every redundant feature in the lexical representation on the grounds that zero was being used improperly as a third value in what was supposed to be a binary distinctive feature system. He proposed that the problem of zeroes could be solved by employing redundancy rules to fully specify lexical representations before they are operated on by P-rules.

d) Phonological rules. There are two kinds of phonological rules: cyclical rules and non-cyclical rules. Cyclical phonological rules apply first within the innermost brackets and then outward within the next set of brackets. At the end of each cycle boundaries are deleted. The most persuasive evidence for cyclical rules has come from supra-segmental phonology; arguments for cyclical rules in segmental phonology have generally been unconvincing.

It is the non-cyclical rules that have been found to be well-motivated. The output of the redundancy rules (i.e. fully specified systematic phonemic representations) enters the P-rule component as the next stage in the derivation. Those segments whose phonetic realisation is in a relation of invariance with their systematic phonemic representation get a free ride through the P-rules. Those segments whose phonetic realisation is not in a relation of invariance with the systematic phonemic representation are operated on by phonological rules which bring about the required modifications. Phonological rules can delete, permute or substitute features and

feature values. The only limitation on them is that they can only apply to matrices which satisfy their structural description. There is a cost attached to the use of phonological rules. The more phonological rules are used in a description the less highly valued it is. In view of this the positing of every abstract underlying representations which can only be converted into surface representations by using many P-rules is avoided unless it enables the linguist to capture some linguistically significant generalization which offsets the cost attached to the application of P-rules.

The output of the P-rules is operated on by low level rules which specify the precise point on the universal phonetic scale at which a given feature is realised in a given utterance. This is achieved by using multi-valued phonetic features (instead of the binary features used elsewhere in phonology).

The representation arrived at after all the rules of phonological component have applied is the systematic phonetic representation. Low level rules specifying phonetic detail are seldom applied and consequently the systematic phonetic representation is often very similar to the phonemic or grossly allophonic representation of a structuralist linguist.

e) Distinctive features. Distinctive features are used to characterise surface and underlying segments in phonology. At first all features were defined in acoustic terms (Jakobson, Fant and Halle, 1951). Since Chomsky and Halle (1968), however, distinctive features have been defined in purely articulatory terms.

The standard theory is summarised in fig.4.1 on page 70.

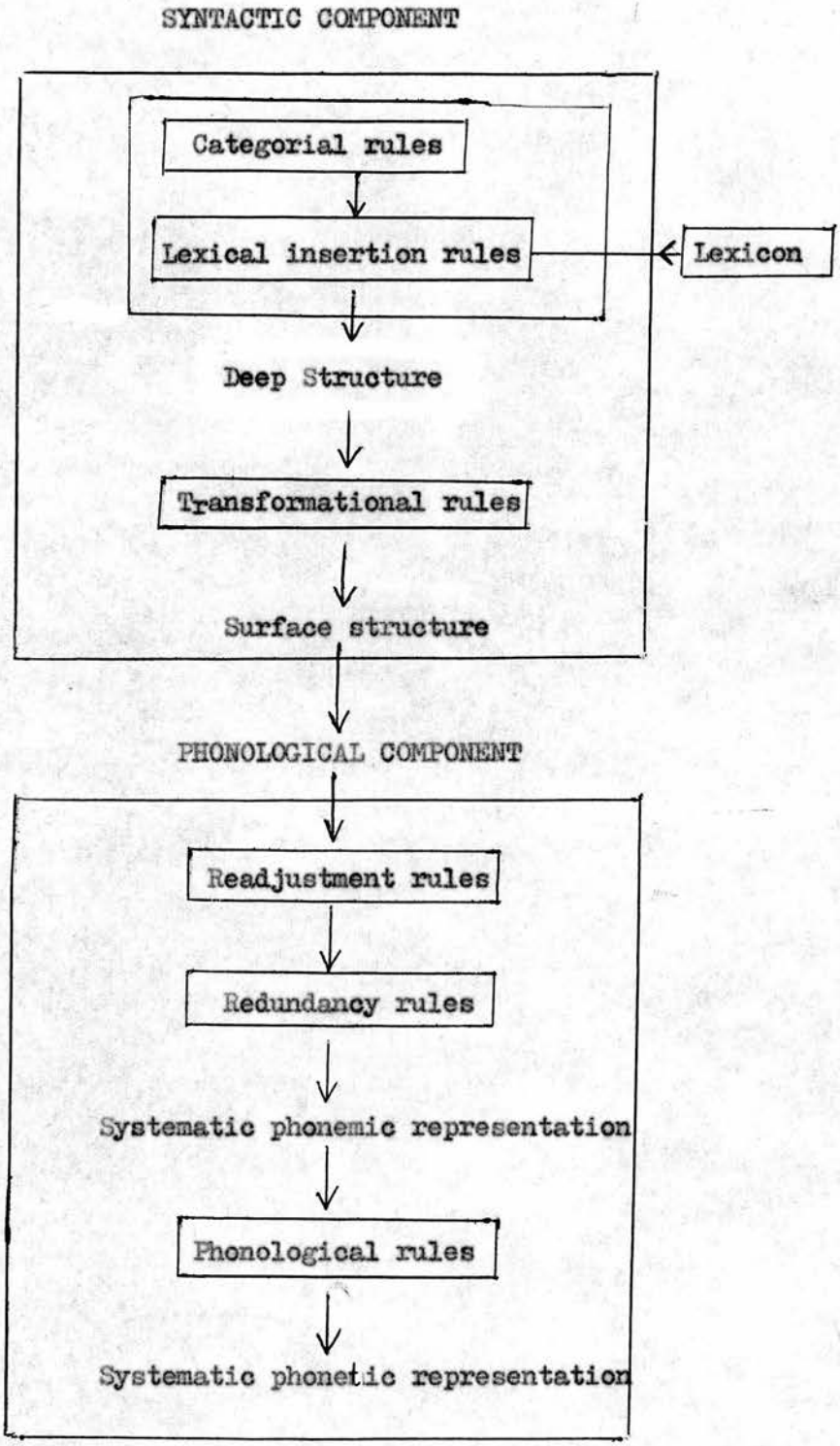


Fig.4.1 A diagrammatic representation of standard generative phonology

This review of generative phonology has been based on the original version of the theory only. We have not mentioned the later version in which the concepts of markedness and naturalness are central (Postal: 1968, Chomsky and Halle 1968)[1] because the present study is based on the original rather than the modified theory (see discussion in 5.3)

4.2 The model used in this description

The model used in this description of Luganda derives from the original standard theory but it diverges from it at several points. In this section our model is explained and our departures from the standard theory are justified.

The present writer's version of generative phonology is schematically summarised in fig.4.2. The numbered boxes in that diagram contain the following devices[2]:

BOX 1: Positive conditions stating constraints on morphophonemic sequences in representations of lexical items

BOX 2: Positive conditions stating constraints on morphophonemic sequences in representations of grammatical formatives.

BOX 3: Morphophonological constraints

BOX 4: Phonological word constraints

BOX 5: Phonotactic constraints

1 Chomsky and Halle (1968) do not introduce markedness until the epilogue. The bulk of their book is written in the framework of the original theory.

2. All these terms will be explained below.

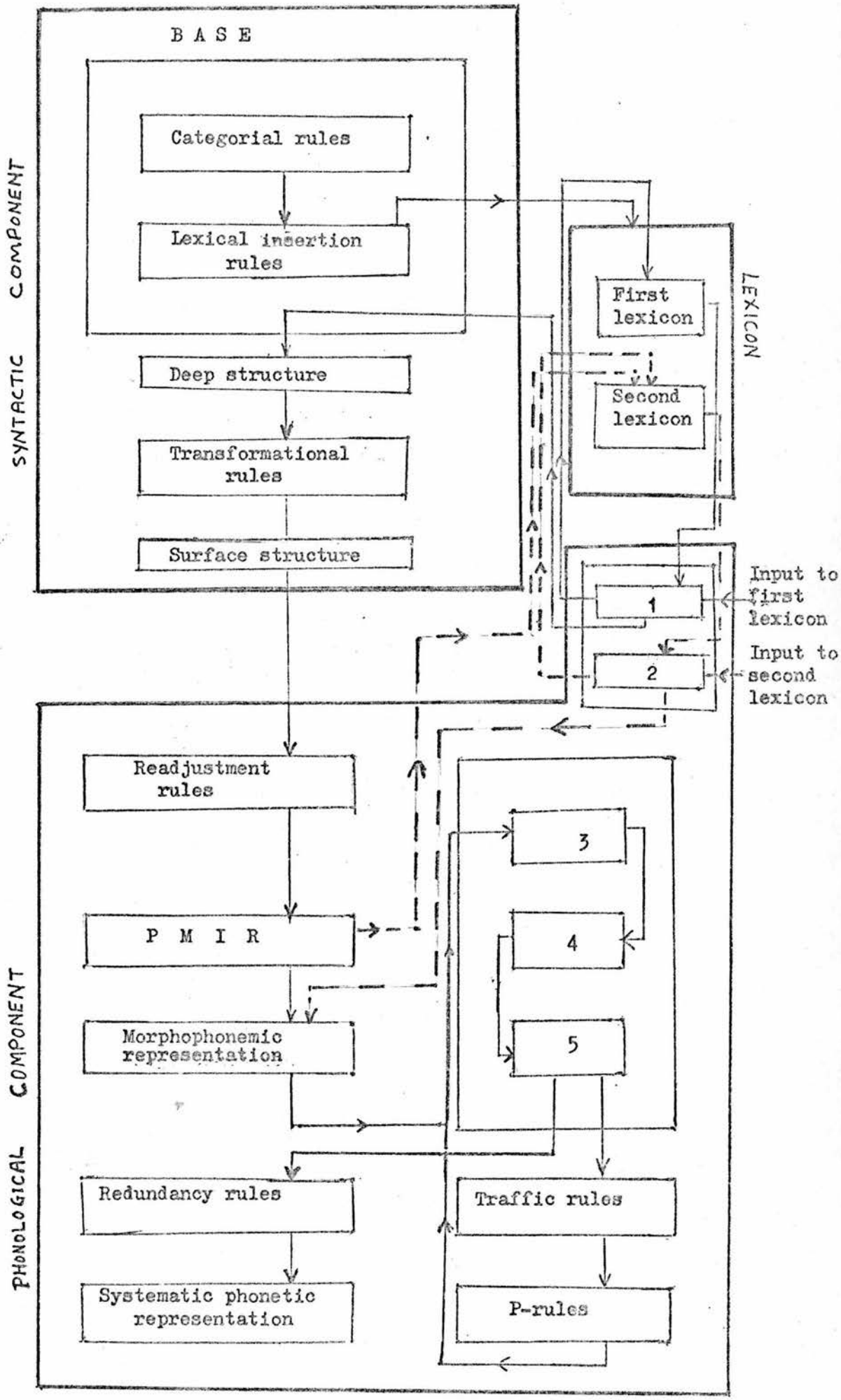


Fig. 4.2 A diagrammatic representation of the model used in this description.

4.2.1 Distinctive features

Most of the features used in this study are derived from the feature system proposed by Chomsky and Halle (1968). However, unlike these authors, we shall not insist on defining all features in physiological terms. We have followed Ladefoged (1971) who argues that:

> ...we do not have the choice of thinking either in acoustic or in physiological terms. The patterns that arise in the sounds of a language are due to intersecting causes (....) Some patterns can be explained in terms of acoustic events, others in terms of articulatory events.

Therefore, though most of the features used in this study are articulatory, where necessary we have used acoustic features. For further discussion, see (5.1).

4.2.2. Positive conditions

Positive conditions (PC's for short) were first introduced into generative phonology by Stanley (1967). They serve as filters allowing only well-formed lexical representations to enter the lexicon and preventing any inadmissible morphophonemic sequence from being introduced by lexical insertion rules and PMIR's (3.2.2). PC's act both as input conditions on the lexicon and as output conditions on lexical insertion rules and PMIR's in order to ensure that no ill-formed morphophonemic representation ever occurs: every morphophonemic sequence must obey the well-formedness conditions expressed by PC's. PC's define the set of possible morphophonemic representations in a given language[1].

1 As we shall see presently (6.3) well-formedness conditions on surface representations are sometimes different from constraints on underlying representations. Consequently some permissible morpho-phonemic sequences are not allowed in the surface representations, and conversely some permissible surface sequences are not allowed in the underlying representation. Such anomalies are sorted out by phonological rules (4.2.5)

Two sets of PC's are required. One set expresses admissible morphophonemic representations of lexical roots and another set expresses permissible morphophonemic sequences in morphs representing grammatical formatives. Before morphophonemic representations enter the lexicon they are checked by the appropriate set of PC's. They are re-checked once again before being inserted into the underlying phonological representation as fig.4.2 shows.

4.2.3 Readjustment rules

Readjustment rules will have a very limited role in this description. They will only be used to insert phonological phrase and phonological word boundaries. In principle readjustment rules will have the power (as in the standard theory) to break complex surface structures into simpler units corresponding to phonological phrases; in practice, however, they will not perform that function in this description because all the utterances described here are too simple to require any further simplification.

4.2.4 Redundancy rules

Redundancy rules predict the phonetic realisation of morphophonemic representations.[1] Stanley (1967) placed the following limitations on redundancy rules:

(i) redundancy rules may only add features; they cannot alter features,

(ii) redundancy rules should be unordered; since they can only add features it is unnecessary to order them as it makes no difference which feature is filled in first,

(iii) redundancy rules apply and re-apply until all features are fully specified.

1 Redundancy rules were first introduced into generative phonology by Halle (1959). The present discussion of redundancy rules is based on Stanley (1967) and Brown (1969, 1972).

(iv) redundancy rules apply only within and never across morpheme boundaries.

The first three limitations on redundancy rules will be accepted but the last one will not. Following Brown (1969, 1972) I shall withdraw the restriction which forbids redundancy rules to apply across morpheme boundaries. Brown has shown that it is unnecessary to restrict the application of redundancy rules to a single morpheme because, as a rule, segment sequence redundancies which are found within a single morpheme are also found across morpheme boundaries. When redundancy rules are restricted to the domain of a single morpheme very frequent recourse to P-rules is necessary in order to characterise cross-morpheme boundary redundancies. This is undesirable for two reasons: (i) it reduces the value of the grammar because there is a cost attached to the use of P-rules (Chomsky and Halle 1968:296) and (ii) it obscures the important fact that constraints on segment sequence which hold within individual morphemes usually also hold across morpheme boundaries within a phonological word and even within an entire phonological phrase in some cases. It is arbitrary to characterise redundancies within a morpheme using redundancy rules and redundancies across morpheme boundaries with P-rules. Thus both within and across morpheme boundaries a nasal consonant is always homorganic with a following consonant in Luganda:

a) homorganic nasal plus consonant sequences within morphemes

/ku + βuNB + a/ [kuβu:mba] 'to mould in clay'

/ku + tuND + a/ [kutu:nda] 'to sell'

/ku + tuNg + a/ [kutu:ŋga] 'to sew'

b) homorganic nasal plus consonant sequences across morpheme boundaries

/N + βogo/ [mbogo] 'buffalo'

/N + te/ [nte] 'cow'

/N + go/ [ŋgo] 'leopard'

Similarly, the rule which prohibits the juxtaposition of syllabic nonconsonants applies equally within and across morpheme boundaries:

a) no juxtaposition of syllabic nonconsonants within a morpheme:

/lu + nu e/ [lunwe] 'index finger'

/Ki + βia/ [ciβya] 'bowl'

/lu + lio/ [lulyo:] 'family, kindred'

b) no juxtaposition of syllabic nonconsonants within a phonological word.

/mu + ana/ [mwa:na] 'child'

/βi + alo/ [βya:lo] 'villages'

/li + eNvu/ [lye:ŋvu] 'banana'

c) no juxtaposition of syllabic non-consonants within a phonological phrase:

/V + muNtu ## V + mu/ [omu:ntwo:mu] 'one person'

/V + βa + ana## V + βa + o/ [aβa:na:βo] 'those children'

Clearly the same constraints apply in these examples within and across morpheme boundaries. In the present description redundancy rules will therefore be allowed to apply anywhere in a phonological phrase each time their structural description is satisfied.

Two types of redundancy rules have been proposed in the literature: segment structure rules and sequence structure conditions. We shall discuss them in turn.

1 See 0.4.1.1 for a discussion of unspecified /V/ and (11.4.3.1) for a more detailed discussion of the realisation of underlying vowels.

Segment structure rules. Segment structure rules fill in redundant features of individual segments which can be predicted, independent of the environment in which it occurs because certain feature combinations presuppose or entail certain other features. In Luganda, for example, nonconsonants cannot be both [+ round] and [+ front] consonants cannot be [+ nasal] without also being [+ voice] and [+ stop] (See 5.2.1)

Sequence structure conditions. Sequence structure conditions are algorithms for predicting feature values which are redundant in certain segment sequences. Thus a sequence structure condition will state that high non-consonants are realised as non-syllabic before any low nonconsonant (see 11.4.3.1):

/li + ato/ [lya:to] 'boat'

/mu + ana/ [mwa:na] 'child'

Redundancy rules of both kinds will be expressed using If-Then conditions (Stanley 1967:424). An If-Then condition consists of two parts: a structural description (SD) and a structural change (SC). It is an instruction to fill in any unspecified values in a matrix M if M satisfies the SD of the rule so that it also satisfies the SC of that rule. An If-Then condition is expressed using this schema:

If (SD) A ([B])

Then (SC) C

e.g. IF $\begin{bmatrix}-\text{cons}\\-\text{low}\end{bmatrix}$ $\begin{bmatrix}-\text{cons}\\+\text{low}\end{bmatrix}$

$\downarrow$

Then [-syllabic]

i.e. a high nonconsonant is non-syllabic when it precedes a low nonconsonant.

Output of the redundancy rules. In the standard theory the output of the redundancy rules is the fully specified systematic phonemic representation, and fully specified systematic phonemes constitute the input to the P-rules.

Brown (1972:41ff) has convincingly argued against the introduction of the level of systematic phonemics between lexical representations and P-rules on the grounds that systematic phonemics squeezes out the valuable concept of the archiphoneme if one is consistent and fully specifies all lexical representations before P-rules apply. Of course, the need for archi-segments is recognised by Chomsky and Halle (1968:64) and archisegments are used in their description (e.g. op.cit., p.85). The point we are making here is that it is rather inconsistent to insist on having fully specified systematic phonemes while at the same time allowing archisegments to occur.

In order to exploit fully the useful notion of redundancy the level of fully specified phonemes should be abandoned. Underlying segments should be specified only for those features which are distinctive in the particular environment in which they occur. For example, a nasal followed by another consonant in Luganda needs to be specified simply as $\begin{bmatrix}+\text{cons}\\+\text{nasal}\end{bmatrix}$ because all its other features can be predicted by redundancy rules; on the other hand, a nasal consonant occuring intervocalically needs to be more fully specified. Turning all lexical representation into fully specified systematic phonemic representations would obscure the fact that /N/ in /NC/ has more redundant features in the underlying representation than a nasal consonant elsewhere.

In view of this the level of fully specified phonemics will be

abandoned, and following Brown (1972) we shall stipulate that the output of the redundancy rules is not a systematic phonemic representation but a systematic phonetic one. Redundancy rules will be realisation rules: for the vast majority of items the transduction from underlying to surface representations will be accomplished by redundancy rules alone without the intervention of P-rules (4.2.5)

4.2.5 Phonological rules

In the standard theory all partially specified lexical representations after being fully specified by redundancy rules enter the P-rules. P-rules apply causing mutation in anomalous matrices which satisfy their structural description and also to nonanomalous sequences which need no modification. The input to the P-rules is the systematic phonemic representation and the output is the systematic phonetic representation.

The principle of 'vacuous rule application' to matrices which are not anomalous has been questioned in several recent publications (e.g. Botha: 1971; Brown: 1972). Brown has pointed out that it is unnecessary to make all underlying representations go through the P-rules regardless of whether they are affected by them or not. She has proposed that only anomalous matrices should go to the P-rule loop to be modified; matrices which need no modification should not get a free ride through the P-rules but should instead be converted into surface phonetic representations by redundancy rules alone (4.2.4). Brown's proposals are incorporated in this model. Only anomalous sequences which would violate some output condition will enter the P-rule loop (4.3). The raison d'être of P-rules in this grammar is to avert violations of output conditions.

To accomplish this task P-rules will have the power to delete,

substitute and permute features which they are given in the standard theory. They will be formally expressed using context sensitive rewrite rules: A → B /C → D. We shall come back to P-rules in the following section.

4.3 Output Conditions

Kisseberth (1969, 1970) has argued that an adequate phonological theory must not only express structural similarity but also functional unity between phonological rules. In standard generative phonology only formal similarity between rules is recognised: the abbreviatory devices of the standard theory collapse adjacently ordered rules which have similar structural descriptions or structural changes. Kisseberth has pointed out that it is a linguistically significant fact that structurally dissimilar rules may have the same effect, in his apt phrasing, formally different rules may 'conspire' to bring about the same result.

In this study we shall approach the question of rule conspiracies in terms of output conditions on the phonology. A conspiracy will be said to occur when structurally dissimilar rules have the same effect of warding off sequences which would violate a given output condition if allowed to occur in the surface representation. Rules united in the same conspiracy have the function of ensuring that underlying sequences which are potential violations of output conditions are appropriately modified to ensure that they satisfy the well-formedness conditions stipulated by the output conditions (Sommerstein: 1974).[1]

Traffic rules. The function of the traffic rules is to direct to the P-rule loop for modification any morphophonemic sequence which would otherwise violate some output condition[2]. Brown (1972) has suggested

1 See for example the vowel realisation conspiracy in (11.4.3.1)

2 The use of traffic rules was first proposed by Lees (1960) as a possible alternative to ordered rules in syntax. He adumbrated the notion of 'traffic laws' each equipped with a 'control unit' which would direct the order of application of rules.

that traffic rules be incorporated into the redundancy rule sub-component to direct any underlying sequence which would be an inadmissible surface representation to the P-rule loop for modification. They add the diacritic feature [+ P-rule X] to any matrix which satisfies the structural description of P-rule X and so identified the matrix enters the appropriate P-rule.

Stanley's If-Then conditions are used to express traffic rules.

Traffic rules will perform the same function in this description as in Brown (1972). However, unlike Brown's traffic rules ours will not be placed in the redundancy rule sub-component because we regard redundancy rules purely as realisation rules; they can only specify redundant phonetic features and they are not allowed to add any diacritic features. Traffic rules on the other hand cannot fill in phonetic features; they can only add a diacritic feature which indicates the P-rule which provides an anomalous underlying representation with the required remedy.

An underlying representation which is rejected by some output condition is directed to the P-rule loop in the manner shown in fig.4.2. After the anomaly has been sorted out in the P-rule loop the matrix cycles once again through the output conditions. After all sequences in the underlying representation which are potential violations of output conditions have been removed, underlying representations go to the redundancy rules to be fully specified and brought to their phonetic realisation.

Implication sets. Implication sets[1] will be used to express conspiracies

1 We have borrowed implicational sets from Lass (1969) who introduced this device in order to state meta-rules expressing sound shifts in diactronic phonology. An alternative formalism for expressing conspiracies has been proposed by Sommerstein (1974).

in phonology (Lass: 1969). An implicational set is a schema which shows that a given output condition necessitates the use of certain phonological rules. It can be interpreted as an instruction to apply a set of rules in order to avert a violation of a given output condition.

An implicational set schema will have two parts which may be conveniently referred to as the left-hand right-hand side respectively. The left-hand side will be a statement of the output condition. It will be expressed in the form of a negative condition (Stanley: 1967). The right-hand side will consist of the rules which conspire to ensure that the output condition is not violated. The two parts will be linked by an implication sign which indicates that the rules on the right are motivated by the output condition on the left.

Example[1]

$$\sim a\ b \supset \left\{\begin{array}{l}(i)\ A \rightarrow \emptyset\ /\ C - B \\ (ii)\ \emptyset \rightarrow d\ /\ A - B\end{array}\right\}$$

The output condition states that a and b cannot be adjacent to each other in the surface representation. There are two strategies which can be used to prevent a from abutting with b: (i) where a is derived from an underlying sequence consisting of CAB A is deleted; (ii) where a is derived from an underlying sequence consisting of AB an epenthetic d is inserted. Three types of output conditions will be used in this description, namely, morphophonological constraints, phonological word constraints and phonotactic constraints.

1 Upper case letters stand for morphophonemic representations and lower case letters for surface representations. Implicational sets are used in Chapters 9, 10 and 11.

4.3.1 Morphophonological constraints

Morphophonological constraints are the least general of all the output conditions. They only govern surface phonetic sequences which are exponents of certain morphemes: phonetic sequences which are permissible elsewhere in the language may be inadmissible in surface phonetic sequences which represent some particular morphemes (see chapters 8 and 9).

4.3.2 Phonological word structure constraints

Phonological word structure constraints are output conditions on phonological sequences within a single phonological word. They never apply across word boundaries. Rules of this kind are well-known to generative linguists (cf. Chomsky and Halle, 1968:12-14)[1].

4.3.3 Phonotactic constraints

Unlike morphophonological constraints which apply only to some subsystems of the phonology and word structure constraints whose domain is limited to a single word, phonotactic constraints are ubiquitous in the surface representation. All systematic phonetic[2] sequences without any exception must conform to their well-formedness conditions. In addition to their filtering function phonotactic constraints also serve as surface phonetic sequential redundancies.

Our phonotactic constraints are modelled on Shibatani (1973)'s surface phonetic constraints (SPC's). Now, the idea of a system of rules for expressing surface phonetic redundancies has been considered and rejected in the standard theory. Postal (1968:214) dismisses it

1 Prosodists too have always stressed the need for rules of the kind mentioned in (4.3.1) and (4.3.2). See Palmer (1970).

2 The systematic phonetic (surface) representation is roughly equivalent to the phonemic or grossly allophonic representation of the traditional phonemicist.

in these words:

> ...an independent phonotactics is necessarily and in all cases useless and redundant in its entirety. It describes or accounts for not one fact which is not accounted for without it.

Postal's position has been shown to be untenable by Shibatani (1973) and Sommerstein (1974) who have demonstrated that, contrary to the prevailing view among generative phonologists, surface phonetic redundancies cannot always be predicted on the basis of morphophonemic redundancies by using morpheme structure conditions. Autonomous rules are needed to express surface phonetic redundancies where there is a discrepancy between morphophonemic and surface representation redundancy. We shall return to this point in (6.3) and in chapter 11 (passim).

What we are attempting to do in part II is to synthesize developments in generative phonology since 1968. In the model we have ended up with (see fig. 4.2) there is a coherent relationship between realization rules and output conditions at different stages of a derivation. In the generative literature we have surveyed it is clear that only fragments of such a model exist today; and stratificationalists have provided us with only the bare bones of such a model (cf. Lamb: 1966). As far as I know, this thesis is the first work where the relationship between realization rules and output conditions is explicitly stated and various kinds of output conditions are inter-related coherently in a detailed phonological description.

5. Phonological features and segments

5.1 Distinctive features

Recall that in (4.2.1) it was stated that both articulatory and acoustic features will be used in this description.

The acoustically defined features used here are 'grave' (vs 'acute') and 'strident' (vs 'mellow'). Both features will have the acoustic characteristics described in Jakobson, Fant and Halle (1951).

The majority of features, however, will be physiologically defined and will have the characteristics ascribed to them by Chomsky and Halle (1968). The articulatory features borrowed from Chomsky and Halle (op.cit.) are: 'obstruent' (vs. 'sonorant'); nasal (vs 'nonnasal'); 'continuant' (vs. 'stop'); 'anterior' (vs. 'non-anterior'); voiced (vs. 'voiceless') 'low' (vs. 'nonlow'); round (vs. 'nonround'), High (vs. 'non high').[1]

Two less widely used physiological features will also be employed, namely the features 'lingual' (vs. labial) and 'advanced tongue root' (vs. 'nonadvanced tongue root'). Lingual consonants are produced using the tongue as the active articulator while nonlingual consonants (i.e. labial and laryngeal consonants are not) (Cf. Brown, 1972; Lass, 1973). In Luganda there are no laryngeals. Therefore all nonlingual segments will therefore be labial.

The feature 'advanced tongue root' (a.t.r.) is borrowed from Stewart (1967). It will be used to distinguish those vowels which are produced with the tongue root in an advanced, forward position from

1 The corollary in parenthesis is in every case only used in the informal discussion.

those which are articulated with the tongue root in a non-advanced position.

Note that there is one important feature which has not yet been mentioned. It is the feature Consonantal. This feature is different in kind from the features listed above. It has no phonetic content. It is simply a classificatory feature characterising the most general set of natural classes found in phonology. Consonants will be [+ consonantal] and vowels will be [-consonantal].

It is important to note that the thirteen distinctive features listed above do not all have exactly the same status in Luganda phonology. Some occur only in a few phonological subsystems or characterise only a handful of underlying segments while others have very much wider currency. The feature 'advanced tongue root', for example, is required only for one vowel harmony rule (9.3.2); the feature 'high' is only needed in diachronic discussions or in very abstract synchronic solutions where seven instead of five underlying vowels are posited; and the feature 'strident' is only used distinctively to classify consonants involved in the spirantization rule (9.1.2). Elsewhere it is redundant.

5.1.2 Non-lexical features

The features mentioned in (5.1.1) are needed to classify non-redundantly segments which appear in the lexical representation. In addition to these lexical features there are a few features which though absent from lexical representations are important in that they play a role in surface phonemic contrasts. They are the features 'syllabic' (vs. 'nonsyllabic'), 'long' and 'raised.'

The definition of the feature 'syllabic' which is used here is that proposed by Brown (1972). Redundancy rules will specify as

[+ syllabic] any segment that functions as a syllable nucleus and as [- syllabic] any segment that functions as a syllable onset. The feature syllabic is absent from the lexicon because the syllable is regarded as a unit of phonetic distribution rather than as a unit of morphophonemic patterning. We shall come back to the syllable in Chapter 11[1].

We shall also borrow from Brown (op.cit.) the feature 'raised' which will be used to characterise nonconsonants. A raised nonconsonant is produced with the body of the tongue lifted up from the floor of the mouth and slightly fronted. For further discussion of this feature see (14.5).

Finally the feature 'long' will be used to specify differences in duration found in the realisation of underlying segments[2]. It is used to capture the relationship between surface phonetic segments which are primarily distinguished by quantity. It will have three values on an arbitrary scale: [-1 long] i.e. 'short'; [o long] i.e. 'normal' and [+1 long] i.e. 'greater than normal duration'[3]. All these values will be relative. Using this feature, the distinction between the alveolar flap [ɾ], the weak alveolar stop [d] and the strong alveolar stop [d:] can be stated as follows: [ɾ] is [-1 long]; [d] is [o long] and [d:] is [+1 long]. The discussion of this feature will be taken up again in Chapters 11 and 12.

1 For a discussion of constraints on segment sequence in the underlying representation see (4.2.2) and (6.1).

2 The feature 'long' used here is equivalent to the feature 'rate' suggested by Ladefoged (1971:56)

3 Recall that unlike classificatory features, phonetic features are multi-valued and not binary.

5.2.1 Segment structure rules

Segment structure rules fill in redundant feature values which can be predicted independent of the environment in which a segment occurs. In the list below the order of the rules is not theoretically significant.

Segment structure rules for consonants

(1) If [+ cons, − lingual]

↓

Then [+ anterior, + grave]

All non-lingual (i.e. labial) consonants are anterior and grave

(2) If [+ cons, − obstruent]

↓

Then [− strident]

All non-obstruents are non-strident

(3) If [+ cons, + nasal]

↓

Then [+ voice]

All nasal consonants are voiced.

(4) If [+ cons, + obstr]

↓

Then [− nasal]

There are no obstruents which are nasal.

(5) If [+ cons, + nasal]

↓

Then [+ stop]

All nasals are stops.

(6) If [+ cons, + obstr., + grave, ± lingual]

↓

Then [- anterior, + stop]

All grave, lingual obstruents are also nonanterior stops.

(7) If [+ cons, + obstr., - stop]

↓

Then [+ strident, + anterior]

All nonstop obstruents are also strident and anterior

(8) If [+ cons, - obstr., - nasal]

↓

Then [+ voiced, - stop]

If a consonant is not obstruent and nonnasal it is a voiced nonstop.

(9) If [+ cons, - grave, - anterior]

↓

Then [+ lingual]

Any nongrave, nonanterior consonant is also lingual.

(10) If [+ cons, + anterior, ± lingual]

↓

Then [- grave]

Any consonant which is lingual and anterior is nongrave.

Segment structure rules for nonconsonants

(11) If [− cons, − grave] → Then [− round]

Nongrave nonconsonants are unround.

(12) If [− cons, + round] → Then [+ grave]

Round nonconsonants are grave (back).

(13) If [− cons., + grave, − round] → Then [+ low]

Grave unround nonconsonants are low.

A Classificatory matrix. Fig.5.1 is a classificatory matrix showing the distinctive feature specification of underlying consonants word initially before /a/ and of vowels following /t/. Segment structure rules illustrated in this section and sequential constraints which we shall discuss later fill in all the feature values left unspecified in this matrix. In fig.5.1 feature relevant only to a very limited number of rules are put in parenthesis.

Fig.5.1 Typical underlying phonological segments of Luganda

	cons.	obs.	nas.	stop	ling.	vc.	ant.	(str.)	grv.	low	rnd.	(atr.)
p	+	+		+	-	-		(-)				
t	+	+		+		-	+	(-)	-			
c	+	+		+		-	-	(-)	-			
k	+	+			+	-		(-)	+			
b	+	+		+	-	+		(-)				
d	+	+		+		+	+	(-)	-			
ɟ	+	+		+		+	-	(-)	-			
g	+	+			+	+		(-)	+			
m	+		+		-							
n	+		+				+		-			
ɲ	+		+				-		-			
ŋ	+		+		+				+			
β	+	-	-		-			(-)				
l	+	-	-				+	(-)	-			
j	+	-	-				-	(-)	-			
f	+	+		-	-	-		(+)				
v	+	+		-	-	+		(+)				
s	+	+		-		-		(+)	-			
z	+	+		-		+		(+)	-			
i	-								-	-		(-)
e	-								-	+		(+)
a	-								+			(-)
o	-									+	+	(+)
u	-									-	+	(-)

Key to abbreviations: cons. = consonant; obs. = obstruent; nas. = nasal; (str.) = (strident); rnd. = round; ling. = lingual; vc. = voice; ant. = anterior; grv. = grave; (atr.) = (advanced tongue root.)

5.2.2 Suprasegmental features

There are two tone features, 'high level tone' and 'low level tone' in the underlying representation. All underlying nonconsonants will have either a high or a low tone. The first segment in an /NC/ or /CC/ sequence will also have a tone in the underlying representation

At the surface phonetic level in addition to a high tone and a low tone there is found a falling tone which is a combination of high plus low tone in the same syllable.

Quantity is another important prosodic feature (5.1). The feature 'long' as we shall see in Chapter 11 is intimately connected with syllable structure and tone.

5.3 Markedness theory

In the original generative phonology model which has been used in a modified form here lexical representations are specified as + or - for each relevant feature or left blank. The evaluation measure used to determine the value of the grammar is a simple count of features (and other formal devices). It is assumed that the value of the grammar is in inverse proportion with the number of symbols used; for notations are selected with a view to capturing linguistically significant generalizations.

Leading generative phonologists have rejected this approach on the grounds that it is overly formal (Postal:1968; Chomsky and Halle: 1968). They have argued that the basic assumption in the original version that plus and minus feature values contribute equally to the complexity of the grammar is ill-founded. For some features some values are more 'neutral', 'normal' and to be expected than others (Postal op.cit., 163) e.g. it is more natural for vowels to be voiced rather than voiceless; it is more normal for front vowels to be

unround, and so on. Another objection levelled against the original version is that it fails to take into account the high degree of mutual expectancy between features which is found in language, e.g. it is natural for nasal consonants to be voiced stops; it is not normal for liquids to be nasal and voiceless. Chomsky and Halle (1968:400) sum up the deficiencies of the original theory by stating that it is overly formal and it disregards the intrinsic phonetic content of features. Because of these defects the original theory is abandoned.

The new approach they propose to replace it by is meant to pay more attention to the content of features; to this end it incorporates the notion of markedness. Lexical representations are specified as marked (M) or unmarked (U). For each feature universal marking conventions translate the M and U specifications into the appropriate + or - value for the feature in question. The natural value for a feature will be + or - depending on the feature composition of the segment and the environment in which that segment occurs, e.g.

$$[\text{U voice}] \longrightarrow [+\text{ voice}] \;/\; \left[\begin{array}{c}\text{-----}\\ -\text{ cons}\end{array}\right]$$

The unmarked, natural value for 'voice' in a vowel is [+ voice].

For an obstruent, however, the unmarked value for this feature is [- voice]:

$$[\text{U voice}] \longrightarrow [-\text{ voice}] \;/\; \left[\begin{array}{c}\text{--------}\\ +\text{ cons}\\ -\text{ obstr.}\end{array}\right]$$

Although markedness theory is ingeneous and appealing, we have not incorporated it in the present model because it raises many as yet unanswered questions. If in formulating the original theory phonologists erred in over-emphasizing formal simplicity, in the

Markedness version they err in over-emphasizing universality (Lass 1972, 1973). One of the assumptions that the Markedness theory is founded on is that there is a universal set of possible natural classes which should be the same for all languages. On the basis of that assumption universal marking conventions can interpret the unmarked and marked values for any feature in a given environment in any language; and the same universal criteria can be used to evaluate the grammar of any language. As Lass (1973:3) points out what is not taken into account is the fact that in addition to universal natural classes there are language-specific classes of segments which form natural classes, sometimes only with respect to certain types of rules at a certain period in time. In Luganda, for example, /i,a,u/ and /e,o/ form different natural classes in relation to the suffix vowel harmony and nowhere else (9.3.2).

The weakness of 'naturalness/markedness' theory is that is fails to harmonise meta-theoretical considerations of simplicity with internal economy of individual phonological systems (Lass 1972)[1]. Thus while clicks and front rounded vowels may be rare in the languages of the world, as the Markedness theory would predict, there is nothing odd or unnatural about them in Xhosa and Swedish respectively. The same can be said about strong consonants in Luganda; strong consonants are not widespread in the languages of the world but in Luganda where they occur their phonological status does not differ from that of other consonants (9.2.1).

This deficiency, it would seem, cancels out the apparent advantages of the markedness theory over the original version.

1 Matthews (1972a) also discusses the issue of universal and restricted models in Linguistics in an illuminating way.

6. MORPHOPHONEMIC REDUNDANCY

6.1 Positive Conditions

Positive Conditions (PC) express morphophonemic sequence redundancies and also act as filters, permitting only admissible sequences of underlying segments to enter the lexicon and to be introduced in the phonological representation by lexical insertion rules and PMIR's (4.2.2)[1].

PC's are expressed using the following conventions[2]:

+ : formative boundary

C : [+ consonant]

V : [- consonant]

R : the constraints expressed within the bracket reapply

(i) Positive Conditions on lexical roots:

$$+ \left\{ \begin{matrix} (V)(C) \\ CC \end{matrix} \right. \; C \; (V) \; V(C)^{R} \; (\; (C) \; C \; (V) \; V(C) \;)^{R} \Big\} \; +$$

This condition states that:

a) A lexical root consists minimally of either CV or CC.

Examples

CV /ku + pa + a/ [kuwa:] 'to give'

/ku + gu + a/ [kugwa] 'to fall'

/N + go/ [ŋgo] 'leopard'

/ma + ta/ [mata] 'milk'

1 See fig. 4.2 above.

2 The conventions for expressing PC's are borrowed from Brown (1972). Note also that her PC on underlying segment sequences in Lumasaba only differs from ours in a few respects. e.g. in Lumasaba the first consonant in a CC sequence must be a nasal while in Luganda it may be either a nasal or a consonant identical with the following consonant.

CC /ku + Ct + a/ [kut:a] 'to kill'[1]

/ku + Cm + a/ [kum:a] 'to refuse, grudge'

/ku + CS + a/ [kus:a] 'to breathe'

/mu + CB + i/ [mub:i] 'thief'

b) A lexical root may begin with the sequences CCV, CV, CVV, VC, VCC.

Examples

CV /lu + muli/ [lumuɹi] 'reed'

/mi + sili/ [misiɾi] 'fields'

CVV /mu + laalo/ [muɹa:ɹa] 'herdsman'

/mu + naana/ [muna:na] 'eight'

VC /li + iso/ [li:so] 'eye'

/li + ato/ [lya:to] 'boat'

CCV /mu + NButi/ [mu:ᵐbuti] 'pigmy'

/mu + Czukulu/ [muz:ukuɹu] 'grand-child'

VCC /mu + aNgaala/ [mwaːⁿgaːɹa] 'open space'

/ku + aNgup+a/ [kwaːⁿgʷa] 'to hurry'

c) The maximum sequence of V is VV.

Examples

VV /ku + teevuuɲ + a/ [kute:vu:ɲa] 'to swarm (of maggots)'

1 All roots of this form are verb roots. Of course, they can be nominalised as in the last example. See Chapter 9 for further discussion.

/mu + fuuβeeto/ [mufu:βe:to] 'door-post'

/mu + mua/ [mumwa] 'mouth'

/ku + zaal + a/ [kuza:ɭa] 'to give birth'

d) The maximum sequence of C is CC. The first of the two consonants is either identical with the second or a nasal.

Examples

/mu + Cto/ [mut:o] 'pillow'

/ku + CtuNk + a/ [kut:u:ŋka] 'to rise up (of smoke)'

/CteNgeCteNge/ [t:e:ŋget:e:ŋge] 'half-full'

/mu + saNgo/ [musa:ŋgo] 'crime'

e) The final segment in a root is either C or V

Examples

V /ku + li + a/ [kulya:] 'to eat'

/ku + fu + a/ [kufa:] 'to die'

C /ku + sim + a/ [kusima] 'to dig' [1]

/ku + goβ + a/ [kugoβa] 'to chase'

Fuller expansion of these conditions predicts roots of this kind:

CVCV /lu + naku/ [lunaku] 'day'

/lu + muli/ [lumuli] 'reed'

CVCVCV /N + senene/ [nse:nene] 'grasshopper'

/βi + sasilo/ [βisasiɭo] 'rubbish'

CVVCV /mu + naana/ [muna:na] 'eight'

/mu + saala/ [musa:ɭa] 'wages'

1 Only verbal roots can end in C. This seems to be a general rule in Bantu.

CVCCV /ma + guNBa/ [magu:mba] 'bones'

/βu + gaCga/ [βugag:a] 'wealth'

CVV /mu + mna/ [mumwa] 'mouth'

/lu + nue/ [lunwe] 'index finger'

VCCV /li + aNda/ [lya:nda] 'charcoal'

/li + eNvu/ [lye:ŋvu] 'banana'

CVCVVCV /mu + sumaali/ [musuma:li] 'nail'

/Ki + palaata/ [ciwala:ta] 'bald head'

CVC /ku + lim+ a/ [kulima] 'to cultivate'

/ku + kol + a/ [kukola] 'to work'

CVVC /ku + saaβ + a/ [kusa:βa] 'to smear'

/ku + siig + a/ [kusi:ga] 'to smear, contaminate'

CVCVVC /ku + talaag + a/ [kutala:ga] 'to beseige'

CVCVCC /ku + talaCg + a/ [kutalag:a] 'to rust'

CVCCVCVC /ku + siNDogom + a/ [kusi:ndogoma] 'to wail'

CVCCVCC /ku + siNziCg + a/ [kusi:nzig:a] 'to travel sadly, drearily'

(ii) Positive Conditions on grammatical formatives

$$+ \left\{ \begin{matrix} (V\ (C)\ )(V)\ V\ (\ (C)\ C) \\ C \end{matrix} \right\} +$$

This condition states that

a) A grammatical formative may minimally consist of V or C

Examples

V /e + kaNpala/ [e ka:mpala] 'in Kampala' (class 23, prefix)

/o + goβ + a/ [ogoβa] 'you chase' (/o/ is the 2nd person, singular, agentive pronoun formative)

C /N + te/ [nte] 'cow' (N/ is the class 9, singular formative)

/N + goβ + a/ [ŋgoβa] 'I chase' (/N/ is the 1st person, singular, agentive pronoun formative)

b) Possible segment sequences in a grammatical formative are V, C, VC, CV, CCV, CV, VCCV, CVV,

Examples

V /a + goβ + a/ [agoβa] 'he chases' (word initial /a/ is the 3rd person, singular, class I, agentive pronoun formative)[1]

C /N + te/ [nte] 'cow' (/N/ is the class 9, singular formative)

/C + tabi/ [t:aβi] 'branch' (/C/ is a class 5 singular formative)

VC /a + goβ + Vl + a/ [agoβela] 'he chases for/towards' (/Vl/ is the prepositional verb suffix formative)

/a + goβ + VS + a/ [agoβesa] 'he causes to chase' (/VS/ is the causative verb suffix formative)

CCV /tu + a+ NDi + goβ + ie/ [twa:ndigoβye] 'we would have chased' (/NDi/ is the conditional formative)

/Nga/ [ŋga] 'when, while' (/Nga/ is an adverbial formative)

CV /tu + goβ + a/ [tuŋoβa] 'we chase' (/tu/ is the 1st person, plural, agentive formative).

/mu + Ntu/ [mu:ntu] 'person' (/mu/ is the noun class I, singular formative)

CVV /tu + naa + goβ + a/ [tuna:goβa] 'we shall chase' (/naa/ is the near future tense formative)

/tu + Kia + goβ + a/ [tuca:goβa] 'we are still chasing' (/Kia/ is the emphatic progressive aspect formative)

VCCV /a + goβ + VCDe/ [agoβed:e] 'he has chased for' (/CDe/ is the perfective formative for the prepositional form of the verb).

c) The maximum sequence of V is VV

/tu + naa + goβ + a/ [tuna:goβa] 'we shall chase' (/naa/ is the near future tense formative)

1 In the nature of things only humans (class 1/2) can be 1st or 2nd person; it is only in the 3rd person that class distinctions are relevant in the pronominal paradigm.

d) The maximum sequence of C is CC

/a + li + CDe/ [aʌlid:e] 'he has eaten' (/CDe/ is the perfective for verbs whose root consists of /CV/).

/tu + a + NDi + goβ + ie/ [twa:ndigoβye] 'we would have chased' (/NDi/ is the conditional formative)

e) A grammatical formative may begin with V, VC, CV,

V /a + goβ + a/ [agoβa] 'he chases' (/a/ is the 3rd person, singular, agentive pronoun)

/o + goβ + a/ [ogoβa] 'you chase' (/o/ is the 2nd person, singular, agentive pronoun)

VC /a + goβ + Vs + a/ [agoβesa] 'he causes to chase' (/Vs/ is the causative suffix formative)

/a + goβ + Vl + a/ [agoβeɾa] 'he chases for' (/Vl/ is an applied/prepositional formative).

/tu+ naa+ laβta/ [tuna:laβa] 'we shall see'

6.2 Phonological grammars

We have expressed morphophonemic redundancies using Stanley's positive conditions. An alternative device which has been proposed in the literature for this purpose is the phonological grammar.

In his review of Chomsky (1957) Lees (1957) stated that the Syntactic Structures model was unsatisfactory because it had no way of distinguishing between admissible and inadmissible non-occuring phonological sequences. He proposed the incorporation into the grammar of a subsystem of rules which would generate all and only the permissible phonological sequences in a given language. Lees's proposal has been taken up by the leading generative phonologists (cf. Halle:1959, Stanley 1967). They have developed the concept of redundancy (4.1, 4.2.4) to account for accidental gaps in the lexicon and to define the notion 'possible morph in language '.

A number of scholars have argued for the use of phonological

grammars instead of the standard theory redundancy rules to express the notion 'possible morph' (Cf. Householder, 1959, 1965, 1971; Contreras and Saporta, 1962; Cheng, 1966; Fudge, 1969; Sampson 1970). These scholars envisage a phonological grammar i.e. a system of phonological rules, analogous to the base rules of the syntactic component, which enumerate all and only the well-formed phonological representations of a language. The enumeration of well-formed phonological sequences has, as a rule, been seen in terms of the syllable (Cheng, op.cit.; Fudge op.cit.). Fudge regards the syllable as a phonological prime. He introduces a device which he calls a syllable generator to enumerate all and only the well-formed syllables of a given language[1].

There is a very strong temptation to write 'a purely phonological grammar to generate purely phonological words' (Householder 1971:133). However, the writing of purely phonological grammars appears to us unnecessary. The analogy between base rule in syntax and phonology appears to me a false one. Base rules in syntax are truly generative. They enumerate an infinite number of well-formed sentences in order to account for the creative aspect of speakers' competence. For all practical purposes there is only very restricted creativity in the competent speakers use of his knowledge of the phonology of his language. This being the case, a device analogous to the base rules of the syntax is excessively powerful when all that is needed is to enumerate the relatively short list of well-formed syllables of a language. When Lees (1957) adumbrated the idea of a phonological

1 Sampson (1970) uses his phonological bases for the same purpose. Base rules generate well-formed syllables and a set of conversion rules map them onto phonetic representations.

grammar there was no device in generative phonology for distinguishing between permissible and impermissible non-occuring sequences. Since then Halle and Chomsky have developed a system of redundancy rules which perform this function (Cf. Halle, 1959; Chomsky and Halle 1968; and also Stanley 1967). When these weak but descriptively adequate devices for expressing phonological well-formedness are available, there seems to be no justification for introducing phonological base rules analogous to syntactic base rules into the model.

Proponents of phonological grammars, of course, might say that phonological base rules need not be recursive as there is no creativity in the adult speakers use of the phonology of his language. The question that could be asked in that case is: if the rules of the phonological base are not going to be recursive, is it useful to consider them equivalent to the rules of the syntactic base? Our answer to that question would be in the negative. That is one reason why we have used Stanley's positive conditions to express morpho-phonemic redundancy and Chomsky and Halle's redundancy rules to express surface phonetic redundancy.

A further reason for preferring PC's to phonological grammars is that it is difficult to see how the latter could be incorporated into generative phonology without causing too many problems. It is not easy to see how a phonological grammar would be related to the rest of the model (Cf. Matthews:1972a)

6.3 The autonomy of surface redundancy rules

Recall that in (4.3.3) a distinction was drawn between morpho-phonemic and surface redundancy rules following Shibatani (1973) and contrary to the standard view. In this section we shall substantiate the claims for an autonomous surface phonotactics independent of

morphophonemic sequence constraints.

Admittedly, some constraints apply to both morphophonemic and surface strings e.g. in Luganda both in the underlying and surface representations an oral consonant cannot be followed by a nasal consonant in a consonant sequence; therefore sequences like */bm/, */tn/, */kŋ/ are inadmissible in the underlying representation, and sequences like *[bm], *[tn] and *[kŋ] are inadmissible in the surface representation.

But there are instances where different sequence constraints hold at the two levels and different rules are required to characterise them. One obvious example of the discrepancy between morphophonemic and surface phonetic segment sequence constraints involves vowels: whereas in the underlying representation several nonconsonants can be juxtaposed, in the surface representation syllabic nonconsonants cannot be juxtaposed within a phonological phrase. Positive conditions allow a maximum of two nonconsonants to abut in individual roots and grammatical formatives but when several roots and formatives are concatenated three nonconsonants may abut:

Examples

(1) /V + mu + tii ## V + gu + o ## / 'that tree'

(2) /V + ku + li + a ## V + ma + eNvu/ 'to eat bananas'

(3) /V + ku + ti + a ## V + ku + a ## o + li/ 'that fellow's funk'

(4) /V + lu + a ## V + N + soNga ## V + zi + o/ 'for those reasons'

(5) /V + N + βua ## V + ji + a ## V + ji + o/ 'that fellow's dog'

Surface phonotactic constraints prohibit the juxtaposition of syllabic nonconsonants within a phonological phrase. Several different rules apply to alleviate a violation of this constraint (11.4.3.1). The items in the examples above are consequently realised as:

(1) [omutyo:gwo]

(2) [okuʲya:me:ŋvu]

(3) [okutyo:kwo:ʲi]

(4) [olwe:nso:ŋge:zo]

(5) [e:mbwe:yo:yo]

For an example of a clash between morphophonemic and surface phonetic sequence constraints involving consonants see (11.4.3.2).

7 A DIACHRONIC INTERLUDE

7.1 Background

In this chapter we shall sketch the development of Luganda from the parent Bantu language. This sketch of the diachronic development of the language is intended to throw some light on synchronic morphophonological processes which are a result of the morphologization of formerly automatic phonological alternation. The picture of historical changes presented here is a very simplified one; controversial issues are not explored.

Let us begin by noting that it was only in the last century that Bantu languages were first written down systematically (Kiswahili, records of which span several centuries, is an exception)[1]. Therefore doing diachronic Bantu linguistics is really groping in the dark. True, the earliest records of Bantu, written in the Arabic script go back to the tenth century, but they contain only a few words. There are a few records dating from the early sixteenth century Portugese manuscripts but they are grossly inaccurate. Italian and English mid-sixteenth century sources contain a few words but they are too sketchy to be useful. For all practical purposes, there are no records dating before 1800 against which reconstructions can be tested.

Fortunately, because of the great number of patent similarities between Bantu languages the situation is not desperate; reconstructions of the parent language have been made and many of them have not been controversial.

1 Cf. Doke (1960, and the works cited there).

7.2 Reconstructions of the parent language

There are two schools of thought in Bantu diachronic linguistics: the philological approach and the empirical (practical) method. The philologists (Meinhof, 1932; Bourquin, 1955; Homburger, 1914) have employed the standard tools of internal reconstruction and the comparative method. Meinhof called his reconstructed parent language Ur-Bantu (UB). Guthrie, on the other hand, uses what he calls the empirical method. His reconstructions were originally meant to be synchronic in character. He calls his reconstructed language common Bantu (CB). The reconstructions of common Bantu (called starred forms) were meant to be simply expressions of regular correspondences devoid of any diachronic implications (Tucker 1962:126). Guthrie insisted on the synchronic nature of his reconstructions because, in default of historical records, one is working in a field of prehistory where there is no hard evidence on which firm conclusions can be based (Guthrie: 1967:15). Others very reasonably tried to impose a historical interpretation on Guthrie's reconstructions. Gleason (1961:307) remarks:

> Guthrie can only thinly veil the fact that the techniques of comparison used are a selection from those of traditional, historically oriented comparative linguistics.

Guthrie himself eventually conceded that his so-called synchronic statements had possible diachronic implications (Guthrie 1967:23). In view of this fact philologists' and empiricists' reconstructions will be regarded as having the same status and we shall draw on them freely in the following pages.

In addition to Meinhof's Ur-Bantu and Guthrie's common Bantu there is a third type of reconstruction, namely Greenberg's (1948)

Proto-Bantu (PB). In theory Proto-Bantu is supposed to involve a phonemicisation and "notational normalizations" of Meinhof's reconstructions. But in practice it would be misleading to regard PB as a mere phonemicization of UB for in several cases substantive changes are made. Specifically, one might wonder whether Greenberg is right to phonemicise UB $\underline{K}$ as /S/ and $\underline{\gamma}$ as /Z/ since the phonetic differences between Meinhof's and Greenberg's sounds is considerable (Köhler-Meyer: 1971). However, for the most part Greenberg's phonemicisation is satisfactory and it will be used here. Where it appears to us inadequate an alternative phonemicisation will be used. Thus Meinhof's $\underline{t}$ and $\underline{k}$ which Greenberg phonemicizes as /s/ will be symbolised by /C/ following Guthrie (1967, 1971); Meinhof's $\underline{\gamma}$ which is rendered as /z/ by Greenberg will be symbolised by /ʃ/ following Coupez (1954). Furthermore, evidence will be presented for phonemicising some of Meinhof's $\underline{\gamma}$ as /j/ i.e. Guthrie (1967, 1971)'s /y/. As for voiced stops alternating with continuants, with the stops occuring after nasals and the continuants elsewhere, they could equally well be phonemicised using the continuant symbols /β,l,ɣ/ (Meinhof:1932) or the stop symbols /b,d,g/ (Greenberg:1948). From the point of view of the phonological system it is a matter of no great importance which set of symbols is chosen.

As for the vowels, in principle we accept Greenberg's phonemicisation of UB. However, in order to avoid confusion which would arise later in the synchronic description instead of Greenberg's graphs we shall employ the more commonly used graphs with a cedilla under extra-high vowels. See table 7.1 overleaf.

Table 7.1 Reconstructions of the parent Bantu language vowel system

Meinhof (UB)	Greenberg (PB)	Guthrie (CB)[1]
î	i	i ɪ
i	e	i
e	ɛ	e
a	a	a
o	ɔ	o
u	o	u
û	u	u ʊ

Table 7.2 Reconstructions of the parent Bantu language consonant system

Meinhof (UB)	Greenberg (PB)	Symbols used here
p	p	p
v	b	b
m	m	m
t	t	t
l	d	d
n	n	n
t		
l		
k	s	c
k	k	k
ɣ	g	g
ɣ	z	ɟ
ń		

Note Meinhof's palatalised t and l as well as his velar nasal n could be phonetically reconstructed but the evidence suggests that they were not phonemic.

1 This symbolisation is used by many leading Bantuists today

Because Meinhof's reconstructions are phonetic rather than phonemic he also reconstructs semi-vowels together with consonants and vowels. There should be no difficulty in phonemicizing his semi-vowels as alternants of the corresponding vowels as table 7.3 shows:

Table 7.3 Reconstructions of the Parent Bantu semi-vowel system

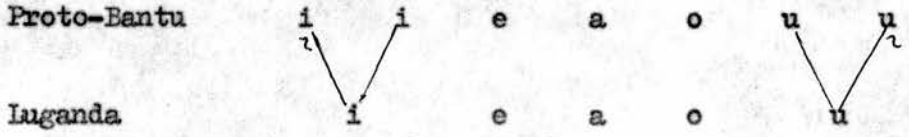
Meinhof (UB)	Greenberg	Symbols used here
w	o	u
ŵ	u	u̯
y	e	i
ŷ	i	i̯

7.3 Sound change

For the most part the parent Bantu phonological system has been preserved in Luganda (Cf. Meeussen, 1955; Tucker, 1962; Guthrie, 1971). However, there took place a few major changes in course of the transition from Proto-Bantu to modern Luganda.

7.3.1 Vowel mergers

Proto-Bantu had seven vowels, of these only five survive in Luganda[1]. The two extra-high vowels merged with the high vowels next below them:



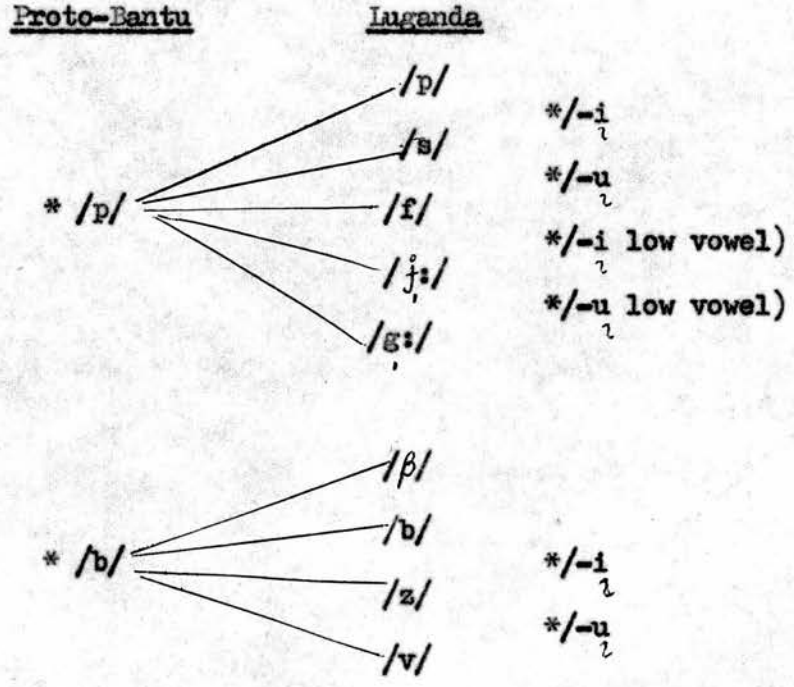
1 In a very abstract analysis of this language a seven vowel system could still be argued for; see Chapter 9 (passim)

A three height distinction gave way to a two height distinction. This could be looked on as simplification - one phonological feature fewer would be required to characterise a five vowel system.

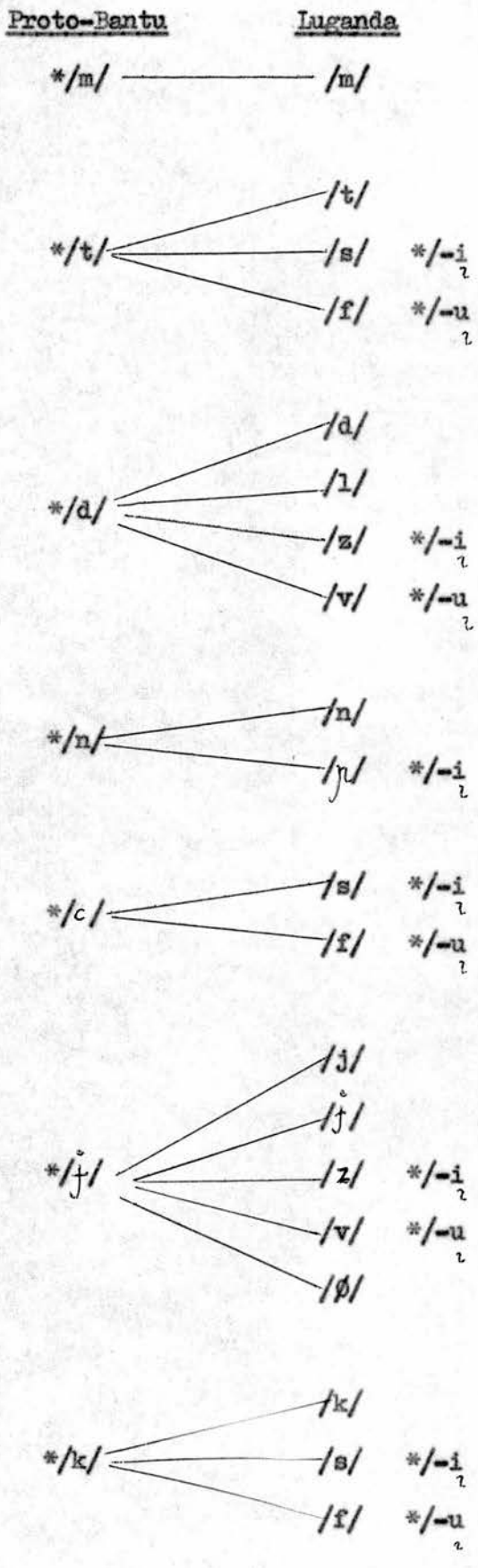
7.3.2 Lenition

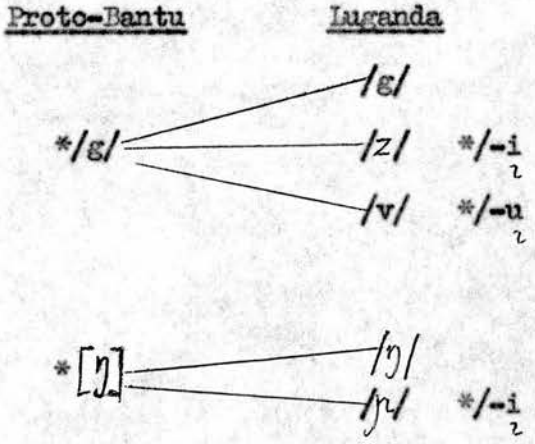
7.3.2.1 Spirantization

As it so often happens in language change, simplification in one subsystem was offset by complications it caused in another subsystem. Vowel merger sparked off splits in the consonant system. Indeed most of the complications in Bantu phonology are a result of the merger of /i̯/ and /u̯/ with /i/ and /u/. Except where the extra high vowels /i̯/ and /u̯/ are involved the Proto-Bantu consonant system has been retained in Luganda with virtually no modification. The summary of the correspondences below is based on Meeussen (1955), Guthrie (1971) and Homburger (1914).



1 For the purposes of this study the differences between PB, CB and UB explained in (7.2) are not important. We shall refer to the parent language as Proto-Bantu.


Proto-Bantu
Luganda
*/m/
/m/
*/t/
/t/
/s/
/f/
*/-i/
*/-u/
*/d/
/d/
/l/
/z/
/v/
*/-i/
*/-u/
*/n/
/n/
/ɲ/
*/-i/
*/c/
/s/
/f/
*/-i/
*/-u/
*/ɟ/
/ɟ/
/ʄ/
/z/
/v/
/ø/
*/-i/
*/-u/
*/k/
/k/
/s/
/f/
*/-i/
*/-u/



From these sound correspondences it is clear that were it not for the high vowels /i z/ and /u z/ the Proto-Bantu consonant system might have been preserved almost intact in Luganda. Almost all the major changes were triggered off by the merger of */i z/ and */u z/ with */i/ and */u/:

(1) $\begin{Bmatrix} p \\ t \\ c \\ k \end{Bmatrix} \rightarrow \begin{Bmatrix} [s] \\ \langle [f] \rangle \end{Bmatrix} / - \begin{Bmatrix} [i_z] \\ \langle [u_z] \rangle \end{Bmatrix}$

(2) $\begin{Bmatrix} b \\ d \\ \acute{j} \\ g \end{Bmatrix} \rightarrow \begin{Bmatrix} [z] \\ \langle [v] \rangle \end{Bmatrix} / - \begin{Bmatrix} [i_z] \\ \langle [u_z] \rangle \end{Bmatrix}$

So long as a seven vowel system was maintained the spirantization processes in (1) and (2) above were phonologically conditioned and predictable. The fricatives that occured before the extra-high vowels were allophones of stop phonemes. With the merger of the

extra-high vowels with */i/ and */u/ the conditioning environment disappeared and as a result it was no longer possible to predict the occurence of spirants. Henceforth the feature fricative which hitherto had been redundant was upgraded and became distinctive[1].

The two assimilation processes stated in rules (1) and (2) on the previous page are very similar both formally and functionally. We shall therefore collapse them as (3):

(3) $$\begin{bmatrix} +\text{cons} \\ +\text{obstr.} \\ +\text{stop} \\ \alpha\text{voice} \end{bmatrix} \rightarrow \begin{bmatrix} -\text{stop} \\ \alpha\text{voice} \\ \beta\text{grave} \end{bmatrix} / __ \begin{bmatrix} -\text{cons} \\ +\text{high} \\ -\text{low} \\ \beta\text{grave} \end{bmatrix}^{2}$$

Functionally, the assibilation induced by /i̯/ and the labialization induced by /u̯/ are complementary: they both contribute to the bringing about of more forward articulations. Both spirantization processes had the effect of shifting the articulatory setting of Luganda towards the front of the mouth (Cf. Honikman:1964).

Spirantization has been extensively discussed and exemplified in the literature (Cf. especially Meeussen: 1955) we shall therefore give only a few samples:

	Proto-Bantu	Luganda
(i)	Assibilation	
	*/-gi̯ge/	/-zige/ [-zige] 'locust'
	*/-ki̯ge/	/-sige/ [-sige] 'eyebrow'
(ii)	Labialisation	
	*/-gu̯bu/	/-vuβu/ [-vuβu] 'hippo'
	*/-ku̯du/	/-fudu/ [-fudu] 'tortoise'

1 These are familiar developments in language change (cf. Hoeningswald: 1960)

2 We are characterising /i̯/ as $\begin{bmatrix} -\text{cons} \\ +\text{high} \\ -\text{low} \\ -\text{grave} \end{bmatrix}$ and /u̯/ as $\begin{bmatrix} -\text{cons} \\ +\text{high} \\ -\text{low} \\ +\text{grave} \end{bmatrix}$

Related to spirantization is the palatalisation induced by /i/ in a preceding nasal. This process has received less attention than spirantization in the literature because it was rather sporadic.

Examples

Proto-Bantu	Luganda
*/-mida/ (Guthrie:1970: 13)	/-ɲila/ [-ɲiɾa] 'nasal mucus'
*/-juni/ (Meinhof:1932: 196, -ɣunî)	/-joɲi/ [-joɲi] 'bird'

This palatalisation can be captured by rule (4) which is a sequential constraint:

(4) If $\begin{bmatrix} + \text{cons} \\ + \text{nasal} \end{bmatrix}$ $\begin{bmatrix} - \text{cons} \\ + \text{high} \\ - \text{low} \\ - \text{grave} \end{bmatrix}$

↓

Then $\begin{bmatrix} - \text{grave} \\ - \text{anterior} \end{bmatrix}$

7.3.2.2 Obstruent weakening

The sound shifts discussed in the last section involved processes whereby obstruents, which are optimal consonants, were changed into spirants. Spirants are more vowel-like than obstruents[1].

Lenition was a general process; it was not limited to spirantization. The other lenition process was what shall be referred to here simply as weakening. Voiced stops alternated with continuants, with continuants occuring everywhere except after nasals, and stops occuring after nasals. In the voiceless series only */p/ weakened. It was realised as [y] before [i] and as [w] before any other vowels[2].

The point to note here is that whereas after the merger of */i/

1 We shall disregard the palatalisation of nasals for the moment.

2 For detailed discussion of weakening see (11-1), (13.2) and appendix I.

with */i/, and */u̯/ with */u/ the necessary environment for the automatic alternation of stops with fricatives was lost and splits giving phonemic status to /s,z/ and /f,v/ followed, no phonemic restructuring took place in the case of weakening because the environments in which stops alternate with continuants has been preserved. It is still possible to state that stops occur after nasals, and continuants elsewhere (see 11.1)

7.3.3 Strengthening

The lenition process of spirantization was induced in Proto-Bantu by */i̯/ or */u̯/ following an obstruent. At the other end, the presence of */i̯/ before a consonant induced strengthening. Any PB consonant preceded by */i̯/ has a strong reflex in Luganda.

Examples[1]

Proto-Bantu	Luganda
*/-ɟi̯b-/	/-CB-/ [-b:-] 'to steal'
*/-ji̯m-/	/-Cm-/ [-m:-] 'to refuse, grudge'
*/-ji̯t-/	/-Ct-/ [-t:-] 'to kill'
*/-ji̯duk-/	/-CDuk-/ [-d:uk-] 'to run'
*/-ɟi̯ɟ-/	/-Cɟ-/ [-ɟ:-] 'to come'
*/-ɟi̯no/	/-Cɲo/ [-ɲ:o] 'tooth'
*/-ɟi̯gad-/	/-Cgad-/ [-g:ad-] 'to shut'

In all these examples the source of strong consonants is a Proto-Bantu syllable with /i̯/ as its nucleus preceding a consonant at the beginning of a following syllable. The historical development of strong consonants is recapitulated in the synchronic derivation of strong consonants which allows absolute neutralization (9.2.2.1).

The aim of this chapter has been to paint the background against which the synchronic problems discussed in the next two chapters must be seen.

1 The examples are based on Meeussen (1955).

8 MORPHOPHONOLOGY

8.1 The abstractness of both phonetics and phonology

Chomsky and Halle (1968:293) observe that since electrical recordings became possible phoneticians have been aware that even the most painstaking phonetic transcription by a first rate phonetician is not a faithful record of what is actually uttered by a speaker because transcription involves systematization and abstraction to varying degrees. The phonetician, like any other scientist, is never confronted by the 'raw data'; he always sees the data through the lenses afforded him by his theory. This should be borne in mind in the discussion of the issues raised in the abstractness controversy in phonology (Kiparsky, 1968b; Hyman, 1970; Derwing, 1973) which is the subject of this chapter: no matter how determined a phonologist may be to hug the phonetic ground he will inevitably indulge in some abstraction since phonetics itself is to a certain degree abstract.

Kiparsky (op.cit.) remarks that all three logically possible answers to his rhetorical question 'How abstract is phonology?' have been given by modern linguists. Prague and neo-Bloomfieldian linguists opted for a relatively non-abstract phonology. Whenever they postulated morphophonemic representations they ensured that they were not too far removed from phonetic representations: morphophonemic representations were chosen from the set of forms which actually occured in some environment.

At the other extreme, glossematicians (cf. Hjelmslev:1943) and other linguists influenced by them (cf. Lamb, 1966; Fudge, 1967) have opted for a "completely abstract" phonology in which morphophonemes have "absolutely no properties which are even remotely phonic". (Fudge:1967).

Transformationalists have discussed thoroughly in the literature the shortcomings of each one of these two extreme approaches (Chomsky and Halle, 1965; Postal, 1968) and have favoured a compromise which takes the best from both without the faults of either. Kiparsky (1968b:1-2) puts it this way:

> Like fully abstract morphophonemics, it (generative phonology, FK) recognizes that there is an underlying phonological pattern which is not necessarily identical with the phonetic pattern (....), which fully concrete morphophonemics is forced to deny. On the other hand, it recognizes that this pattern, while abstract, is not arbitrary, but in general related to the phonetic level (....), a relationship which fully abstract morphophonemics, with inexplicable joy, throws overboard. Process morphophonemics is the only form of theory which tries to do justice to the fact that abstract morphophonemic patterning is to a large extent (but not wholly) determined by concrete phonetic form."

In this chapter and the next we shall show, with special reference to Luganda what has already become evident from the general abstractness debate, namely that the generative phonologist trying to steer between the Scylla of concrete morphophonemics and the Charybdis of totally abstract morphophonemics has not always been successful; too often he has veered towards excessive abstractness.

The issues at stake could be formulated as two complementary questions:

(1) where does one draw the line between synchrony and diachrony?

(2) where does one draw the line between morphology and phonology?

We are no nearer the answers to these old questions than our

predecesors ever were.

8.2 The cline between synchrony and diachrony

For Saussure deciding where to draw the line between synchrony and diachrony was a straightforward matter: "the opposition between the two viewpoints, the synchronic and the diachronic, is absolute and allows no compromise." (1916:83). He could therefore feel justified in stating categorically that:

> Everything that relates to the static side of our science is synchronic; everything that has to do with evolution is diachronic.

Saussure's belief that there is a discrete boundary between synchrony and diachrony is not shared by generative linguists. The method of postulating abstract underlying representations which are mapped on phonetic representations by phonological rules is very similar to the internal reconstruction technique used in historical linguistics. It is therefore hardly surprising that the underlying representations posited by generative linguists in synchronic studies often recapitulate diachronic developments. Although generative phonologists do not claim that synchronic derivations can only be valid if they recapitulate history (cf. Chomsky and Halle: 1968:251), they would agree that the resemblances are not fortuitous. But even so, in principle at any rate (though the practice of some linguists suggests the contrary), underlying representations and phonological rules are justified on the basis of synchronic morphophonemic alternation alone[1]. The crucial issue here seems to be deciding what

1 Some linguists e.g. the Stratificationalists (cf. Lamb 1966) and Sampson (1970) deny the synchronic validity of underlying representations and P-rules in phonology altogether. Matthews (1972a) contains a reply to their criticisms.

counts as valid synchronic evidence.

This point was brought to the fore by Kiparsky (1968b). Kiparsky pointed out that generative phonologists usually incorporate in their descriptions the principle of "absolute neutralisation" whereby very abstract underlying representations which are never realised in the phonetic representation are posited in the underlying representation (cf. Chomsky and Halle, 1968:233; Hyman, 1970, Lightner, 1965; Vago, 1973; Selkirk and Vergnaud, 1973). It is claimed that these very abstract underlying representations enable the linguist to achieve greater descriptive adequacy than less abstract underlying representations where only conditioned alternation is allowed. Hyman (op.cit.) in his discussion of Nupe phonology, for example, attempts to explain the labialisation of consonants before certain surface [a]'s, the palatalisation of consonants before other [a]'s and the fact that consonants are neither palatalised nor labialised before yet another set of [a]'s by postulating three underlying vowels /a/, /ɛ/ and /ɔ/ which are absolutely neutralised and are realised as [a]. A consonant can then be naturally expected to be palatalised before [a] derived from /ɛ/, labialised before [a] derived from /ɔ/ and unaffected before [a] derived from /a/. He bases his arguments on pattern congruity and naturalness.

The case for absolute neutralisation has been questioned by Kiparsky (op.cit.) and several other linguists after him (Harms, 1973; Derwing, 1973). The objection raised against absolute neutralisation is not that it is not explanatory, for it is, but rather that the explanation it affords is neither synchronic nor purely phonological. It is morphophonological.

In his important paper on morphophonology Martinet (1965:20-1) writes:

> Nous nous trouvons là sur la frontière entre la phonologie et la morphologie, entre le domaine des variations phonologiques qui sont toujours imposées par l'environment phonématique ou prosodique, et qui s'expliquent synchroniquement, hic et nunc, en fonction de cet environment, et celui des variations des signifiants qui ne sont qu'un legs de la tradition et ne se justifient que par référence à des conditions dépassées depuis des siècles ou des millénaires.

Martinet believes that morphophonology could be dispensed with if definitive criteria were found for separating synchronic phonologically conditioned alternation from morphologically conditioned alternation which is a historical relic. Similar assumptions underly the principle of absolute neutralization. Because they do not recognize the validity of morphophonology advocates of this principle extend the range of purely phonological alternation to include morphophonological alternation. The issue which this over-extension of automatic phonological alternation raises concerns the nature of synchronic explanation in a remotely psychologically plausible grammar (Matthews 1972a:208-18).

There are two main sources of difficulty. First, there are no unambiguous criteria for distinguishing between purely phonological/synchronic alternation on the one hand and morphological/diachronic alternation on the other. Secondly, there is no discrete boundary between synchronic/phonological alternation and diachronic/morphological alternation; there are many points along the cline that separates these two extremes. There is no algorithm for deciding which alternations are synchronic and which alternations are diachronic. We shall illustrate the problem with a discussion of the surface and

underlying representation of two consonants in Luganda.

8.2.1 The representation of /p/

Underlying /p/ in Luganda can be realised by a variety of phonetic representations ranging from the patently phonologically conditioned to the morphologically determined.

In the majority of cases the realization of an underlying /p/ is purely phonologically conditioned:

(i) /p/ → [p] / /N/-

Examples

/N + pisi/ [mpisi] 'hyena'

/N + pa + a/ [mpa:] 'I give'

/N + puŋgu/ [mpu:ŋgu] 'eagle'

/N + peta/ [mpeta] 'ring'

(ii) /p/ → [y] / -/i/ if not preceded by a consonant

Examples

/ka + pisi/ [kayisi] 'small hyena'	but /N + pisi/ [mpisi] 'hyena'	
/lu + pii/ [luyi:] 'slap'	but /N + pii/ [mpi:] 'slaps'	
/lu + pina/ [luyina] 'string of banana leaves'	but /N + pina/ [mpina] 'strings of banana leaves'	
/ku + pit + a/ [kuyita] 'to call'	but /N + pit + a/ [mpita] 'I call'	

(iii) /p/ → [w] / - any vowel except /i/ if not preceded by a consonant

Examples

/ku + pa + a/ [kuwa:] 'to give	but /N + pa + a/ [mpa:] 'I give'
/ku + pɔl + a/ [kuwɔla] 'to lend'	but /N + pɔl + a/ [mpɔla] 'I lend'
/ku + pug + a/ [kuwuga] 'to swim'	but /N + pug + a/ [mpuga] 'I swim'

/mu + pala/ [muwala] 'girl but /N + pala/ [mpala] 'tomboy'

The three types of alternations above are all at the phonetic end of the spectrum; they are regular and productive. However, this is not true of all the surface realisations of /p/.

(iv) Consider these examples:

/C + pipa/ [p:ipa] 'barrel' but /ma + pipa/ [mapipa] 'barrels'

/C + peesa/ [p:e:sa] 'button' but /ma + peesa/ [mape:sa] 'buttons'

/C + peela/ [p:e:ɾa] 'guava' but /ma + peela/ [mape:ɾa] 'guavas'

/C + pata/ [p:ata] 'hinge' but /ma + pata/ [mapata] 'hinges'

/C + paapaali/ [p:a:pa:ɻi] 'paw-paw' but /ma + paapaali/ [mapa:pa:ɻi] 'paw-paws'

/ku + coCp + a/ [kucop:a] 'to become destitute'[1]

/ku + leCp + a/ [kuɻep:a] 'to contend, struggle'

/ku + tiCp + a/ [kutip:a] 'to tie tightly'

The realisation of underlying /Cp/ as [p:] can be accounted for by these informal rules

(i) /p/ → [p:] / /C/-

(ii) /C/ → [Ø] / -[p:]

For further discussion of the derivation of strong consonants see (9.2) and (11.3)

Let us consider further examples of invariant /p/ in addition to those given in (iv) above:

/ku + pim + a/ [kupima] 'to measure' /N + pim + a/ [mpima] 'I measure'

1 The /c/ before /o/ is a token of the palatal affricate phoneme /c/ and not a symbol for the archi-segment [+ cons]

/ku + pekuk + a/ [kupekuka] 'to wander about' /N + pekuk + a/ [ᵐpekuka] 'I wander about'

/ku + papal + a/ [kupapaɭa] 'to flutter' /N + papal + a/ [ᵐpapaɭa] 'I flutter'

/ku + paapaal + a/ [kupa:pa:ɭa] 'to fly' /N + paapaal + a/ [ᵐpa:pa:ɭa] 'I (way of flying'

/ku + pul + Vk + a/ [kupuɭuka] 'to escape' /N + pul + Vk + a/ [ᵐpuɭuka] 'I escape'

Furthermore, there are a few /p/'s which are realised as long in all environments; all the examples I have found so far are either loan words or proper nouns:

/C + piKipiKi/ [ᵖ:icipici] 'motor-cycle'[1]

/zi + C + piKipiKi/ [zipᵖ:icipici] 'motor-cycles'

/C + paNBa/ [ᵖ:aᵐba] 'cotton'

/∅ + Cpaapa/ [ᵖ:a:pa] 'Pope'

/βa + Cpaapa/ [βaᵖ:a:pa] 'Popes'

/∅ + CpooKino/ [ᵖ:o:cino] 'title of county chief of Buddu county'

/βa + CpooKino/ [βaᵖ:ocino] 'Chiefs of Buddu county'

The fact that some underlying /p/'s have several surface alternants and others are realised invariantly as [p] causes severe problems. The question which arises is whether Luganda has two underlying /p/'s, one which alternates in the manner described at the beginning of this section and another which is realised everywhere as /p/ (except after /C/ where [ᵖ:] is mandatory). This last one could conceivably be represented in the underlying representation as /ᵖ:/.

1 It is also arguable that the underlying representation of this is /∅ + CpiKipiKi/ and /zi + CpiKipiKi/

However, there would be a strong case against postulating an underlying /p:/. It would be extravagant to introduce a whole set of distinctive features to characterise /p:/ as invariant /p:/ occurs in about half a dozen words only. It would be more economical to mark with a diacritic the words in which it occurs. On the grounds that the invariant /p:/ has a very defective distribution the linguist can deny it morphophonemic status for underlying representations, among other things, are supposed to capture some important generalisation. In an extreme case like this one the decision is easy.

But how general is general? How many irregularities make a regularity? Of course, these questions cannot be answered definitively. That is one reason why morphophonological statements are required. After listing the handful of items containing invariant /p:/ one would still be left with /p/'s some of which weaken intervocalically and initially and others which do not. It would be tempting to postulate two underlying /p/'s which are different in the underlying representation but are absolutely neutralised in the phonetic representation. In a synchronic description this sleight of hand would amount to nothing more than the use of phonological features as diacritics (Kiparsky:1968b).

Postulating two /p/'s in the underlying representation (i) $/p/_1$ which weakens to [y] or [w] medially and initially and (ii) $/p/_2$ which does not weaken anywhere would only differ superficially from stating that there are some lexical items represented by phonological sequences containing a /p/ which is an exception to the weakening rule

1 The realisation of /C + p/ as [p:] is accounted for by the strengthening rule (9.2.2.2) and it therefore poses no problems.

which /p/ is normally subject to. The absolute neutralisation solution is objectionable in a synchronic grammar because it involves false claims. It claims to explain synchronically in purely phonological terms what, it seems to me, cannot be so explained. The reason why some /p/'s undergo alternations from which others are exempt is not that they are phonetically or phonologically different but rather for historical reasons.

The weakening and non-weakening of /p/, we shall tentatively suggest, can be diachronically explained in terms of the proposals made by Wang (1969). Wang suggests that sound change may be implemented in a manner which is phonetically abrupt, but its spread through the lexicon is gradual. Consequently as a change creeps through the lexicon, it may not have the chance to affect all forms which satisfy its structural description until after a very long time - if ever. If one examines a language in the course of its evolution one will notice forms which are eligible, but which for no apparent reason seem to be exceptions to a sound law simply because the change has not yet reached them. Another point that Wang makes is that as a change works its way across the lexicon it may be intercepted in mid-course by a competing change which robs it of its input[1]. Again the result is that some forms which are eligible to undergo a rule are unaffected by it.

In the case of Luganda /p/ it could be argued that words with a non-weakening /p/ form a phonological residue. They have not yet been affected by the sound law which weakened Proto-Bantu */p/ initially

1 The notion of competing changes was not invented by Wang. See for example Vendryes (1902) who already expressed that idea.

and interconsonantally in Luganda. This diachronic explanation is quite plausible and illuminating, I would claim.

If this account is correct, in the underlying representation the distinction between the weakening and non-weakening /p/ should be made with a diacritic in a synchronic description, and the explanation of this should be left to diachronic linguistics for the distinction is synchronically phonologically unmotivated. The trouble with the diacritic use of phonological features involved in the absolute neutralization solution is that it creates the illusion of a synchronic phonological explanation where none is possible (Kiparsky 1968b).

8.2.2 The representation of /j/

The representation of /j/ raises problems similar to those encountered with /p/. Usually the realisation of /j/ is purely phonologically conditioned.

(i) /j/ → [ʄ] / /N/—

/N + jig + a/ [ɲʄiga] 'I learn' but /ku + jig + a/ [kuyiga] 'to learn'

/N + jeej + a/ [ɲʄe:ya] 'I mock' but /ku + jeej + a/ [kuye:ya] 'to mock'

/N + jaβa/ [ɲʄaβa] 'crab' but /ka + jaβa/ [kayaβa] 'small crab'

/N + joga/ [ɲʄoga] 'hyrax' but /ka + joga/ [kayoga] 'small hyrax'

/N + juu/ [ɲʄu:] 'house' but /ka + ju/ [kayu] 'small house'

This kind of alternation between stop and continuants, with stop occuring after nasals and continuants initially and intervocalically is common in Bantu. See (11.1) for further discussion.

(ii) Consider these examples:

/C + jiβa/ [ʄ:iβa] 'dove' but /ma + jiβa/ [mayiβa] 'doves'

/C + jeNgo/ [ɟ:eːŋgo] 'wave' but /ma + jeNgo/ [mayeːŋgo] 'waves'

/C + jaNge/ [ɟ:aŋge] 'maize flower' but /ma + jaNge/ [mayaːŋge] 'maize flowers'

/C + jute/ [ɟ:ute] 'boil' but /ma + jute/ [mayute] 'boils'

The following informal rules can account for the realisation of /j/ as [ɟ:]:

(i) /j/ → [ɟ:] / /C/—

(ii) /C/ → [Ø] / —[ɟ:]

For further discussion of the derivation of strong consonants see (9.2) and (11.3)

(iii) Consider these examples

/N + jiNB + a/ [ɲ:iːmba] 'songs but /lu + jiNBa/ [luyiːmba] 'song'

/N + jeNg + a/ [ɲ:eːŋga] 'I stir up' but /tu + jeNg + a/ [tuyeːŋga] 'we stir up'

/N + jaNB + a/ [ɲ:aːmba] 'I help' but /tu + jaNB + a/ [tuyaːmba] 'we help'

/N + juNB + a/ [ɲ:uːmba] 'house' but /ka + juNBa/ [kayuːmba] 'small house'

When a sequence like / # X N_1j v(v) N_2 X # / occurs it is converted into a surface representation by rules of this kind:

(1) /N_1/ → [ɲ:] / —/j/

(2) /j/ → Ø / [ɲ:]—

This is the Ganda Law operating (cf. 10.2.1)

(iv) We can provisionally state that elsewhere /j/ is realised as [y]:

/jiNB + a/ [yiːmba] 'sing!'	/ku + jiNB + a/ [kuyiːmba] 'to sing'
/jeNg + a/ [yeːŋga] 'stir up!'	/ku + jeNg + a/ [kuyeːŋga] 'to stir up'
/jaNB + a/ [yaːmba] 'help!'	/ku + jaNB + a/ [kuyamba] 'to help'
/juNg + a/ [yuːŋga] 'join!'	/ku + juNg + a/ [kuyuːŋga] 'to join'

In addition to these phonologically regular and synchronically explicable alternations /j/ has other alternations which are morphophonological. These latter can only be explained when the diachronic dimension is also taken into account.

I have in mind the deletion of root initial /j/ after a CV prefix.

Examples

/tu + jagal + a/ [twa:gaɭa] 'we want' but /a + jagal + a/ [ayagaɭa] 'he wants'

/ku + jak + a/ [kwa:ka] 'to blaze' but /e + jak + a/ [eyaka] 'it burns'

/βa + jaNBal + a/ [βa:mbaɭa] 'they wear' but /a + jaNBal + a/ [aya:mbaɭa] 'he wears'

/mu + jal + a/ [mwa:ɭa] 'you spread out' but /a + jal + a/ [ayaɭa] 'he spreads out'

/tu + jol + a/ [two:ɭa] 'we carve' but /0 + jol + a/ [yoɭa] 'you carve'

/mu + jot + a/ [mwo:ta] 'you warm yourselves at the fire' but /a + jot + a/ [ayota] 'he warms himself at the fire'

/βa + jogel + a/ [βo:geɭa] 'they talk' but /a + jogel + a/ [ayogeɭa] 'he talks'

/ku + jonoon + a/ [kwo:no:na] 'to spoil' but /e + jonoon + a/ [eyono:na] 'it spoils'

The deletion of /j/ in this environment is sporadic. If occurs in just a little more than half of the relevant items listed in Snoxall's (1967) dictionary. There are forms like those in the list below which satisfy the structural description of the /j/ deletion rule and yet do not undergo it.

Examples

/ku + jaβ + a/ [kuyaβa] 'to be inert, weak'

/ku + jagaajag + an + a/ [kuyaga:yagana] 'to be ill at ease'

/tu + jagaajag + an + a/ [tuyaga:yagana] 'we are ill at ease'

/ku + jaNB + a/ [kuya:mba] 'to help'

/βa + jaNB + a/ [βaya:mba] 'they help'

/ku + jaj + Vk + a/ [kuyayuka] 'to be frayed'

/zi + jaj + Vk + a/ [ziyayuka] 'they are frayed'

/ku + joNB + a/ [kuyo:mba] 'to quarrel'

/mu + joNB + a/ [muyo:mba] 'you quarrel'

/βa + jool + a/ [βayo:ɻa] 'they collect, pick up in hands'

/tu + jool + a/ [tuyo:ɻa] 'we collect, pick up in hands'

/ku + joNk + a/ [kuyo:ŋka] 'to suck'

/βa + joNk + a/ [βayo:ŋka] 'it (baby) sucks'

So far we have considered the deletion and non-deletion of /j/ root initially when it is preceded by a CV prefix and followed by a nonhigh back vowel /a,o/. Occasionally /j/ is deleted when it is preceded by a CV prefix and followed by a front vowel /i,e/. But this is rare.

Examples

/mu + jiko/ [mwiko] or [muyiko] 'mason's trowel'

/mu + jiniino/ [mwi:ni:no] 'uninvited (adverb)'

/ku + jeβak + a/ [kwe:βaka] 'to sleep'

/ku + jel + a/ [kwe:ʃa] 'to sweep' but /a + jel + a/ [ayeʃa] 'he sweeps'

No deletions of /j/ before /u/ when it is preceded by a CV prefix have been found so far.

It is tempting to account for the deletion and non-deletion of /j/ in terms of absolute neutralization. One might postulate two different underlying /j/'s which are neutralized in the surface representation. The trouble with this suggestion is that it involves the use of phonological features to identify exceptions and in the process creates

the illusion that there are systematic phonological differences between the two /j/'s. It is preferable in my view to use exception features to distinguish the two segments in a synchronic grammar. The task of explaining how those exceptions arose is best left to historical studies.

We shall suggest a tentative explanation for the deletion of /j/ which is analogous to the one we proposed for the realisation of /p/ in (8.2.1). Perhaps there is a sound change still creeping across the lexicon deleting root initial /j/ after a CV prefix. I shall claim that it started off with /j/ in that environment followed by the low, back vowels /o,a/. It seems about half of them have already been affected. Meanwhile the rule has been generalised to front vowels and a few /j/'s are deleted before /i/ or /e/. The residual items which synchronically are exceptions to the deletion rule may in time all be affected by it if no rival change intercepts it (see (8.2.1) and the references cited there). Until /j/ deletion becomes generalised - if it ever does - it should be treated as a morphophonological rather than as a purely phonological rule.

8.3 The cline between phonology and morphology

In the last section we discussed morphophonological problems which arise at the confluence of synchrony and diachrony. In this section we shall briefly introduce the problems which form the subject of the next chapter, namely the morphophonological alternations which occur at the intersection of synchrony and diachrony; phonology and morphology.

In extreme cases a purely synchronic phonological explanation on the one hand and a purely morphological/diachronic explanation on the other is the only one that could be reasonably proposed (8.2). At

the phonological end there is the kind of rule which palatalises velar obstruents before /i/; at the other end there is the kind of alternation found in the suppletive realisation of the verb 'to be' in Luganda which has two roots in the lexical entry /-li/ and /-βa-/ the distribution of which can only be explained diachronically and morphologically.

What we want to do is chart the controversial area between these two extremes - i.e. alternations which historically were probably phonologically automatic but which synchronically are to varying degrees morphologised without their phonological basis becoming totally obscured. This is the domain of morphophonology (cf. Matthews 1972b). In the following chapter we shall show the many shades of morphophonological rules.

9 MORPHOPHONOLOGICAL CONSTRAINTS

9.1 Spirantization

It was pointed out in (7.3.2.1) that diachronically fricatives arose in Luganda as a result of the spirantization of oral consonants before the Proto-Bantu close vowels */i̯/ and */u̯/. Originally spirantization was an automatic phonological process which applied across the board each time the structural description of the rule was satisfied. After the merger of PB */i̯/ with */i/ and */u̯/ with */u/ spirantization ceased being an automatic phonological process. But it did not disappear altogether.

9.1.1 Labialisation

There still exist in Luganda some islands of labialisation (see 0.4.2.1).

Examples

/ku + ku + at + a/ [kukwa:ta] 'to freeze (of water), to turn (of milk)'

/ma + ku + at + u/ [makwa:fu] 'turned (milk)' (class 6)

/βu + ku + at + u/ [βukwa:fu] 'state of being turned' (class 14)

/ku + goND + a/ [kugo:nda] 'to be soft'

/mu + goND + u/ [mugo:ɲ̇vu] 'soft (e.g. of mango)' (class 3)

/βu + goND + u/ [βugo:ɲ̇vu] 'softness' (class 14)

/ku + laβ + Vk + a/ [kulaβuka] 'to be on one's guard'

/mu + laβ + Vk + u/ [mulaβufu] 'alert' (class 1)

/βu + laβ + Vk + u/ [βulaβufu] 'alertness' (class 14)

/ku + jig + a/ [kuyiga] 'to learn'

/mu + jig + u/ [muyivu] 'learned'

/βu + jig + u/ [βuyivu] 'learning'

/ku + koCg + a/ [kukog:a] 'to grow lean'

/mu + koCg + u/ [mukoɣ:u] 'lean' (class 1)

/βu + koCg + u/ [βukoɣ:u] 'leanness' (class 14)

/ku + geCJ + a/ [kugeʄ:a] 'to grow fat'

/mu + geCJ + u/ [mugeɣ:u] 'fat' (class 1)

/βu + geCJ + u/ [βugeɣ:u] 'fatness' (class 14)

The word final /u/ in all these words must be a reflex of PB */u/ since it causes the same mutations as the Proto-Bantu vowel. Note, however, how restricted the range of the labialisation rule has become. Whereas originally it affected all non-nasal consonants now it is limited to lingual ones; labial non-nasal consonants undergo no spirantization[1].

/ku + koop + a/ [kuko:wa] 'to be tired'

/mu + koop + u/ [muko:wu] not *[muko:fu] 'tired (class 1)

/βu + koop + u/ [βuko:wu] not *[βuko:fu] 'tiredness' (class 14)

/ku + e + siNB + a/ [kwe:si:mba] 'to stand upright'

/mu + e + siNB + u/ [mwe:si:mbu] not *[mwe:si:ŋvu] 'upright' (class 1)

/βu + e + siNB + u/ [βwe:si:mbu] not *[βwe:si:ŋvu] 'uprightness' (class 14)

In the transition from Proto-Bantu to Luganda non-nasal labial consonants were not exempt from spirantization before */u/ as these reconstructions taken from Guthrie (1970, Vols.3 and 4) show:

Proto-Bantu	Luganda
* /-puanan-/	/-faanan-/ [-fa:nan-] 'to resemble each other'

1 Though they do not undergo spirantization, the forms ending in /p/ are subject to the rule described in (8.2.1) which weakens /p/ to [y] before /i/ and to [w] before other vowels if not preceded by a consonant.

Proto-Bantu	Luganda
*/-puKud-/	/-fukul-/ [-fukuɭ-] 'to dig up, fling up earth'
*/-bu/	/-vu/ [-vu] 'ashes'
*/-bui/	/-vii/ [-vi:] 'white hair' [1]
*/-bun-/	/-vun-/ [-vun-] 'to break, snap'

As the direction of the sound change has been towards squeezing out labialisation, nasal consonants which from the start were beyond its reach are still exempt:

/ku + βugum + a/ [kuβuguma] 'to be warm'

/C + βugum + u/ [b:ugumu] 'heat'

/ku + lam + a/ [kuɭama] 'to be in good health, survive'

/mu + lam + u/ [muɭamu] 'alive' (class 1)

/βu + lam + u/ [βuɭamu] 'life, health' (class 14)

Furthermore, it is important to note that even where the structural index of the labialisation rule is present sometimes it fails to apply: some lingual non-nasal consonants are not turned into labial fricatives:

/ku + kal + a/ [kukaɭa] 'to be dry, empty'

/Ki + kal + u/ [cikaɭu] not *[cikavu] 'dry' (class 7)

/βu + kal + u/ [βukaɭu] not *[βukavu] 'dryness' (class 14)

1 This morph has a long final vowel in the surface representation in modern Luganda. This suggests that it has two underlying vowels which are adjacent to each other (see 11.4.3.1). The problem is how to decide what the first of these two vowels is in a synchronic derivation: is it /u/ or /i/?

/ku + pol + a/ [kuwoɭa] 'to grow cold'

/ma + pol + u/ [mawoɭu] not *[mawovu] 'cold food' (class 6)

/βu + pol + u/ [βuwoɭu] not *[βuwovu] 'coldness' (class 14)

/ku + vuND + a/ [kuvu:nda]

/Ki + vuND + u/ [civu:ndu] not *[civu:ɲvu] 'rotten' (class 7)

/βu + vuND + u/ [βuvu:ndu] not *[βuvu:ɲvu] 'rottenness' (class 14)

There is a clear pattern here. The non-application of the spirantization rule can be predicted on the basis of the value of a non-nasal consonant for the feature 'anterior' on a phonetic scale: it is mandatory to apply the spirantization rule when the labialising /u/ follows a velar or palatal consonant; the rule may or may not be applied to a coronal consonant depending on the root in which it occurs, and it never applies to labial consonants anywhere.

As the reader might recall, we stated in (0.4.2.2) that spirantization in Luganda is now a morphophonological process. It only applies where the /u/ in question is an exponent of certain grammatical morphemes. Not every /u/ calls forth spirantization: only an /u/ which represents abstract/stative nominalizing/adjectivising morpheme causes spirantization. Otherwise /u/ does not cause spirantization.

Examples

/mu + kuNgu/ [muku:ŋgu] 'high ranking chief'

/Ki + pagu/ [ciwagu] 'small bunch of bananas'

/lu + kuku/ [lukuku] 'skin disease'

/Ki + peCcu/ [cipec:u] 'prodigy' [1]

1 The first /C/ in /Ki + peCcu/ is the symbol for the archi-segment [+ cons].

/N + fudu/ [ŋfudu] 'tortoise'

/mu + kutu/ [mukutu] 'canal'

/βu + tulututu/ [βutuɻututːu] 'pimples'

/N + suuluulu/ [nsuːɻuːɻu] 'pickaxe'

Having established the fact that spirantization is morpho-phonologically conditioned the question which we may ask next is: why has spirantization survived in some forms after it dropped out as a major automatic process? A possible answer to this question is that /u/ continues to cause mutations in a small section of the phonology because of the strength of paradigm pressure.

It is a well established fact that paradigm coherence is sometimes a very strong influence on phonological change. Kiparsky (1972) has shown that there is a "functional factor in phonology and morphology, which we may call paradigm coherence. This says that allomorphy within a paradigm tends to be minimized," sometimes even "at the cost of complicating the system of rules" (op.cit., 208-9, emphasis his). In purely formal terms spirantization adds to the complexity of the grammar and one might expect it to be lost as a result of simplification in the course of linguistic evolution. Yet it has survived. Its survival is probably due to its functional utility: it serves to impose some kind of regularity in the formation of stative/abstract nouns/adjectives which are derived from verbs. Spirantization has been lost where it was automatic and non-functional; it has been preserved where it was/is functional.

The kind of alternation found in the spirantization process will be discussed using a morphophonological constraint (4.3.1) for it is a process which has a basis in phonetics but is only triggered off by

some morphosyntactic feature.

We shall postpone discussion of the formalisation of this morphophonological constraint until (9.1.2)

9.1.2 Assibilation and palatalization

In (9.1.1) we have seen how a Proto-Bantu labialisation process came close to being lost and has only survived in Luganda in morphological environments where it is functional. The related process of assibilation had a similar fate though it was allowed slightly more leeway and has survived in several paradigms. The theoretical points made about /u/ in the last section equally apply to /i/.

The reader might recall that in the transition from Proto-Bantu to modern Luganda close /i/ caused spirantization: non-nasal consonants followed by /i/ turned into the sibilants /s/ and /z/ depending on whether they were voiceless or voiced (see 7.3.2.1). Here are some more examples taken from Guthrie (1970 vol.3 and vol.4):

Proto-Bantu	Luganda
*/-pigo/	/-sigo/ [-sigo] 'kidney, seed'
*/-bin-/	/-zin-/ [-zin-] 'to sing, dance'
*/-tim-/	/-sim-/ [-sim-] 'to dig'
*/-dimu/	/-zimu/ [-zimu] 'spirit, ghost'
*/-kiNgo/	/-siNgo/ [-si:ŋgo] 'neck'
*/-gige/	/-zige/ [-zige] 'locust'

The important point to note is that diachronically these alternations were purely phonological but synchronically they are morphophonological: while their phonological basis has remained unchanged, they have come to be severely restricted. Assibilation

occurs only where the /i/ in question is an exponent of one of a few morphemes. It has persisted, just like labialisation (9.1.1) in environments where it serves some morphological purpose:

(i) Assibilation occurs in the formation of the perfect aspect in the simple, unextended stem of the verb (0.4.2.2).[1]

Examples

infinitive		perfect aspect	
/ku + leet + a/	[kuʃe:ta] 'to bring'	/βa + ∅ + leet + ite/	[βaʃe:se] 'they have brought'
/ku + kol + a/	[kukoʃa] 'to work'	/βa + ∅ + kol + i + e/	[βakoze] 'they have worked'
/ku + loND + a/	[kuʃo:nda] 'to choose'	/βa + ∅ + loND + i + e/	[βaʃo:nze] 'they have chosen'
/ku + lek + a/	[kuʃeka] 'to leave'	/βa + ∅ + lek + i + e/	[βalese] 'they have left'
/ku + jig + a/	[kuyiga] 'to learn'	/βa + ∅ + jig + i + e/	[βayize] 'they have learned'
/ku + jiCg + a/	[kuyig:a] 'to hunt'	/βa + ∅ + jiCg + i + e/	[βayiz:e] 'they have hunted'

Note that even when a formative representing a morpheme which triggers off assibilation is available the rule does not apply if the consonant before the /i/ formative is labial (also see 9.1.1).

Examples[2]

Infinitive		perfect aspect	
/ku + loop + a/	[kuʃo:pa] 'to denounce'	/βa + ∅ + loop + i+ e/	[βaʃo:pye] 'they have denounced'
/ku + laβ + a/	[kuʃaβa] 'to see'	/βa + ∅ + laβ + i + e/	[βaʃaβye] 'they have seen'

1 The analysis in (0.4.2.2) was very gross; /i/, the perfect aspect formative was not separated from the non-basic verb suffix /e/.

2 It is on the basis of the realisation of the formative representing the perfect aspect morpheme after labial, non-nasal consonants that we have postulated /i/ as the underlying representation of this formative: /i/→ [y] before a low vowel (see 11.4.3).

There are some exceptions to the rules outlined so far for the formation of the perfect. A few mono-syllabic roots form their perfect as follows:[1]

Infinitive	perfect aspect
/ku + fu + a/ [kufa:] 'to die'	/βa + ∅ + fu + CD + e/ [βafud:e] 'they have died'
/ku + vu + a/ [kuva] 'to come from'	/βa + ∅ + vu + CV + e/ [βavud:e] 'they have come from'
/ku + gu + a/ [kugwa] 'to fall'	/βa + ∅ + gu + CD + e/ 'they have fallen' [βagud:e]

(ii) The causative morpheme also triggers off assibilation:[2]

infinitive	causative
/ku + paat + a/ [kuwa:ta] 'to peel'	/ku + paat + VS + a/ [kuwa:sisa] 'to cause to peel'
/ku + kol + a/ [kukoda] 'to work'	/ku + kol + VS + a/ [kukozesa] 'to cause to work'
/ku + loND + a/ [kulo:nda] 'to choose'	/ku + loND + Vs + a/ [kulo:nzesa] 'to cause to choose'
/ku + lek + a/ [kuleka] 'to leave'	/ku + lek + VS + a/ [kulesesa] 'to cause to leave'
/ku + jig + a/ [kuyiga] 'to learn'	/ku + jig + Vs + a/ [kuyizisa] 'to cause to learn'

The causative formative is involved in vowel harmony. We shall come back to it in (9.3.2)

(iii) The nominalising suffix which derives agentive nouns from verbs is another morpheme which triggers off assibilation:

1 We shall not discuss the derivations involved here as they are not crucial to the argument in this section.

2 For a fuller discussion of the formation of the causative see Ashton et al.(1954:340 ff)

infinitive	agentive nominalization
/ku + leet + a/ [kuɭe:ta] 'to bring'	/mu + leet + i/ [muɭe:si] 'bringer'
/ku + kol + a/ [kukoɭa] 'to work'	/mu + kol + i/ [mukozi] 'worker'
/ku + jig + a/ [kuyiga] 'to learn'	/mu + jig + i/ [muyizi] 'pupil, student'

As in the other paradigms, no spirantization occurs here after labials:

infinitive	agentive nominalization[1]
/ku + laβ + a/ [kulaβa] 'to see'	/mu + laβ + i/ [mulaβi] 'viewer'
/ku + loop + a/ [kuɭo:pa] 'to denounce'	/mu + loop + i/ [muɭo:pi] 'accuser'

(iv) Assibilation is met with in experiencer nominalizations. However with this suffix assibilation seems to be regular when /l/ is involved:

infinitive	experiencer nominalization
/ku + taNB + Vl + a/ [kuta:mbuɭa] 'to travel'	/mu + taNB + Vl + i + e/ [muta:mbuze:] 'traveller'
/ku + lual + a/ [kuɭwa:ɭa] 'to be sick'	/mu + lual + i + e/ [muɭwa:ze:] 'invalid'
/ku + naanaag + Vl + a/ [kuna:na:ɟiɾa] 'to stutter'	/mu + naanaag + Vl + i + e/ [muna:na:ɟize] 'stutterer'
/ku + koNg + Vl + a/ [kuko:ŋgoɭa] 'to shirk'	/mu + koNgol + i + e/ [muko:ŋgoze:] 'shirker'

Assibilation is sporadically activated by the experiencer morpheme when a velar consonant precedes this suffix:

infinitive	experiencer nominalization
/ku + pit + a/ [kuyita] 'to pass'	/mu + pit + i + e/ [muyise:] 'passer-by'

1 This and all the other labels for secondary grammatical categories are only rough approximations of their semantic content.

As we said above this rule is sporadic. It fails to apply to several items which satisfy its structural description.

Examples

infinitive		experiencer nominalization	
/ku + pit + a/	[kuyita] 'to call, invite'	/mu + pit + i + e/	[muyite] 'invited guest'
/ku + loND + a/	[kuɭo:ndaˈ] 'to choose'	/mu + loND + i + e/	[muɭo:ndeˈ] 'chosen person'

In the case of these words it is difficult to justify an underlying /i/ before /e/ since there is no mutation and the two forms are not realised as *[muyitye:] and *[muɭo:ndyeˈ:] as our vowel realisation would predict, with underlying /i/ being realised as non-syllabic before a low vowel.

Finally labials are never affected by the assibilation rule:

Examples

infinitive		experiencer nominalization	
/ku + gaβ + a/	[kugaβa] 'to put in command'	/mu + gaβ + i + e/	[mugaβe:] 'commander'
/ku + siβ + a/	[kusiβa] 'to imprison'	/mu + siβ + i + e/	[musibe:] 'prisoner'

Again the underlying /i/ which we have posited is not realised as [y]: /mu + gaβ + i + e/ is not realised as *[mugaβye:] and /mu + siβ + i + e/ is not realised as *[musiβye:]. However, the fact that the two forms have a long final vowel in the phonetic representation is a strong indication of the fact that they have two adjacent underlying vowels finally. On the basis of the spirantization which occurs elsewhere in the paradigm we can provisionally assume that the penultimate underlying vowel is /i/.

The spirantization triggered off by the experiencer morpho-syntactic feature is less regular than that conditioned by other morphemes. One can only speculate about the reasons for this. One possible explanation is that paradigm coherence is not an important a force in the case of the realisation of this morpheme as it is in the other cases we have discussed because experiencer nominalizations are less common than the other morphemes which trigger off spirantization and therefore regularity of formation is not as functionally important in the case of the experiencer morpheme as it is in the other cases. The formalization of the assibilation rule is discussed in (9.1.3).

Palatalisation. Closely related to assibilation is palatalization. In (7.3.2.1) we noted that nasals were palatalized before PB */i/ diachronically. Synchronically this rule has been retained and it applies in the same grammatical environments as spirantization but its scope has been reduced. Like the spirantization rule it now affects only lingual consonants.

Examples

infinitive		Perfect aspect	
/ku + luan + a/	[kulwa:na] 'to fight'	/βa + ∅ + luan + i + e/	[βalwa:ɲe] 'they have fought'
/ku + sun + a/	[kusuna] 'to pinch'	/βa + ∅ + sun + i + e/	[βasuɲe) 'they have pinched'
/ku + pon + a/	[kuwona] 'to be cured'	/βa + ∅ + pon + i + e/	[βawoɲe) 'they are cured'
/ku + ŋooŋ + a/	[kuŋo:ŋa] 'to low'	/zi + ∅ + ŋooŋ + i + e/	[ziŋo:ɲe] 'they have lowed'

But labial nasals are not palatalized:

infinitive		perfect aspect	
/ku + tum + a/	[kutuma] 'to send'	/βa + ∅ + tum + i + e/	[βatumye] 'they have sent'

infinitive		Perfect aspect	
/ku + lum + a/	[kuluma] 'to bite'	/βa + ∅ + lum + i + e/	[βalumye] 'they have bitten'
/ku + vum + a/	[kuvuma] 'to abuse'	/βa + ∅ + vum + i + e/	[βavumye] 'they have abused'
/ku + sim + a/	[kusima] 'to dig'	/βa + ∅ + sim + i + e/	[βasimye] 'they have dug'

As we saw with /u/ in (9.1.1) not all high vowels cause spirantization. Only high vowels which are exponents of certain morphemes cause spirantization. Thus in the examples below the presence of /i/ does not cause assibilation of non-nasal lingual consonants (or palatalization of nasals) because it does not represent a morpheme which triggers off spirantization.

Examples

/mu + loNgooti/ [mulo:ŋgo:ti] 'mast'

/N + juKi/ [ɲɟuci] 'bee'

/lu + muli/ [lumuli] 'reed'

/βu + luNJi/ [βulu:ɲɟi] 'well'

/a + ni/ [ani] 'who'

/mu + jini/ [muyini] 'handle of hoe or spade'

In the remainder of this section we are going to discuss more formally the spirantization and palatalization processes discussed in (9.1.1) and (9.1.2).

After underlying representations have been inserted by lexical insertion rules and PMIR's they enter the output conditions which check whether they will form admissible phonetic sequences, if left unmodified. Let us suppose that the following underlying representations enter the output conditions:

agentive nominalizations

/mu + leet + i/ [mule:si] 'bringer'

/mu + jig + i/ [muyizi] 'pupil'

/mu + luan + i/ [mulwa:ɲi] 'fighter'

stative nominalizations

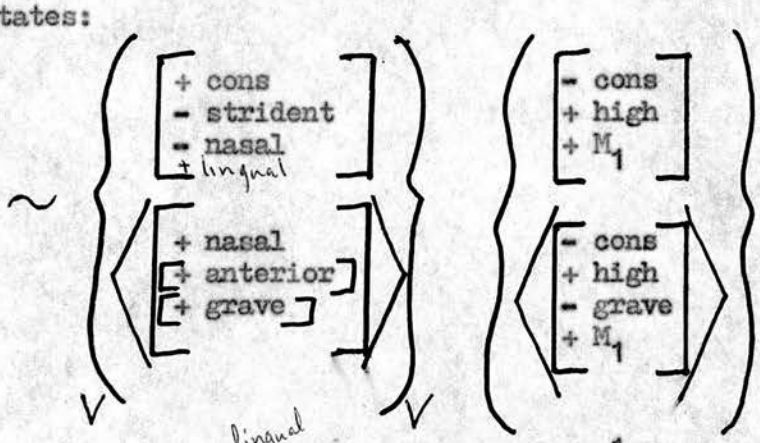
/mu + laβ + Vk + u/ [mulaβufu] 'alert'

/mu + jig + u/ [muyivu] 'learned'

We shall be concerned only with what happens to them in the morphophonological subsystem.

a) Morphophonological constraint 1. The above morphophonemic sequences would be prohibited by morphophonological constraint (MC) 1 which states:

MC1



MC1 states that a {lingual non-nasal, nonstrident[1] consonant i.e. any one of /p,t,c,k,b,d,ɟ,g,β,l,j/ occuring in a verb root or stem cannot be followed by a high vowel if that vowel is an exponent of M_1. Similarly a nasal consonant with a positive value for either the feature anterior or grave cannot be followed by /i/ if that /i/ is an exponent of M_1 where M_1 is a set of morphemes which trigger off spirantization or palatalization[2]. All our five morphophonemic

1 The feature strident is redundant elsewhere but it is used distinctively here to define the natural class for this particular rule. See (5.1) and the references cited there.

2 Members of this set have been discussed in (9.1.1) and (9.1.2).

sequences are rejected as potential inadmissible phonetic sequences by MC1.

After being checked by MC1 our morphophonemic representations are also checked by other morphophonological constraints. None of them except /mu + laβ + Vk + u/ is found to be subject to any other morphophonological constraint. The others are passed on to word structure and phonotactic constraints while /mu + laβ + Vk + u/ is marked as potentially ill-formed by a suffix vowel harmony rule (9.3.2)[1]. All our five forms do not violate any word structure constraint. They are therefore allowed to go on to the phonotactic constraints. There /mu + lee + ti/ and /mu + luan + i/ are marked as inadmissible phonetic sequences by a phonotactic constraint on vowel sequences (11.4.3.1)[1]. On leaving the output condition filters derivations enter the traffic rules.

b) Traffic rules 1a and 1b. Since they have all been rejected by a morphophonological constraint all our five morphophonemic sequences go to the traffic rule component. There they are directed to P-rule 1 to have their anomalies sorted out:

Traffic rule 1a If [+ cons, - strident, - nasal] [- cons, + high, + M_1]

Then [+ P-rule 1] [+ P-rule 1]

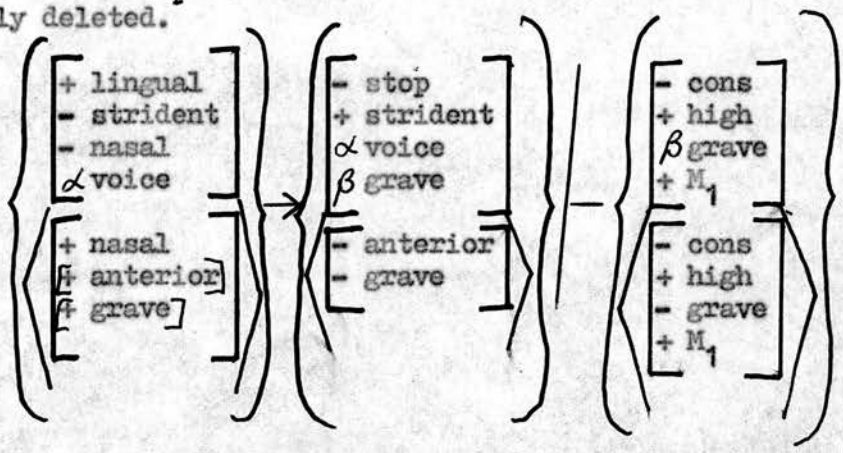
Traffic rule 1b: If [+ nasal, + anterior, + grave] [- cons, + high, + grave, + M_1]

Then [+ P-rule 1] [+ P-rule 1]

1 For the sake of clarity we shall not discuss these operations here though they are involved in our derivations. We shall take them for granted.

c) P-rule 1. Thus marked our five morphophonemic representations enter the P-rule loop to be operated on by P-rule 1. As in Brown (1972) when the appropriate P-rule applies the feature [+ P-rule X] is automatically deleted.[1]

P-rule 1.



The operation of this rule has the following results:

morphophonemic representation	output of P-rule 1
/mu + leet + i/	/mu + leesi/
/mu + jig + i/	/mu + jizi/
/mu + luan + i/	/mu + luaɲi/
/mu + laβ + Vk + u/	/mu + laβVfu/
/mu + jig + u/	/mu + jivu/

Those matrices which have some other anomaly are operated on by any other relevant P-rule. For example /mu + leesi/ is operated on by the vowel deletion rule (11.4.3.1). When all the anomalies spotted by output conditions have been sorted out by the P-rules, matrices re-cycle once more through the output conditions. The aim of this is to check whether in sorting out the original anomalies no new ones have been created. If new anomalies are found matrices

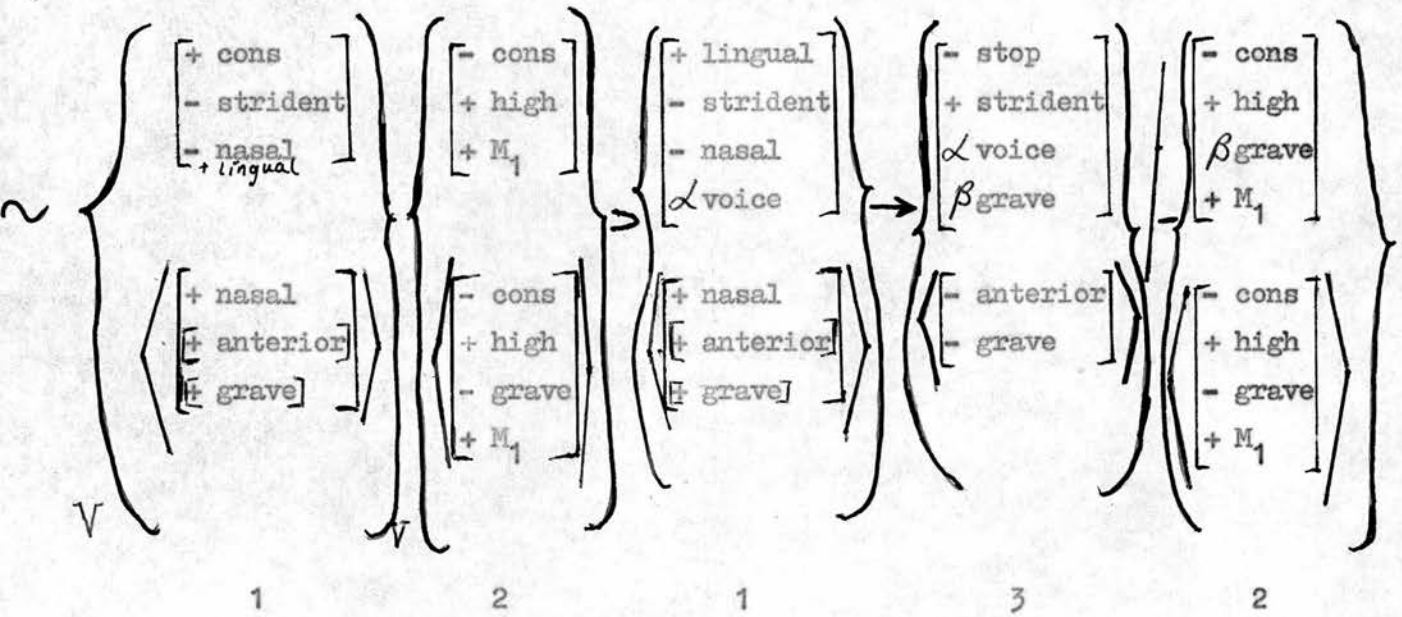
1 The feature [+ P-rule X] will not be included in the SD of P-rules as it is always presupposed by the application of the rule. It is only needed up to the point when an anomalous matrix enters the appropriate P-rule.

return to the P-rule loop to be modified. This is done until no more inadmissible potential phonetic sequences are found. When that stage is reached matrices enter the redundancy rule component to be fully specified.

Note that P-rules are not extrinsically ordered. Following Koutsoudas (1972, 1973) and Koutsoudas, Sanders and Noll (1974) we do not envisage extrinsically ordered phonological rules. It is assumed that the ordering of P-rules is determined by universal principles outlined by these authors (see 9.2.2.1). We shall stipulate simply that P-rules apply anywhere their structural description is satisfied.

We shall summarize the morphophonological constraint discussed here in an implicational set which explicitly brings out the fact that P-rule 1 exists only to prevent violations of MC1 (see 4.3):

Implicational set I



One obvious question raised by the data we have surveyed is whether in a synchronic description we should postulate two underlying

/i/'s and /u/'s, one which causes spirantization (and in the case of /i/ palatalization as well) and another one which does not. We shall address ourselves to this and related problems in the rest of this chapter.

9.2 Strong consonants

Strong consonants are the most peculiar feature of Luganda phonology. As we observed in (7.3.3), diachronically strong consonants arose in root or stem initial position when a weak syllable[1] with an */i/ nucleus was lost in the development of Luganda from Proto-Bantu and its mora together with tone was passed on to the following consonant which was as a result realized as strong and tone bearing[2]. This claim is based on these data from Guthrie (1970, vol.3 and 4):[3]

(1) Verb roots and stems

Proto Bantu		Luganda
*/-jib-/	'to steal'	/-CB-/ [-b:-]
*/-jibid-/	'to sink'	/-CB + Vl/ [-b:iɾ-]
*/-jigad-/	'to shut'	/-Cg + Vl-/ [-g:ad-]
*/-jigud-/	'to open'	/-Cg + Vl-/ [-g:ud-]
*/-jiɟud-/	'to become full'	/-CJ + Vl-/ [-ɟ:ud-]
*/-jiɟ -/	'to come'	/-CJ-/ [-ɟ:-]

1 The term 'weak syllable' refers to */ji/ as we shall see in a moment.

2 The realisation of strong consonants is discussed in Chapter 13.

3 See also Meeussen (1955).

Proto Bantu		Luganda
*/-jim-/	'to refuse, grudge'	/-Cm-/ [-m:-]
*/-jinik-/	'to soak, dip in water'	/-C ɲ + Vk-/ [-ɲ:ik-]
*/-jik-/	'to come (go) down'	/-Ck-/ [-k:]
*/-jit-/	'to kill'	/-Ct-/ [-t:-]

(2) Noun stems

Proto Bantu		Luganda
*/-jiɟi/	'water'	/-Czi/ [-z:i]
*/-jiɟukudu/	'grandchild'	/-Czukulu/ [-z:ukulu]
*/-jina/	'name'	/-Cɲa/ [-ɲ:a]
*/-jino/	'tooth'	/-Cɲo/ [-ɲ:o]

Root or stem medial strong consonants arose where the second of two adjacent PB vowels was */i/. So far we have found only one example of a Proto-Bantu reconstruction which supports this claim. It is Guthrie's (1970, vol.4) reconstruction for 'to spit' which is */-tuiɟ-/. Its Luganda reflex is /-fuCJ-/ [-fuj:-].

The correctness of this hypothesis is borne out by the correspondences between stem medial strong consonants in Luganda and VVC sequences where the second vowel is /i/ realised as a [vi̯] dipthong in cognate forms in closely related neighbouring languages. Consider the following Luganda forms in comparison with cognates in the dialect of Runyoro spoken in Bugangaizi county:

Lugangaizi		Luganda
/-koNgoiVure/	[-ko:ŋgoi̯vure] 'ankle'	/-koNgoCvule/ [-ko:ŋgov:ule]
/-koig + a/	[-koi̯ga] 'to grow thin'	/-koCg + a/ [-kog:a]

1 Bugangaizi is in Mubende district. See Map 1. My informant was Mr. Stephen Ssennyonga, a bilingual speaker of Luganda and Lugangaizi.

Lugangaizi	Luganda
/-hiig + a/ [-hi:ga] 'to hunt'	/-jiCg + a/ [-yig:a]
/-toigo/ [-to:go] 'March to June, rainy season'	/-toCg + o/ [-tog:o]
/-lain + am + a/ [-lainama] 'to sit with legs stretched out'	/-laCn + am + a/ [lan:ama]
/-saiɟa/ [-saiɟa] 'man'	/-saCJ + a/ [-saɟ:a]
/-suiɟa/ [-suiɟa] 'fever'	/-suCJ + a/ [-suɟ:a]
/-βoigo/ [-βo:go] 'snappishness'	/-βoCg + o/ [-βog:o]

It is important to note that the strengthening rule did not apply blindly everywhere /i/ was followed by a consonant: In the following examples taken from Guthrie (op.cit.) of Proto-Bantu sequences of C_1iC_2 assibilation affected C_1 but C_2 is not strengthened though it is preceded by a front close vowel.

(4) Examples

Proto-Bantu	Luganda
*/-pida/ 'pus'	/-sila/ [-siʃa]
*/-piga/ 'cooking stone'	/-siga/ [-siga]
*/-bido/ 'soot'	/-zilo/ [-ziʃo]
*/-bin-/ 'to dance'	/-zin-/ [-zin-]
*/-tiki/ 'stump of tree'	/-siKi/ [-sici]
*/-tim-/ 'to dig'	/-sim-/ [-sim-]
*/-tigad-/ 'to remain'	/-sig + al/ [-sigaɭ-]
*/-di/ 'root'	/-zi/ [-zi]
*/-dib-/ 'to shut'	/-ziβ-/ [-ziβ-]
*/-diik-/ 'to bury'	/-zi + Vk/ [-zi:k-]
*/kidu/ 'stupidity'	/-silu/ [-siʃu]
*/-kige/ 'eyebrow'	/-sige/ [-sige]

Proto-Bantu	Luganda
*/-kiNgo/ 'neck'	/-siNgo/ [-si:ŋgo]
*/-gid-/ 'abstain, taboo'	/-zil-/ [-zi[-]
*/-gige/ 'locust'	/-zige/ [-zige]

The correct explanation seems to be that strengthening was automatically phonologically activated when a weak */ji/ syllable preceded a consonant. (See the examples in (1) and (2) above of PB noun and verb roots/stems commencing with */ji/ which has reflexes in Luganda which begin with strong consonants). A syllable containing */j/ is called weak if it is unstable and tends to be deleted. The deletion of /j/ happens synchronically (8.2.2). When root initial */j/ was lost a high front vowel was left in initial position, where it was very unlikely to survive because there is a strong tendency to exclude high vowels from initial position (10.1.1)[1]. After the loss of the */ji/ syllable its tone passed on the following syllable which is also lengthened in compensation[2]. Length is the most prominent phonetic feature of strong consonants (13.1.1).

Automatic phonological strengthening also occured where */i/ was preceded by another vowel as the examples in (3) above show.

Morphophonologically conditioned strengthening occured where the Proto-Bantu class 5 prefix formative */di/ was placed before a consonant commencing noun or adjective root/stem. Proto-Bantu */di-/

1 High vowels cannot occur initially in a phonological word and they seldom appear initially in a root or stem.

2 Compensatory lengthening is a general process in Luganda phonology see (11.4.3.1) and (11.4.3.2).

became /li-/ in Luganda. The formation of the class 5, singular class prefix before vowel commencing noun or adjective stems/roots is /li-/

(5) Examples

/li + ato/ [lya:to] 'boat'

/li + aNDa/ [lya:nda] 'charcoal'

/li + ovu/ [lyo:vu] 'acne'

/li + eNvuu/ [lye:ɱvu:] 'banana'

The change from PB */di-/ to Luganda /li-/ did not take place where */di-/ was followed by a consonant commencing root/stem. There */di-/ probably after turning into */li-/ was deleted. The approximant /l/ like /j/ which we have discussed above was weak and it was easily lost in initial position. This left /i/ occupying the initial position. There is an output condition which excludes high vowels from initial position in Luganda (10.1.1). To conform to it word initial /i/ was deleted, passing on its tone to the following consonant which was also lengthened in compensation. This is one plausible explanation, and there might be others.

(6) Examples[2]

Proto-Bantu	Luganda	
Class 5. singular	Class 5, singular	class 6, plural
*/di + bada/ 'spot'	/C + βala/ [b:aʃa]	/ma + βala/ [maβaʃa]
*/di + beede/ 'breast'	/C + βeele/ [b:e:ɾe]	/ma + βeele/ [maβe:ɾe]
*/di + taβi/ 'branch'	/C + taβi/ [t:aβi]	/ma + taβi/ [mataβi]

1 Numerous Bantu languages have */i/ as the class 5, singular formative e.g. Gikuyu, Kamba, Sukuma etc. See Kadima (1969:38)

2 The Proto-Bantu data are from Guthrie (op.cit.)

Proto-Bantu	Luganda	
Class 5, singular	Class 5, singular	Class 6, plural
*/di + tako/ 'buttock'	/C + tako/ [t:ako]	/ma + tako/ [matako]
*/di + tama/ 'cheek'	/C + tama/ [t:ama]	/ma + tama/ [matama]
*/di + dadu/ 'madness'	/C + dalu/ [d:alu]	-
*/di + dogo/ 'witchcraft'	/C + logo/ [d:ogo]	/ma + logo/ [malogo]
*/di + jiβa/ 'pigeon'	/C + jiβa/ [ʄ:iβa]	/ma + jiβa/ [mayiβa]
*/di + jo/ 'yesterday'	/C + jo/ [ʄ:o]	-
*/di + kumi/ 'ten'	/C + kumi/ [k:umi]	/ma + kumi/ [makumi]
*/di + gudo/ 'evening'	/C + gulo/ [g:ulo]	-

There are a few exceptions. Roots/stems commencing with a sequence of two consonants do not have their initial consonant strengthened in the same way as that in which the initial consonant of roots which begin with a consonant is. Instead they take a /li-/ prefix.

(7) Examples

Class 5, singular	Class 6, plural
/li + Cgua/ [lig:wa] 'thorn'	/ma + Cgua/ [mag:wa]
/li + Cɲo/ [liɲ:o] 'tooth'	/ma + Cɲo/ [maɲ:o]
/li + Cɲa/ [liɲ:a] 'name'	/ma + Cɲa/ [maɲ:a]

One possible explanation for this is that if these stems took a consonant prefix the rule which allows the maximum of one mora to the syllable onset would be violated. An underlying /CC/ sequence is realised as one strong [C:] which is long and tone bearing (it has the value of one mora). The realization of class 5, singular as /li-/ here is part of the conspiracy to prevent sequences of more than one

mora in the onset (see 11.4.3.2).

Kiparsky (1972:219) has stated that one reason for questioning the validity of conspiracies and derivational constraints in phonology is that they have not been shown to play any role in phonological change. If our analysis is correct that objection cannot be considered altogether valid. Our examples in (7) show that instead of the change */di-/ ⊃ /li-/ ⊃ /i-/ ⊃ /C/ which occured elsewhere before a consonant commencing root/stem in order to avoid a violation of the phonotactic output condition which allows a maximum of one mora per syllable onset (11.4.3.1), a /li-/ prefix is used before roots/stems beginning with /CC/ sequences.

9.2.1 The naturalness of strong consonants

According to the current naturalness theory in generative phonology, strong consonants are marked (see 5.3). Statistically they are rare in the world's languages and even in languages where they occur (e.g. Luganda) they are less common than weak consonants. On the basis of arguments like these Postal (1968:169) assumes "the 'normality' of short, not long segments."[1].

Now, one claim made for the markedness hypothesis is that it enables the linguist to predict the direction of sound change (Postal 1968:170). It enables him to predict that given two related segments, one marked and the other unmarked, sound change will probably merge the marked segment with the unmarked or change the marked segment in some other way so that the language may rid itself of marked, unnatural segments or features.

On the basis of this hypothesis one would expect strong consonants to be dropping out of Luganda phonology as it evolves. A quick inspection of the facts shows clearly that this is not the case. On

1 Length is probably the most salient feature of strong consonants in Luganda.

the contrary, in spite of their being marked, not only are strong consonants holding their own in the course of language change, but they are also spreading[2].

(1) Strong consonants have spread to some infinitive forms of the verb.

The initial stem consonant of a verb root is strengthened when it is preceded by the infinitive formative /ku-/ if the initial stem consonant is a non-nasal velar stop. On the basis of impressionistic observations it seems that this is a rule which has been added by younger speakers to their grammar. It is not present in the grammar of other people. To me it seems to be the most striking phonological characteristic which distinguishes younger from older speakers.

Examples

Older speakers		Younger speakers	
/ku + kol + a/	[kukoɭa] 'to work'	/ku + kol + a/	[kːoɭa]
/ku + kuβ + a/	[kukuβa] 'to beat'	/ku + kuβ + a/	[kːuβa]
/ku + Kim + a/	[kucima] 'to fetch'	/ku + Kim + a/	[cːima]
/ku + kal + a/	[kukaɭa] 'to dry up'	/ku + kal + a/	[kːaɭa]
/ku + gem + a/	[kugema] 'to prevent'	/ku + gem + a/	[kugema]
/ku + gaβ + a/	[kugaβa] 'to give out'	/ku + gaβ + a/	[kugaβa]
/ku + goβ + a/	[kugoβa] 'to chase'	/ku + goβ + a/	[kugoβa]
/ku + gul + a/	[kuguɭa] 'to buy'	/ku + gul + a/	[kuguɭa]

Directly before a verb root the infinitive prefix triggers off strengthening only where the root begins with a velar non-nasal stop. However, where there is a pronominal prefix coming between the

2 The arguments in this section derive from Lass (1972).

infinitive prefix and the root the infinitive will trigger off the strengthening of the consonant of the pronominal prefix no matter what that consonant may be. Compare the examples in (1) with those in (2).

(1) infinitive formative + verb root + basic verb suffix[1]

/ku + pim + a/ [kupima] not *[p:ima] 'to measure'

/ku + βul + a/ [kuβula] not*[b:ula] 'to get lost'

/ku + sal + a/ [kusala] not *[s:ala] 'to cut'

/ku + tem + a/ [kutema] not *[t:ema] 'to cut'

/ku + kuβ + a/ [kukuβa] or [k:uβa] 'to beat'

/ku + goβ + a/ [kugoβa] or [g:oβa] 'to chase'

(2) infinitive formative + {object personal pronoun / class prefix} + verb root + basic verbal suffix.

/ku + βa + laβ + a/ [kuβalaβa] or [b:alaβa] 'to see them' (class 2, 3rd. person, plural)

/ku + mu + laβ + a/ [kumulaβa] or [m:ulaβa] 'to see him' (class 1, 3rd. person singular)

/ku + tu + laβ + a/ [kutulaβa] or [t:ulaβa] 'to see us' (class 1, 1st. person, plural)

/ku + li + laβ + a/ [kuliɬaβa] or [d:iɬaβa] 'to see it' (class 5, 3rd. person, singular)

/ku + zi + laβ + a/ [kuziɬaβa] or [z:iɬaβa] 'to see them' (class 10, 3rd. person plural)

/ku + ka + laβ + a/ [kukalaβa] or [k:alaβa] 'to see it' (class 12, 3rd. person singular)

/ku + gu + laβ + a/ [kugulaβa] or [g:ulaβa] 'to see it' (class 3, 3rd. person, singular)

1 The tendency seems to be to futther generalise this strengthening rule. My brother (13) finds all these starred forms acceptable.

Note again the importance of morphological paradigms in language change in the development of strengthening in infinitive forms.

(2) The spread of strong consonants to classes 9/10. The pressure of a morphological paradigm influencing the direction of sound change can again be seen in the generalization of the strong consonant over the last few decades to classes 9/10 in loan words. The original classes 9/10 prefix was a nasal homorganic with the initial consonant of a noun or adjective root.[1]

Many loan words that have entered Luganda have been assigned to classes 9/10. Some of them have been given a zero prefix instead of a homorganic nasal which native words have.[2]

Examples

/∅ + βeNDela/ [βe:ndeɾa] 'flag'

/∅ + leedijo/ [le:diyo] 'radio'

/∅ + lupiija/ [lupi:ya] 'rupee'

Most of them however are assigned to class 9 in the singular and class 6 in the plural (except for nouns referring to humans which usually go to classes 1/2). Phonologically they are similar to class 5 nouns with stems beginning with a consonant. In fact some of them may be given a class 5 or a class 9 prefix in the singular depending on the speaker. Possible membership of class 5 explains why they have

1 The Proto-Bantu classes 9/10 was */ni-/. As a result of syncope the vowel was lost, leaving behind a homorganic consonant. See Bell (1970a, 1970b). It is equally arguable that the /C/ of the class 5 prefix also arose as a result of syncope: PB */di + C/ → /dCC/; such a sequence was inadmissible. /d/ was deleted and the consonant of the noun root was lengthened in compensation.

2 A handful of indigenous words have a zero classes 9/10 prefix e.g. /∅ + laCDu/ [lad:u] 'lightning'

a strong initial consonant. The only native class 9 word with a strong consonant initially in class 9 seems to be /C + goNBolola/ [g:o:mbolola] 'county' which may have either a class 10 plural: /zi + C + goNBolola/ [zig:o:mbolola][1] or a class 6 plural /ma + goNBolola/ [mago:mbolola] 'counties'. This seems to be a class 5/6 noun which has migrated to class 9/10.

With loan words, however, a strong initial consonant is very common.

Examples

/C + βaasi/ [b:a:si] 'bus' (class 9, singular)
/C + βaasi/ [b:a:si] 'buses' (class 10, plural)
/zi + C + βaasi/ [b:a:si] 'buses' (class 10, plural)

/C + pipa/ [p:ipa] 'barrel' (class 9, singular)
/C + pipa/ [p:ipa] 'barrels' (class 10, plural)
/ma + pipa/ [mapipa] 'barrels' (class 6, plural)

/C + saati/ [s:a:ti] 'shirt' (class 9, singular)
/C + saati/ [sa:a:ti] 'shirts' (class 10, plural)
/ma + saati/ [masa:ti] 'shirts' (class 6, plural)

/C + kooti/ [k:o:ti] 'coat, court' (class 9, singular)
/C + kooti/ [k:o:ti] 'coats, courts' (class 10, plural)
/ma + kooti/ [mako:ti] 'coats' (class 6, plural)

1 The class 10 prefix is usually /N/ but /zi-/ also occurs in a few forms (cf. Ashton et al., 1954)

/C + gama/ [g:ama] 'mug'[1] (class 9, singular)

/C + gama/ [gama] 'mugs' (class 10, plural)

Finally, the Ganda law is an important source of strong nasal consonants. We shall discuss it in (10.2.1)

One conclusion which can be drawn from this survey is that although strong consonants are regarded as marked on the basis of markedness criteria used in the standard theory, they are by no means unnatural in Luganda. Markedness theory would predict that they shall be lost in the course of language change. The data show, however, that they are stable and indeed spreading. The point we are making is that a feature or a segment regarded as marked by the universal theory may be natural and unmarked for a particular language or language family where it occurs (see 5.3). While the quest for universals is important, the excessive universalist bias of some schools of thought tends to obscure the fact that idiosyncratic characteristics of languages and language families are interesting for they might turn out to be as important as universals for a deeper understanding of language (cf. Lass 1972, 1973).

9.2.2 The underlying representation of strong consonants

So far we have presented the synchronic underlying representation of Luganda reflexes of Proto-Bantu forms like */-jit-/ 'kill' and */di-tabi/ 'branch', without any debate, as having two juxtaposed underlying consonants. We have represented the former as /-Ct-/ and

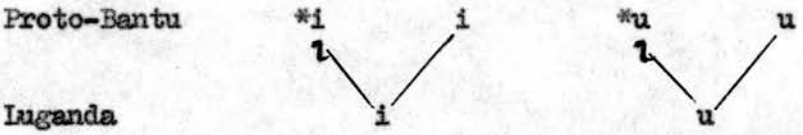
1 Note the metathesis here. Metathesis is rare in Luganda as it is in most other languages. The only other example I have found is /-kapa/ [-kapa] 'cat' from PB */-paka/.

the latter as /C+taβi/ without pointing out that these representations are controversial. In the next two sections we shall discuss two rival approaches to this issue and to the problem of abstractness in phonology in general (see Chapter 8, passim)

9.2.2.1 An absolute neutralisation solution

As far as I know no one has as yet proposed an absolute neutralization solution to this problem in Luganda phonology. My formulation of arguments for absolute neutralization, coming as they do from a sceptic, may not be one which proponents of absolute neutralization would accept. For the purposes of this chapter let us assume that the statement here of absolute neutralization is acceptable. The case for absolute neutralization would probably be argued in the manner outlined below.

In (7.3.1) it was stated that the seven vowel system of Proto-Bantu was reduced to a five vowel system in Luganda as a result of these mergers:



An advocate of the absolute neutralization solution would claim that the merger only took place at the surface phonetic level; at the level of underlying representation, he would suggest, the two extra-high vowels of Proto-Bantu have been preserved in Luganda. He would adduce the following arguments to support his claim:

(1) Evidence from spirantization

In (9.1.1) and (9.1.2) we noted that only some high vowels cause spirantization[1] (and palatalization in the case of /i/). There are

1 No explicit mention will be made here of the palatalization of nasals before a high front vowel because the remarks about spirantization equally apply to them.

other high vowels which, in identical phonetic environments, do not cause these processes. There we suggested that spirantization is a morphophonological process and the spirantization rule has to be morphologically triggered.

Armed with the same data, however, a proponent of absolute neutralization would argue that the fact that some high vowels cause spirantization and others do not is explainable in purely phonological terms: Luganda distinguishes /i/ from /i/ and /u/ from /u/ in the underlying representation but the opposition between the high and the extra-high (i.e. /i/ and /u/) vowels of each pair is neutralised everywhere in the phonetic representation. Though /i/ and /u/ are not attested in the surface representation, their phonological effect is unmistakable: they have the same effects in the synchronic grammar of Luganda as they had in Proto-Bantu.

What robs this argument of its power is the fact that all the spirantization processes which occur in Luganda are restricted to a few morphological paradigms. It is suspicious to have morphophonemic segments whose distribution is limited to a few formatives and which never occur in any phonetic representation.[1] An explanation of spirantization in terms of morphological conditioning seems to be more persuasive. If the absolute neutralization solution is to be sustained stronger evidence is needed. The behaviour of strong consonants appears to provide such evidence.

(ii) Evidence from consonant strengthening

From the discussion so far it is clear that one of the underlying assumptions made (albeit inexplicitly) in advocacy of absolute

1 These objections to absolute neutralization would seem to be relevant to Hyman (1970), Vago (1973) and Selkirk and Vergnaud (1973).

neutralization is that the break between Luganda and Proto-Bantu has only been at the surface phonetic level; at the level of underlying representation Proto-Bantu has survived in modern Luganda. On this view the phonological process which we regarded in chapter 7 as diachronic would be regarded as synchronic. This approach which stands at the opposite extreme from Saussure's position that synchrony and diachrony are separate disciplines is prone to distort synchrony because of the great reluctance to recognise the fact which it embodies that periodically phonological systems get restructured.

If the absolute neutralization principle is used the derivation of strong consonants in forms like [t:a] 'kill!' [ɲ:ima] 'I refuse, grudge' and [t:aβi] 'branch' would start from underlying representations very close to, or identical with, the Proto-Bantu forms.

a) The derivation of [t:a] would involve the following rules

(i) underlying representation / # jìt + á # /

(ii) The consonant /j/ is weak and unstable especially before a high front vowel. The two are so similar that it is difficult to distinguish [yi] from [i:]. Consequently /j/ is lost leaving /ìtá/

(iii) /ìtá/ is an impermissible surface representation because it has a high vowel initially and violates the constraint which prohibits initial high vowels. So /i/ is deleted (see 10.1.1)

(iv) The deletion of /i/ means the loss of the whole /jì/ syllable

(v) In compensation the following consonant is lengthened, strengthened, and given the tone of /jì/. This produces [t:á][1].

1 For a discussion of strong consonants and their tone bearing capacity see (11.4.2). Until then tone will be left out of the discussion of strong consonants. It has only been introduced here to illustrate historical developments which are recapitulated in an absolute neutralization solution.

b) The derivation of [t:aβi] would involve the following processes:

(i) */di + taβi/, even an advocate of very abstract underlying representations would probably agree, has changed to /li + taβi/ because the class 5 prefix is now /li/ not /di/

(ii) /li + taβi/ becomes /zitaβi/ when the spirantization rule applies to it.

(iii) /zitaβi/ should become */ztaβi/ after the application of the syncope rule which drops high front vowels in weak syllables - and class prefixes are weak syllables[1]. But the intermediate representation */ztaβi/ is inadmissible; the only consonant sequences allowed in the surface representation are NC sequences (11.1). Therefore /z/ is deleted leaving /taβi/.

(iv) /taβi/ is turned into [t:aβi] by a rule which strengthens, lengthens and passes on the tone of the deleted syllable to the onset of the following syllable.

c) For the derivation of [ɲ:ima] the following operations might be proposed:

(i) /N/ → [ɲ]: / - CV(V)N (where /C/ is a non-strident continuant). This produces /ɲ:jima/

(ii) /j/ → ∅ / [ɲ:] - V(V)N. This yields [ɲ:ima]

The two sub-rules constitute the Ganda Law (10.2.1).

This very abstract approach allows one a very natural explanation for one of the most baffling phonological alternations in Luganda. Consider these sets of examples:

1 See Bell (1970a, 1970b) for a discussion of syncope in classes 9/10 where PB */ni-/ has become /N/

(i) Verbs

infinitive	1st person, singular, present tense
/ku + jit + a/ [kut:a] 'to kill'	/N + jit + a/ [nzita] 'I kill'
/ku + jig + Vl + a/ [kug:ula] 'to open'	/N + jig + Vl + a/ [nzigula] 'I open'
/ku + jig + Vl + a/ [kug:ala] 'to shut'	/N + jig + Vl + a/ [nzigala] 'I shut'
/ku + jim + a/ [kum:a] 'to refuse'	/N + jim + a/ [ɲ:ima] 'I refuse'

(2) Nouns

Class 11, singular	Class 10, plural
/lu + jizi/ [luz:i] 'well'	/N + jizi/ [nzizi] 'wells'
/lu + jɲa/ [luɲ:a] 'trench'	/N + jɲa/ [ɲ:iɲa] 'trenches'
/lu + jɲo/ [luɲ:o] 'stretcher'	/N + jɲo/ [ɲ:iɲo] 'stretchers'

These alternations would be explained using ordered rules. We shall illustrate with /N + jit + a/ and /N + jim + a/. We have already discussed the derivations of forms with stem initial consonants. In this paragraph we shall discuss reasons for the non-appearance of strong consonants in the 1st person, singular and in the class 10, plural strong consonants.

The derivation of [nzita] would be done using the following ordered rules:

(i) The morphophonemic representation is /N + jit + a/

(ii) The strengthening rule applies /Nǰita/ (see 11.1). The application of this rule bleeds (i.e. destroys the input to) the /j/ deletion rule: when underlying /j/ has been hardened into /ǰ/ it cannot be deleted[1].

1 The idea of feeding and bleeding rule order was introduced by Kiparsky (1968a).

(iii) /N̥jita/ becomes /ɲj̥ita/ by the homorganic nasal rule (11.1)

(iv) /N̥jita/ becomes [nzita] after the application of the spirantization rule.

For this derivation to work out correctly it is essential to apply (ii) before the deletion rule applies. If deletion of /j/ is allowed to precede hardening there will be no /j/ to harden.

The derivation of [ɲ:ima] would also require extrinsically ordered rules:

(i) The morphophonemic representation is /N + jim + a/

(ii) The nasal is assimilated to the palatal place of articulation of /j/ by the rule which stipulates that nasals are homorganic with consonants which come after them in clusters (11.1).

(iii) [j] is deleted by the Ganda Law and the [ɲ] is strengthened, lengthened in compensation (10.2.1).

This explanation is sound. Diachronically it is probably correct. But is it also correct synchronically? What is at stake is the question of what constitutes a valid synchronic phonological explanation.

The main attraction of absolute neutralization is that it affords the linguist a phonologically plausible explanation of morphophonemic alternation. If one postulates seven underlying vowels for Luganda, for example, as we have seen above, one can write well-motivated phonological rules to account for spirantization and strengthening in Luganda. Admittedly, the underlying representations and the rules involved in the derivations would not differ very much (if at all) from the historical development of these processes. There is an implicit belief in the absolute neutralization principle that diachronic processes persist into synchrony. This belief would probably

be accepted by many linguists, but they would add the qualification that such persistent rules operate at different depths and only those rules which are relatively near the surface could be psychologically valid[1]. Absolute neutralization is controversial largely because its advocates claim psychological reality even for alternations which are very deep and far from the surface (cf. Hyman:1970).

In principle generative phonologists (including those who advocate absolute neutralization) subscribe to the principle that only synchronic facts are relevant in a synchronic grammar. Lightner (1967:51) observes:

> Since native speakers normally know neither the Proto-forms of their language nor the corresponding forms in related languages, a grammar of a language which uses such diachronic/comparative information is not a true reflection of the native speaker's internalized knowledge of his language.

The interpretation of what constitutes native speakers' competence is, of course, problematic.

Approaching the problem from the angle of language acquisition seems promising. If we accept Lightner's observations we cannot postulate absolutely neutralized /i/ and /u/ in Luganda because, if in language acquisition the child reconstructs underlying representations on the basis of what he actually hears, it is not easy to see why one should assume that the child infers very abstract underlying oppositions where he does not encounter any in the phonetic input (the speech of people around him). (cf. Derwing:1973:100 ff).

1 Cf. Chafe (1968).

Non-surfacing phonological oppositions are unlearnable, it would seem, on the basis of morphophonemic alternations. In the next section an alternative treatment will therfore be discussed.

9.2.2.2 A less abstract solution

Kiparsky (1968b) proposes the abandonment of absolute neutralization. He argues that an alternation condition should be incorporated in generative phonology. The alternation condition is the requirement that all morphophonemic alternations should be conditioned. All morphophonemic representations should have at least one form which is phonetically realized in some environment. This constraint excludes absolute neutralization.

Even before Kiparsky proposed the alternation condition, McCawley (1967b) had already observed that Sapir's morphophonemic representations (which generative phonologists often claim anticipated their own systematic phonemic representations) differ from systematic phonemic representations in a fundamental way. Whereas Sapir (and indeed the structuralists generally) insisted on having morphophonemic representations which surfaced in some environments, standard generative phonology allows absolute neutralization (cf. Chomsky and Halle: 1968:233-4). In this respect it is much less constrained than Sapir's and structuralist morphophonemics generally. It is therefore misleading to equate Sapir's morphophonemic representations with a systematic phonemic representation. This is not simply a terminological question. There is a substantive difference involved: systematic phonemes may be absolutely neutralised but traditional morphophonemic representations cannot. That is why we have consistently referred to our own underlying representations as morphophonemic rather than systematic phonemic.

Besides the objection that absolutely neutralized systematic phonemes are unlearnable (Derwing 1973) which we have already raised there is another argument which can be produced by opponents of absolute neutralization. It can be argued that allowing absolute neutralization weakens constraints on the grammar excessively for virtually it is a removal of all restrictions on the input of the phonological component in a synchronic grammar. Given the enormous power of the P-rules, if any systematic representation can be postulated and be designated as absolutely neutralized, there is a great risk of generative phonology becoming a formal mathematical game. One would have to rely more on the good sense of the linguist and less on the formal constraints on the theory to prevent this from happening.

The great virtue of the alternation condition is that by restricting the range of possible inputs to phonological rules (i.e. by limiting the range of possible underlying representations) it constrains the power of the grammar and helps to ensure that phonological representations ultimately have empirical content.

The point has already been made that the absolute neutralization solution allows the linguist to account for spirantization, strengthening and the appearance of [zi] and [ʃ:i] in the first person singular form of verbs and the class 10 forms of nouns which have strong consonants initially (9.2.2.1). We have conceded that postulating abstract /i/ and /u/ allows the linguist to make plausible explanations which are probably historically valid.

Synchronically, however, a different kind of explanation is required if the phonologist wants to claim some psychological validity

for his derivations[1]. A morphophonological explanation commends itself. For such forms as [b:a] 'steal!', [t:aβi] 'branch', and [m:a] 'refuse!' underlying representations with a dummy consonantal segment is posited. That dummy would serve in the underlying representation to indicate that the consonant after it is strengthened and bears tone in the phonetic representation. What is being suggested is that succeeding generations of speakers have restructured the underlying representations: PB */-jib-/ 'to steal', */-jim-/ 'to refuse', */di + tabi/ 'branch' have now been assigned new underlying representations which are not very abstract, namely /-CB-/[2], /-Cm-/ and /Ctaβi/ respectively. The derivation of surface forms would go through the following stages:

(1) Lexical representation: /-CB-/, /C + taβi/, /-Cm-/.
The /C/ is an archi-segment specified in the lexicon as [+ cons]. It bears the tone of the adjacent weak syllable which was lost in the course of language change.

(2) The hardening rule which requires that a consonant following another consonant may not be $\begin{bmatrix}\text{-nasal}\\ \text{-obstr}\end{bmatrix}$ applies and /-CB-/ becomes /-Cb-/; the others are unaffected.

(3) The next rule to apply simultaneously strengthens the second of two consonants and deletes the first where the consonant sequence in question is not NC. This operation is illustrated below:

a) C → C: /C - (i.e. Cb → b:/C-; C + t → t:/C-; Cm → m:/C-)

b) C → ∅ /-C: (i.e. C → ∅/-b:; C → ∅ /-t:; C → ∅ /-m:

1 Of course, the linguist need not claim that his description is psychologically well-motivated. But even if he does not, a linguist who opts for absolute neutralization and makes no psychological claims would still be criticised for relaxing constraints on the grammar as we saw earlier in this section.

2 Recall that /B/ is an archisegment representing /β/ or /b/ after another consonant (0.4.1.3)

See chapter 13 (passim) for further discussion.

The occurrence of [-zi-] and [-ɲ:i] in roots commencing with strong consonants when they take a 1st person singular or a class 10, nasal prefix would be accounted for morphophonologically in a synchronic grammar: [nziβa] 'I steal' and [ɲ:ima] 'I refuse' and [ɲ:iɲo] 'stretchers' (from [luɲ:o] 'stretcher'), it could be argued, exhibit the intrusive [nzi-] and [ɲ:i-] in specific morphological environments and this suggests that the alternation between strong initial consonant and [nzi-] or [ɲ:i-], whatever might have been its historical origins, has become morphologised. It has been reanalysed with the result that [nzi-] and [ɲ:i-] have become formations of the 1st person singular in verbs and of class 10 in nouns with roots which commence in strong consonants. Speakers probably do not go through the complex derivations we discussed in (9.2.2.1) but instead store these entire morphs unanalysed as representations of these syntactic features: [nzi-] and [ɲ:i] together with /N-/ are perhaps stored as alternative formations of the first person singular pronoun or class 10 prefixes (see 1.3.4). This view is tantamount to denying the possibility of a synchronic phonological explanation. Later in (11.1) and (11.4.3.2) an alternative synchronic phonological explanation in terms of phonotactic output conditions on tri-consonantal sequences will be proposed.

Consonant initial stems in class 5 e.g. /-taβi/ 'branch' could also be treated in either of these two ways. It is arguable that speakers have a rule in their grammar which triggers off initial consonant strengthening in roots in class 5. An equally plausible alternative suggestion is that speakers have reanalysed class 5 as having a /C/ prefix so that the underlying representation of [t:aβi]

is /C + taβi/. On this view the strengthening of the root initial consonant in class 5 is accounted for by the same general rule which applies everywhere which states that the archisegment [+ cons] triggers off the strengthening of the following consonant and is itself deleted:

a) C → C: /C-

b) C → ∅ / -C:

See above (9.2.2.2)

Recall that in (9.1.1) and (9.1.2) an absolute neutralization explanation was said to be unacceptable. Diachronically all evidence indicates that /i/ and /u/ caused spirantization. But synchronic spirantization cannot be explained in terms of these vowels as they never occur anywhere in the phonetic representation. We therefore preferred a morphophonological explanation where certain morphemes which we designated as 'M' trigger off spirantization. The point I have been making in this chapter is that synchronically sometimes only a subsumptive explanation (i.e. a grouping of alternations to show what morphophonological regularities there are) is the only possible one; in such cases for an interpretive explanation which states why those regularities exist the linguist may have to turn to diachrony. The absolute neutralization principle seems to be based on the belief that all (or very nearly all) alternations can be given a synchronic interpretive explanation.

9.3 Vowel harmony

Vowel harmony is the last major morphophonological process that we are going to investigate. It is necessary to distinguish between two subsystems of morphophonological vowel harmony. One subsystem operates word initially and the other word finally. The two systems

differ in their harmonizing features.

9.3.1 Preprefix vowel harmony

Initially there is vowel harmony between the vowel of the noun class prefix and the preprefix (also called the initial vowel in the literature). The preprefix is an exponent of some as yet undefined syntactic/semantic property which we referred to as X^1. There is a gravity harmony between the preprefix and the prefix vowel. The harmony is regressive. The prefix vowel determines the specification of the preprefix vowel:

Examples

/V + Ki+ nene/ [ecine] 'big' (class 7, singular)

/V + mi + nene/ [eminene] 'big' (class 4, plural)

/V + βi + nene/ [eβinene] 'big' (class 8, plural)

/V + mu + nene/ [omunene] 'big' (class 1 or 3, singular)

/V + lu + nene/ [olunene] 'big' (class 11, singular)

/V + gu + nene/ [ogunene] 'big' (class 20, singular)

/V + βa + nene/ [aβanene] 'big' (class 2, plural)

/V + ka + nene/ [akanene] 'big' (class 12, singular)

/V + ma + nene/ [amanene] 'big' (class 6, plural)

The vowel of the class prefix in Luganda can only be one of /i,a,u/. Reconstructions indicate that diachronically the following developments must have taken place[2]:

(1) Form preprefix by copying the class prefix once to its left:

/βa + Ntu/ → /βa + βa + Ntu/ 'people'

/mu + Ntu/ → /mu + mu + Ntu/ 'person'

1 See the paragraph on the preprefix in (0.4.3.1) and the references cited there.

2 Synchronic evidence from some languages e.g. Lumasaaba suggests that this account is correct. (Cf. Brown:1972).

(2) Delete the initial consonant.

/a + βa + Ntu/

/u + mu + Ntu/

(3) Luganda has a rule which prohibits the occurence of high vowels initially: all word initial vowels are low (10.1.1). Therefore /u + mu + Ntu/ underwent initial vowel lowering and became /o + mu + Ntu/ while /a + βa + Ntu/ which already had a low vowel was unaffected.

Before we express this rule formally let it be noted that initial vowel harmony is a morphophonological process limited to the preprefix. Word initial vowels which are not preprefixes have to be low but they do not have to be in harmony with the vowel in the next syllable in the word.

Examples[1]

/a + li + lim + a/ [alilima] 'he will cultivate'

/a + Ø + tum + a/ [atuma] 'he sends'

/a + naa + tem + a/ [ana:tema] 'he will cut'

/e + tu + lum + a/ [etuluma] 'it bites us (class 9)

/e + li + lum + a/ [eliluma] 'it will bite' (class 9)

/e + ga + laβ + a/ [egalaβa] 'it sees them' (class 9, class 22)

/o + li + sim + a/ [olisima] 'you will dig'

/o + βa + laβ + a/ [oβalaβa] 'you see them' (class 2)

/o + Ø + loβ + a/ [oloβa] 'you fish'

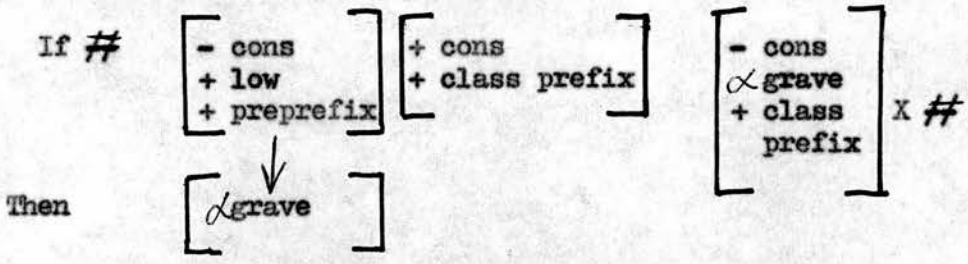
Clearly preprefix vowel harmony cannot be explained in purely phonological terms since in identical phonological circumstances other

1 Where no class is specified for pronouns referring to humans they are class 1 if singular and class 2 if plural.

word initial vowels do not display such harmony. But on the other hand, it is not phonologically capricious (vowel harmony by definition is a phonologically based process). Preprefix vowel harmony is morphophonological.

This process could be stated using the following If-Then condition:

Sequence structure condition (SSC1) [1]



Sequence structure condition I is a morphophonological output condition. Its structural description explicitly states that it applies only where the sequence in question contains a preprefix followed by a consonant and a vowel which are exponents of some class prefix.

Note that the various output conditions are hierarchically organised: phonotactic rules are absolute and are never violated anywhere; word structure rules apply only within the word but in that limited domain they are absolute; morphophonological rules apply only in certain morphophonological environments and are subject to word structure and phonotactic constraints. Thus the preprefix vowel harmony must obey the word structure rule which stipulates that only low vowels may occur word initially (10.1.1).

So far we have discussed transparent cases of initial vowel

1 X stands for any segments. It is unnecessary to specify them because they are not relevant to this rule.

harmony. But now consider these examples:

/V + N + βuzi/ [e:ᵐbuzi] 'goat' (classes 9/10)

/V + N + te/ [e:ⁿte] 'cow' (classes 9/10)

/V + N + koko/ [e:ᵑkoko] 'chicken' (classes 9/10)

/V + N + pisi/ [e:ᵐpisi] 'hyena' (classes 9/10)

/V + N + go/ [e:ᵑgo] 'leopard' (classes 9/10)

/V + N + liga/ [e:ⁿdiga] 'sheep' (classes 9/10)

/V + N + juki/ [e:ɲɟuci] 'bee' (classes 9/10)

These data raise problems concerning the correct synchronic underlying representation of the classes 9/10 prefix. Ashton, et al. (1954) and other writers on Luganda grammar have regarded the classes 9/10 prefix as a nasal which is preceded by a low front vowel preprefix in some environments: '(E)N' is how these authors represent classes 9/10. A generative linguist who does not find it desirable to postulate very abstract underlying representations in synchronic descriptions would follow the traditional account. The occurence of (e) as the preprefix before the classes 9/10 prefixes would be regarded as phonologically arbitrary and purely morphologically conditioned. He would use a PMIR to rewrite the preprefix as /e/ before classes 9/10 prefixes.

The same solution would be suggested by the phonologist who does not like very abstract representations for the representation of the preprefix in these forms:

/V + C + βeele/ [eb:e:ɬe] 'breast' (class 5)

/V + C + kuβo/ [ek:uβo] 'road' (class 5)

/V + C + gulo/ [eg:ulo] 'evening' (class 5)

/V + C + taβi/ [et:aβi] 'branch' (class 5)

/V + C + gaali/ [eg:a:li] 'bicycle' (classes 9/10)

/V + C + cupa/ [ec:upa] 'bottle' (classes 9/10)

He would suggest that the occurence of [e] before all these class 5 and classes 9/10 prefixes is morphologically conditioned.

But that linguist could be criticised for failing to capture the obvious (and possibly significant) generalization that all these forms with an allegedly morphologically conditioned [e] preprefix have one thing in common. The underlying representation of their class prefix is a consonant not followed by a vowel: /N/ and /C/ respectively. A phonological rule, it could be suggested, can be written to predict that [e] occurs as the preprefix before prefixes whose underlying representation consists of simply a consonant.

SSC2 If # [-cons, + low, + preprefix] [+ cons, + class prefix] X #

Then [- grave]

No doubt this rule would yield the correct results. But what it offers is a subsumptive rather than an interpretational explanation: it summarises the regularities without showing <u>why</u> they exist. SSC1 which elsewhere predicts the realisation of the preprefix is a vowel harmony rule SSC2 though formally similar to it is in no sense a vowel harmony rule.

The real explanation for the occurence of [e] as the preprefix in these forms is diachronic. The underlying representation of classes 9/10 in PB was */ni-/[1] and that of class 5 was */di-/. A syncope rule

1 See (9.2.2.1) and (9.2.2.2) for a discussion of strengthening. Syncope changed PB classes 9/10 prefix from */ni-/ to /N/ (cf. Bell)

deleted /i/ after /n/ and the strengthening rule deleted /i/ after */d/ but this only happened after the vowel harmony rule stated in SSC1 had applied. We have called this explanation historical but of course a linguist who favours very abstract underlying representations would claim that this process has persisted and is still operative in contemporary Luganda. Whatever might be the explanatory value of such a claim, one thing seems certain: Luganda speakers who have not followed a course in Proto-Bantu are unaware of the fact that /N/ is at a more abstract level traceable to /ni/.

9.3.1 Verb suffix vowel harmony

A different kind of vowel harmony system operates in verbal extension suffixes (0.4.2.2). This vowel harmony is also morpho-phonologically conditioned. The labels of the verbal extensions used in this discussion are borrowed from Ashton, et al. (1954). The appropriateness of these labels will not concern us here as it is not relevant to the operation of the harmony rules.

9.3.2 'Transparent' suffix vowel harmony

In Luganda verb roots may have any one of the following morphophonemic sequences in their underlying representations (see 6.1):

CV	/ku + βa + a/	[kuβa:] 'to be'
	/ku + li + a/	[kulya:] 'to eat'
CVC	/ku + laβ + a/	[kulaβa] 'to see'
	/ku + lim + a/	[kulima] 'to cultivate'
CVVC	/ku + loot + a/	[kulo:ta] 'to dream'
	/ku + siim + a/	[kusi:ma] 'to be grateful'
CVCC[1]	/ku + jiCg + a/	[kuyig:a] 'to hunt'
	/ku + loND + a/	[kulo:nda] 'to choose'

1 The symbol /C/ covers any consonant including a nasal which precedes another consonant.

CC[1] /ku + Ct + a/ [kut:a] 'to kill'

/ku + Ck + a/ [kuk:a] 'to go (come) down'

/ku + Cm + a/ [kum:a] 'to refuse'

There is vowel harmony between the last vowel of the verb root and the vowel (or vowels) of any extension suffix(es) that may follow the root. This harmony does not affect the final vowel of the verb form, be it the basic verb suffix or some other suffix (0.4.2.2). It is necessary to stress that this is an extension suffix vowel harmony because it does not affect other formatives which may be affixed to a verb root. Note that the infinitive being a verbal noun, the infinitive prefix in class prefix 15, may take a preprefix which would be subject to the preprefix vowel harmony discussed in (9.3.1).

The feature involved in suffix vowel harmony is 'advanced tongue root'. When we introduced it in (5.1) we pointed out that it plays a very limited role in Luganda phonology. It is required only for the statement of the suffix vowel harmony rule (Lass 1973). Extension suffix vowels must agree with the vowel of the root in specification for the feature 'Advanced tongue root' (a.t.r). The vowels /i,a,u/ are [-a.t.r] and the vowels /e,o/ are [+ a.t.r.]: only vowels from the first set can occur in extensions where the root vowel is [-a.t.r] and conversely only [+ a.t.r.] vowels can occur in extensions when the root vowel is from the second set. This harmonization occurs in about a dozen extended verb forms. The traditional syntactic labels for extension suffixes are used. Their appropriateness is relevant to

1 These raise different problems which we shall not discuss until (9.3.2.2)

the issues under consideration.

Examples[1]

(i) infinitive /ku + siNB + a/ [kusi:mba] 'to plant'
passive /ku + siNB + Vβu + a/ [kusi:mbibwa] 'to be planted'
applied /ku + siNB + Vl + a/ [kusi:mbiɬa] 'to plant for'
causative /ku + siNB + VS + a/ [kusi:mbisa] 'to cause to plant'
stative /ku + siNB + Vk + a/ [kusi:mbika] 'to be plantable'
conversive /ku + siNB + Vl + a/ [kusi:mbuɬa] 'to uproot'

(ii) infinitive /ku + fuNB + a/ [kufu:mba] 'to cook'
passive /ku + fuNB + Vβu + a/ [kufu:mbibwa] 'to be cooked'
applied /ku + fuNB + Vl + a/ [kufu:mbiɬa] 'to cook for'
causative /ku + fuNB + VS + a/ [kufu:mbisa] 'to cause to cook'
stative /ku + fuNB + Vk + a/ [kufu:mbika] 'to be cookable'
conversive */ku + fuNB + Vl + a/ [kufu:mbuɬa] (an accidental gap)

(iii) infinitive /ku + laβ + a/ [kulaβa] 'to see'
passive /ku + laβ + Vβu + a/ [kulaβiβwa] 'to be seen'
applied /ku + laβ + Vl + a/ [kulaβiɬa] 'to see for'
causative /ku + laβ + VS + a/ [kulaβisa] 'to cause to see'
stative /ku + laβ + Vk + a/ [kulaβika] 'to be visible'
conversive /ku + laβ + Vl + a/ [kulaβuɬa] 'to warn'

(iv) infinitive /ku + tem + a/ [kutema] 'to cut'
passive /ku + tem + Vβu + a/ [kutemebwa] 'to be cut'
applied /ku + tem + Vl + a/ [kutemeɬa] 'to cut for'
causative /ku + tem + VS + a/ [kutemesa] 'to cause to cut'
stative /ku + tem + Vk + a/ [kutemeka] 'to be cutable'

1 This is not an exhaustive list of the formation of verb forms listed here. See Ashton, et al. (op.cit) for a fuller discussion.

conversive /ku + tem + V1 + a/ [kutemuɭa] 'to murder'[1]

(v) infinitive /ku + goβ + a/ [kugoβa] 'to chase'

passive /ku + goβ + Vβu + a/ [kugoβeβwa] 'to be chased'

applied /ku + goβ + V1 + a/ [kugoβeʃa] 'to chase for'

causative /ku + goβ + VS + a/ [kugoβesa] 'to cause to chase'

stative /ku + goβ + Vk + a/ [kugoβeka] 'to be chaseable'

conversive /ku + goβ + V1 + a/ [kugoβoɭa] 'to draw bolt of rifle'

In the examples in (i), (ii) and (iii) there is [-a.t.r.] harmony while in the examples (iv) and (v) there is [+ a.t.r] harmony.

The same vowel harmony process goes on where an extension suffix is reduplicated,

Examples

(vi) conversive /ku + sum + V1 + V1 + a/ [kusumuɭuɭa] 'to untie'

/ku + goβ + V1 + V1 + a/ [kugoβoɭoɭa] 'to make a profit'

applied /ku + jim + V1 + V1 + a/ [kuyimiʃiʃa] 'to stand up'

/ku + sek + V1 + V1 + a/ [kusekeʃeʃa] 'to laugh at, make fun of'

or where more than one extension is suffixed to the root:

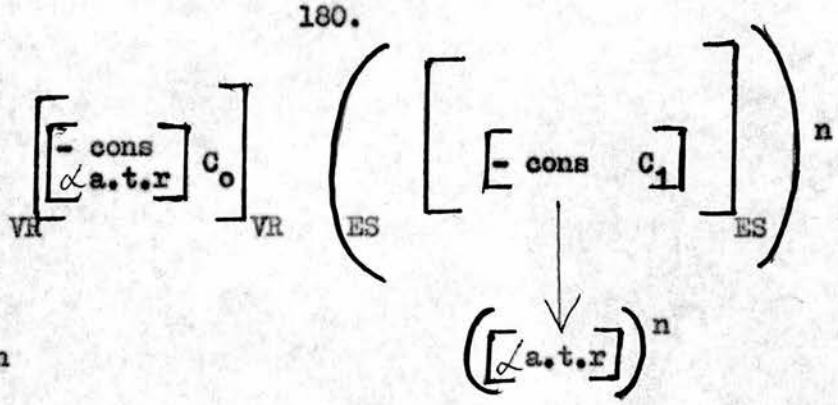
(vii) stative + applied /ku + laβ + Vk + V1 + a/ [kulaβiciʃa] 'to appear to'

/ku + teg + Vk + V1 + a/ [kutegekeʃa] 'to prepare for'

/ku + saɲ + Vk + V1 + a/ [kusaɲuciʃa] 'to welcome'

The extension suffix vowel harmony rule can be stated using SSC3

1 Here one would expect */kutemoɭa/ not [kutemuɭa]. This erratic behaviour will be explained below (see 9.3.3)

SSC3. If 

Then

The abbreviations mean the following:

VR = verb root;

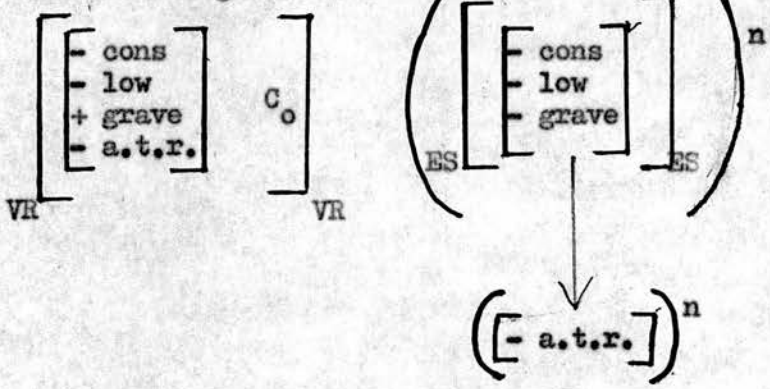
C_o = zero or more consonants

C_1 = at least one consonant

ES = any suffix

$(\ )^n$ = the condition between brackets applies n times.

Note that though in our informal representation of the harmonising suffix vowel we have simply used the archi-segment V in a formal representation it must be specified for other features as well since only the feature values 'advanced tongue root' are predictable using this rule. For example, for /ku + fuNB + V1 + a/ [kufu:mbiʃa] 'to cook for' this rule will fill in the values for the feature 'advanced tongue root':

SSC3a If 

there is no root final consonant present.

Examples

(viii) infinitive /ku + li+a/ [kuʎa:] 'to eat'

passive /ku + li + Vβu + a/ [kuʎi:βwa] 'to be eaten'

applied /ku + li + Vl + a/ [kuʎi:ɬa] 'to eat for'

causative /ku + li + VS + a/ [kuʎi:sa] 'to cause to eat'

stative /ku + li + Vk + a/ [kuʎi:ka] 'to be edible'

9.3.2.2 'Opaque' suffix vowel harmony

Severe problems are posed by 'vowel harmony' in roots whose underlying representation, in the less abstract analysis which we suggested in (9.2.2.2), consists of only consonants and no non-consonants. Since the vowel of the root always controls vowel harmony it is not clear why only vowels from the non-advanced tongue root series occur after all the roots which consist of /-CC-/

Examples

(ix) infinitive /ku + CB + a/ [kub:a] 'to steal'

passive /ku + CB + Vβu + a/ [kub:iβwa] 'to be stolen'

applied /ku + CB + Vl + a/ [kub:iɬa] 'to steal for'

causative /ku + CB + VS + a/ [kub:isa] 'to cause to steal'

stative /ku + CB + Vk + a/ [kub:ika] 'to be stealable'

(x) infinitive /ku + Ct + a/ [kut:a] 'to kill'

passive /ku + Ct + Vβu + a/ [kut:iβwa] 'to be killed'

applied /ku + Ct + Vl + a/ [kut:iɬa] 'to kill for'

causative /ku + Ct + VS + a/ [kus:isa] 'to cause to kill'[1]

stative /ku + Ct + Vk + a/ [kut:ika] 'to be killable'

1 The causative morpheme triggers off spirantization.

Though these roots contain no vowels, they behave like roots from the non-advanced tongue root series. Diachronically, of course, these forms are all derived from Proto-Bantu roots which had */-ji/ followed by a consonant: PB */-jib-/ 'to steal and */-jit-/ 'to kill' would naturally take /i,a,u/ suffixes.[1]

This data provides ammunition for proponents of absolute neutralization. They might, on the basis of it, claim justification for synchronic lexical representations of forms like these which are almost identical to the Proto-Bantu forms. Using extrinsically ordered rules they could get from /ku + jiβ + a/ 'to steal' and /ku + jit + a/ 'to kill' and all the extended forms of these verbs which display vowel harmony in a natural way. For these rules to work the linguist would have to ensure that the deletion of the weak syllable /-ji-/ did not happen before the suffix harmony rule. The derivation of [kut:iɬa] 'to kill for' might, for example, proceed like this:

(1) underlying representation

/ku + jit + Vl + a/

(2) Vowel harmony rule

/ku + jit + il + a/

Then the remaining rule would apply to yield a strong [t:] see (9.2.2.1) The two important points to take note of here are (i) the occurence of a non-advanced vowel in the suffix is regarded as a synchronic productive process and (ii) the importance of extrinsic rule ordering for this solution.

As elsewhere in this chapter the question that is to be asked

1 See (7.3.3), (9.2.2.1) and (9.2.2.2) for a discussion of the origin and status of strong consonants.

here is not whether absolute neutralization provides the correct explanation. There is no doubt that it does. The only question is whether that explanation is synchronic. It is very doubtful that the vowels in extension suffixes are regarded by any speaker synchronically as being phonologically conditioned by the abstract root vowel of /i/. There are about only a score of roots with /-CC-/ sequences. It is therefore not difficult to imagine that speakers learn as lists these verbs and the extension suffixes they can take. Memorizing verbs which take only non-advanced suffixes is made relatively easy by the additional fact that they are very common verbs in the language e.g. [kud:a] 'to return', [kuk:a] 'to come (go) down', [kum:a] 'to refuse'. Furthermore, as we shall see in (9.3.3) suffix vowel harmony is asymmetrical: the non-advanced series dominate so that unless it is explicitly stated that it is the advanced series that are involved it can always be assumed that it is [-a.t.r] that is the harmonizing feature. In other words one synchronic explanation for the occurence of non-advanced vowels after roots of the /-CC-/ type may be accounted for by the fact that [-a.t.r] is the unmarked member of the tongue root advancing opposition.

9.3.3 Some typological remarks

We shall base this discussion on the remarks on vowel harmony typologies outlined in Aoki (1968).

Direction. In verb extensions vowel harmony is progressive: it goes from left to right. The vowel of the root determines the specification of the extension vowel(s) for the feature 'advanced tongue root'[1]. In

1 In addition to Aoki (1968) other generative studies in vowel harmony include Lightner (1965), Zimmer (1967) and Vago (1973).

preprefix vowel harmony it is a different matter. Harmony is regressive: the vowel of the class prefix[1] determines the value for the feature 'grave' for the preprefix which goes before it.

Harmonizing features. As we noted earlier, preprefix vowel harmony operates on the feature 'grave': prefixes and preprefix must be [αgrave]. Suffix vowel harmony operates in terms of tongue root advancing: the verb root vowel and the extension suffix vowel must be [αa.t.r].

Asymmetry. In SSC3 it was stated that the root vowel determines the value for the feature 'advanced tongue root' for all the extension vowels that follow it. We must modify that statement. Vowel harmony is disrupted when, having started off with a harmonizing advanced tongue root vowel, there occurs a switch to the non-advanced tongue root series. In the examples in (i), (ii) and (iii) below vowel harmony goes as SSC3 would predict, with non-advanced vowels in all extensions where the root vowel is non-advanced but in the examples in (iv) through (vi) vowel harmony starts off with the -advanced series and ends with the non-advanced.[2]

Examples

(i) Static: /ku + sit + am + a/ [kusitama] 'to squat down'

static + passive: /ku + sit + am + Vβu + a/ [kusitamibwa] 'to be squatted down'[3]

static + applied: /ku + sit + am + Vl + a/ [kusitami$\int$a] 'to squat down for/at'

conversive: /ku + sit + Vk + a/ [kusituka] 'to stand up'

conversive + applied: /ku + sit + Vk + Vl + a/ [kusituli$\int$a] 'to stand up for'

1 This term is used loosely to cover independent prefixes as well see (0.4.2.1)

2 These syntactic semantic labels are taken from Ashton et al. (op.cit.) Their syntactic/semantic justification is not crucial to the argument here.

3 As in [kusitamibwa:ko] 'to be squatted down on'

conversive + applied + associative /ku + sit + Vl + agan + a/ [kusituʃagana] 'to lift each other up'

conversive + applied + associative + applied /ku + sit + Vl + Vl + agan + Vl + a/ [kusituliʃaganiʃa] 'to lift up each other for'

(ii) static: /ku + kut + am + a/ [kukutama] 'to bow the head, bend down'

static + applied: /ku + kut + am + Vl + a/ [kukutamiʃa] 'to bow to'

static + conversive + conversive: /ku + kut + am + Vl + Vk + a/ [kukutamuʃukuka] 'to straighten oneself up'

static + applied + associative + applied: /ku + kutam + Vl + agan + Vl ≠ a/ [kukutamiʃaganiʃa] 'to bow to each other'

(iii) contactive: /ku + ku + at + a/ [kukwa:ta] 'to catch, seize'

contactive + applied: /ku + ku + at + Vl + a/ [kukwa:tiʃa] 'to catch for'

contactive + applied + associative + applied: /ku + ku + at + Vl + agan + Vl + a/ [kukwa:tiʃaganiʃa] 'to catch each other at'

(iv) infinitive: /ku + tom + a/ [kutoma] 'to aim'

applied: /ku + tom + Vl + a/ [kutomeʃa] 'to charge into, bump into'

applied + associative /ku + tom + Vl + agan + a/ [kutomeʃagana] 'to bump into each other'

applied + associative + applied: /ku + tom + Vl + agan + Vl ≠ a/ [kutomeʃaganiʃa] 'to bump into each other at'

(v) infinitive: /ku + goβ + a/ [kugoβa] 'to chase'

associative + applied: /ku + goβ + agan + Vl + a/ [kugoβaganiʃa] 'to chase each other for'

(vi) infinitive: /ku + tem + a/ [kutema] 'to cut'

associative + applied: /ku + tem + agan + Vl + a/ [kutemaganiʃa] 'to cut each other for'

conversive + associative + applied: /ku + tem + Vl + agan + Vl + a/ [kutemuʃaganiʃa] 'to murder each other for'

Examples (iv) through (vi) above show the asymmetrical nature of extension suffix vowel harmony. The non-advanced vowels are the

dominant series. The /u/ of the conversive suffix and the /a/ of the static and the associative suffix which do not show any alternation are significantly all non-advanced vowels. The non-alternating vowels would have to be specified for the feature 'advanced' in the underlying representation because their value for this feature cannot be predicted on the basis of whether or not the verb root vowel is [± a.t.r]. These vowels have to be specified as [-a.t.r] because they are not neutral with regard to vowel harmony. In the examples in (iv) through (vi) these non-alternating vowels are followed in every case by vowels from the non-tongue advanced series: the presence of a non-advanced vowel causes a switch from [+ a.t.r] to [-a.t.r].

Suffix extension vowel harmony could be approached in terms of markedness. One could argue that [-a.t.r] vowels are unmarked and [+ a.t.r] vowels are marked. In the event of a conflict between [+ a.t.r] and [- a.t.r] vowels the unmarked [- a.t.r] vowels prevail.

To express extension suffix vowel harmony two If-Then conditions will be required:[1]

SSC4 If [[[- cons, ∝a.t.r.] C_o] ([[- cons] C_o])^n]

Then [([∝a.t.r])^n] Exts

Exts

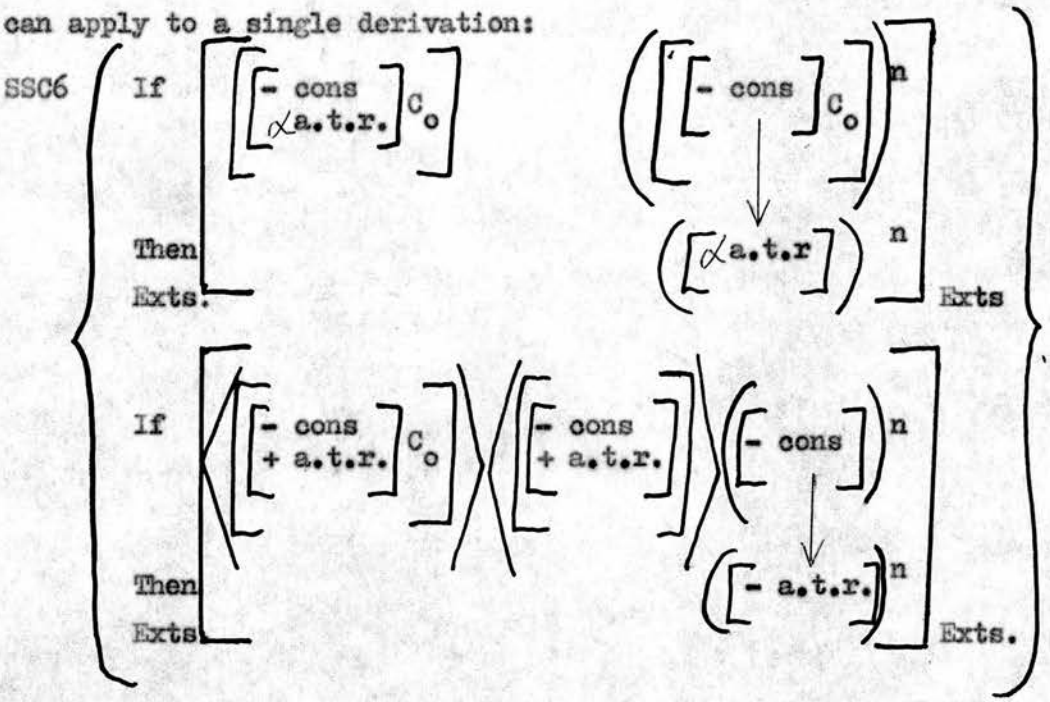
SSC5 If [⟨ [[- cons, + a.t.r.] C_o] ⟩ ⟨ [[- cons, - a.t.r.] C_o] ⟩ ([- cons])^n]

Then [([- a.t.r])^n] Exts

Exts.

1 'Exts' means extended verb stem. It includes the verb root and extension suffixes but does not include the basic (or non-basic) verbal suffix which occurs finally in a verb stem (0.4.2.2)

These two conditions can be collapsed as SSC6 which is a disjunction of SSC4 and SSC5: only one of these If-Then conditions can apply to a single derivation:



With this we shall end our discussion of vowel harmony in Luganda and of morphophonology in general and turn to word structure output conditions.

10. PHONOLOGICAL WORD STRUCTURE CONSTRAINTS

Phonological word structure constraints are output conditions on systematic phonetic sequences within the domain of a phonological word (4.3.2). They apply only within this domain and have no effect beyond it.

10.1 Phonological word structure conditions on vowels

10.1.1 Only low vowels occur word initially

One interesting fact about the distribution of vowels in Luganda is that only low vowels may occur word initially, and even root initially the occurence of non low vowels is extremely rare. In the underlying representation any vowel might occur initially but in fact initial non low vowels are not common. So far the only roots commencing with a non-low vowel which I have found are /-iso/ [-iso] 'eye' and /-uNgu/ [-u:ŋgu] 'vegetable marrow'. In the systematic phonetic representation only low vowels can occur initially. This has been recognised for some time by students of Luganda (cf. Cole:1967:6).

This constraint may be expressed as implicational set 2:

Implicational set 2: $\sim \# \begin{bmatrix} - \text{ cons} \\ - \text{ low} \end{bmatrix} \supset$ If # [-cons] ↓ Then [+ low]

The effect of this output condition can be seen in the vowel harmony rule in (9.3.1).

It is important to note that vowel lowering is a persistent process in Luganda which has a long history. Today the output condition banning non-low vowels from initial position lowers /i/ and /u/ to [e] and [o] respectively; diachronically it led to the lowering of close /i/ and /u/ which resulted in the merger of these vowels with

/i/ and /u/ respectively (7.3.1).

10.1.2 Demarcative vowel length

Cole (op.cit., 5-6) has suggested that word initially, except when followed by a CC[1] cluster, word initial vowels are phonemically long. This claim is very difficult to justify: if phonemic means unpredictable and distinctive then surely vowel length cannot be phonemic if it can be predicted by Cole's neat rule.

A more satisfactory alternative, and the one which we shall opt for is to regard initial - and final vowel length, for vowels are also long word finally[2] - as a demarcative feature. In Firthian terms, initial and final vowel length may be considered a prosody of word initial and word final position[3]. The phonetic realisation of vowels in these positions is discussed in (14.1.1) and (14.1.3) See also (11.4.5) for a discussion of some of the phonological issues involved in word final vowel length.

10.1.3 Vowel raising

In a phonological word any vowel preceding a front (i.e. [-grave]) vowel is realised as raised. Phonetically raising entails being articulated with the tongue slightly fronted and closer to the roof of the mouth. The acoustic effect of tongue raising is lowering F_1 values and raising F_2 values in spectrograms (see 14.5)

1 What he regards as CC sequences are regarded in this description as single strong consonants.

2 Ashton, et al., (op.cit) state that as a rule word final vowels are short. This claim is inaccurate as we shall see later in this section and in (14.1.3)

3 We have called this vowel length a characteristic of the phonological word because that is how it has been traditionally regarded (cf. Cole, op,cit.). In fact these remarks do not apply to the word in isolation but also to an entire phonological phrase.

Examples

/βa + som + a/ [βasoma] 'they read' /βa + som + i/ [βasomi] 'readers'

/βa + laβ + a/ [βalaβa] 'they see' /βa + laβ + i/ [βalaβi] 'viewers'

/V + mu + tii/ [omuti:] 'tree'

/βa +βi/ [βaβi] 'bad' (class 2, plural)

/a + li + na/ [alina] 'he has'

/βa +β e/ [βaβe] 'his' (class 2, plural possessed individual)

/βa + laβ + e/ [βalaβe] 'see them!'

/βa + som + e/ [βasome] 'let them read!'

The vowel raising rule can be expressed using SSC7[1].

SSC7 If # $\begin{bmatrix} -\text{cons} \\ +\text{syll} \end{bmatrix}$ X $\begin{bmatrix} -\text{cons} \\ -\text{grave} \end{bmatrix}$

Then $\downarrow$ [+ raised]

where X represents any number of segments which many be [± cons], [± syll].

10.2 Word structure conditions on consonants

10.2.1 The Ganda Law

The Ganda Law (also called Meinhof's rule) is responsible for some of the major complications of Luganda phonology. It is a rule whose application is limited to a single phonological word. Meinhof (1932:183) formulated this rule in these words:

> When two successive syllables both begin with a nasal plus a following voiced plosive, the plosive of the first syllable is lost.

Meinhof's formulation of the Ganda Law was not altogether accurate as one can see from these examples:

1 SSC7 is aimilar to Brown (1972)'s redundancy rule 35 stating vowel raising in Lumusaaba.

Examples

(i)

/N + βaNBa/ [m:a:mba]

'lung fish' (classes 9/10)

/ka + βaNBa/ [kaβa:mba]

'small lung fish' (class 12)

/N + laNga/ [n:a:ŋga]

'harp' (classes 9/10)

/ka + laNga/ [kaɭa:ŋga]

'small harp' (class 12)

/N + jiNB + a/ [ɲ:i:mba]

'I sing'

/ku + jiNB + a/ [kuyi:mba]

'to sing'

/N + gaNB + o/ [ŋ:a:mbo]

'rumours' (classes 9/10)

/lu + gaNB + o/ [luga:mbo]

'rumour' (class 11)

/N + jiNz + a/ [ɲ:i:nza]

' I am able'

/tu + jiNz + a/ [tuyi:nza]

'we are able'

/N + loNzaloNz + a/ [n:o:nzalo:nza]

'I vaccilate'

/tu + loNzaloNza/ [tulo:nzalo:nza]

'we vaccilate'

(ii)

/N + βun + a/ [m:una]

'I am covered with'

/ku + βun + a/ [kuβuna]

'to be covered with'

/N + limi/ [n:imi]

'tongues' (class 10)

/lu + limi/ [luɭimi]

'tongue' (class 11)

/N + jaajaan + Vl + a/ [ɲ:a:ya:niɬa]

'I long for'

/ku + jaajaan + Vl + a/ [kuya:ya:niɬa]

'to long for'

/N + gom + a/ [ŋ:oma]

'

/ka + goma/ [kagoma]

'small drum' (class 12)

(iii)

/N + bam + a/ [mbama]

'I rush about madly' [1]

/ku + bam + a/ [kubama]

'to rush about madly'

1 The presence of a handful of non-alternating /b/'s and /d/'s which have no continuant counterparts is what justifies setting them up as contrasting underlying units (0.4.1.2)

(iv)

/N + doNgo/ [ndo:ŋgo]	/ka + doNgo/ [kado:ŋgo]
'harp' (classes 9/10)	'small harp' (class 12)
/N + doNgu + a/ [ndo:ŋgwa]	/tu + doNgu + a/ [tudo:ŋgwa]
'I talk absolute rubbish'	'we talk absolute rubbish'

The Ganda Law applies to forms in (i) and (ii) but fails to apply to forms in (iii) and (iv). Meinhof's formulation of the rule would incorrectly predict its application in all the four sets of examples. The correct formulation of the rule can be informally stated as follows:

Structural description: /NCV$_1$N/

where N stands for any nasal

C for a nonstop, nonobstruent consonant (/β,l,j,g/)[1]

V$_1$ at least one vowel

Structural change: [N:V$_1$N]

Note that it is essential to specify the consonant following the nasal as $\left[\begin{smallmatrix}-\text{ stop}\\-\text{ obstr}\end{smallmatrix}\right]$ because the Ganda Law operates only in (i) and (ii) where the underlying representation of the stop following the first nasal is $\left[\begin{smallmatrix}-\text{ stop}\\-\text{ obstr.}\end{smallmatrix}\right]$. It is for this reason that the rule fails to apply in (iii) and (iv) where the plosive following the first nasal is derived from a consonant which is $\left[\begin{smallmatrix}+\text{ stop}\\+\text{ obstr.}\end{smallmatrix}\right]$. This fact is not brought out in Meinhof's formulation of the Ganda Law. Another fact which is missed in the original formulation is that the first nasal is phonetically strengthened as a result of this operation

1 The curious behaviour of /g/ as a nonobstruent, nonstop will be discussed later in this section and in (13.2).

in Luganda[1]. A further point to note is that the presence of a plosive after the second nasal is not necessary in the structural description of the Ganda Law: it operates on examples in (ii) where the second nasal is directly followed by a vowel.

The Ganda Law is discussed by Meinhof under the heading "Dissimilation of Nasal Compounds". This seems to be inappropriate. Surely its effect is not to cause dissimilation. It could more revealingly be regarded as a consonant harmony rule for it makes two successive syllable onsets agree in specification for the feature value [+nasal].[2]

Let us now turn to the curious involvement of /g/ in the Ganda Law. We claimed for the Ganda Law to apply the consonant following the first nasal must be $\begin{bmatrix} - \text{ stop} \\ - \text{ obstr.} \end{bmatrix}$ yet the /g/ which is $\begin{bmatrix} + \text{ stop} \\ + \text{ obstr.} \end{bmatrix}$ is affected. There is no straightforward explanation. We shall offer this tentative explanation: let us first of all assume that the same segment may simultaneously belong to more than one natural class: which natural class it belongs to being determined by the phonological process it is involved in (Lass:1973). An underlying /g/ is a stop everywhere except when it is involved in the Ganda Law. For this process it is classified as a nonstop obstruent. There is good

1 Meinhof's formulation of this rule is correct in this respect in the case of other Bantu languages which have the Ganda Law but which do not have strong consonants e.g. Lumasaaba (cf. Brown:1972)

2 Of course, the purpose of these criticisms is not to cudgel Meinhof. Working with very limited data this great Bantuist was able to recognise one of the central phonological processes of Luganda and indeed of many other Bantu languages. In spite of its shortcomings, his formulation of the rule was not too wide of the mark.

phonetic evidence for classifying this sound as a nonstop obstruent. Kymographic data show that intervocalically /g/ is often realised as [ɣ]; there is no complete closure (13.2). Note also that recognition of a phonetic [ɣ] and the possibility of the /g/ in the Ganda Law environment being analysed - only for that rule - as a velar continuant means that the segment structure rule which states that there are no velar continuants has to be modified. From the point of view of pattern congruity a velar continuant alternating with velar voiced stop completes the pattern of voiced stops alternating with velar continuants. As we stated at the outset this explanation is tentative.

The domain of the Ganda Law is limited to the phonological word. It cannot operate across word boundaries. Therefore /NCV # N/ sequences in the following examples are not affected by the Ganda Law:

(v)

/ # N + βa + a # mu + gaCga # / [mbamug:a][1] 'If I were rich....'

/ # N + βa + a # N + gul + a # / [mba:ŋgu.la] 'As I was buying...'

/ # N + li # ∅ + NBaale # / [ndi:mba:.le] 'I am at Mbaale'

/ # N + juu # N + lala # [ɲɲu:nda.la] 'another house'

/ # Nga # N + βal + a/ [ŋ:ga:mba.la] 'when I am counting'

/ # a + ∅ + tuNg + a # N + goje # / [atu:ŋga:ŋgoye] 'he sews clothes'

/ # a + ∅ + jiNB + a # N + βuzi # [ayi:mba:mbuzi] 'he tethers goats'

/ # a + ∅ + luND + a # N + liga # [alu:nda:ndiga] 'he herds sheep'

/ # N + li + a# N + βeleNge # / [ndya:mbeʃe:ŋge] 'I eat popcorn'

/ #β a + tuND + a # N + βua # / [βatu:nda:mbwa:] 'they sell dogs'

1 The first [a] is not lengthened. The reason for this is still unclear.

Clearly the Ganda Law is an output condition on the phonological word stipulating that in the surface phonetic representation no word may have sequences of [NCV_1N] where C is derived from an underlying consonant specified as [- stop, - obstr.] Outside that domain such sequences are permissible. The sequences in (v) are therefore all permissible. The discussion up to this point may be summarised using the following rules:

a) Ganda Law word structure constraint:

$$\sim \# X \begin{bmatrix} + \text{cons} \\ + \text{nasal} \end{bmatrix} \begin{bmatrix} + \text{cons} \\ - \text{stop} \\ - \text{obstr.} \end{bmatrix} [- \text{cons}] \left([- \text{cons}] \right) \begin{bmatrix} + \text{cons} \\ + \text{nasal} \end{bmatrix} X \#$$

where X stands for segments not relevant to this output condition.

b) Traffic rule 2

$$\text{If } \# X \begin{bmatrix} + \text{cons} \\ + \text{nasal} \end{bmatrix} \begin{bmatrix} + \text{cons} \\ - \text{stop} \\ - \text{obstr.} \end{bmatrix} [- \text{cons}] \left([- \text{cons}] \right) \begin{bmatrix} + \text{cons} \\ + \text{nasal} \end{bmatrix} X \#$$

$$\text{Then } [+ \text{P-rule 2}][+ \text{P-rule 2}][+ \text{P-rule 2}][+ \text{P-rule 2}][+ \text{P-rule 2}]$$

c) P-rule 2

$$\# \begin{bmatrix} + \text{cons} \\ - \text{stop} \\ - \text{obstr.} \end{bmatrix} \rightarrow \emptyset \Big/ \begin{bmatrix} + \text{cons} \\ + \text{nasal} \end{bmatrix} __ [- \text{cons}] [- \text{cons}] \begin{bmatrix} + \text{cons} \\ + \text{nasal} \end{bmatrix} \#$$

d) This derivation is completed by the compensatory lengthening sequential redundancy rule which specifies the first nasal is long (11.4.3.2). In order to correctly specify the first nasal as long in the present model the Ganda Law has to be a global rule looking back to the previous stages of the derivation and forward to the

ultimate phonetic realisation. It is necessary to check the derivational history in order to find out whether the plosive following the first nasal is derived from a consonant which is $\begin{bmatrix} - \text{ stop} \\ - \text{ obstr.} \end{bmatrix}$. It is necessary to look forward to the output in order to establish that it is going to form one phonological word.

Where a sequence has a Ganda Law derivational history its first nasal will be specified $[+ \text{ long}]^1$.

SSC8

$$\text{If } \underset{\text{G.L.}}{\left[\begin{bmatrix} + \text{ cons} \\ + \text{ nasal} \\ + \text{ G.L.} \end{bmatrix} [- \text{ cons}] \left([- \text{ cons}]\right) \begin{bmatrix} + \text{ cons} \\ + \text{ nasal} \end{bmatrix}\right]_{\text{G.L.}}}$$

$$\downarrow$$

$$\text{Then } [+ \text{ long}]$$

where $\underset{\text{G.L.}}{[\quad]_{\text{G.L.}}}$ means 'with a Ganda Law derivational history'.[2]

The Ganda Law is a phonological word structure rule; an equally strong case could be made for regarding it as a morphophonological rule. In all examples of the Ganda Law the first nasal is either an exponent of the first person, singular pronoun or a classes 9/10 prefix. It is arguable that the Ganda Law is not simply a phonological word structure rule but is rather a morphophonological rule. We have chosen to call it a word structure rule because it is possible to state it without reference to any morphological information even in a relatively non-abstract description.

1 'Long' is being used as a cover term for strong consonants. For a more precise statement see chapter 13.

2 The use of global rules to state the Ganda Law may be an artefact of our model. It is quite possible that a formulation of the rule which avoids global rules could be made.

One last point which we shall make about the Ganda Law is that it is a major source of strong consonants. In languages like Lumusaaba where there is no strengthening of the kind found in Luganda the deletion of the continuant is not compensated for. In Luganda where strengthening is a favourite phonological process (9.2.1) the deletion of the continuant following the first nasal leads to the strengthening of the nasal in compensation. See the example in (i) and (ii) above.

The strengthening produced by the Ganda Law should not be confused with the strengthening which occurs when two nasals, each having its own raison d'être abut:

Examples

/N + male/ [m:ale] 'lung fish' (classes 9/10)	/ka + male/ [kamale] 'small lung fish' (class 12)
/N + mese/ [m:ese] 'mouse' (classes 9/10)	/ka + mese/ [kamese] 'small rat' (class 12)
/N + mil + a/ [m:ila] 'I swallow'	/tu + mil + a/ [tumila] 'we swallow'
/N + nog + a/ [n:oga] 'I pick fruit'	/tu + nog + a/ [tunoga] 'we pick fruit'

The Ganda Law is the last word structure rule which we shall discuss. In the next chapter we shall turn to surface phonotactic output conditions.

11 PHONOTACTIC CONSTRAINTS

Recall we stated in (4.3.3) that phonotactic constraints are output conditions which all surface representation in phonology must conform to. No inadmissible surface phonetic sequence can go through these filters[1]. While morphophonological constraints apply only to some subsystems in the phonology and word structure rules apply only within the domain of the word, phonotactic constraints apply everywhere within the phonological phrase which constitutes their maximum domain[2]. The constraints described here apply obligatorily in citation forms and slow speech. They are not absolute in allegro speech.

11.1 Consonant sequence constraints

In the surface phonetic representation in Luganda the only permissible consonant sequences are those where a homorganic nasal is followed by a non-nasal consonant.

Examples

initially		medially	
/N + βua/	[mbwa:] 'dog'	/ku + saNB + a/	[kusa:mba] 'to kick'
/N + pisi/	[mpisi] 'hyena'	/ku + Npi/	[ku:mpi] 'near'
/N + fun + a/	[ŋfuna] 'I get'	/mu + saNvu/	[musa:ŋvu] 'seven'
/N + te/	[nte] 'cow'	/mu + Ntu/	[mu:ntu] 'person'
/N + juu/	[ɲ,ʃ:u:] 'house'	/V + N + juu/	[e:ɲ,ʃu:] 'house'
/N + koko/	[ŋkoko] 'hen'	/N + siNgo/	[nsi:ŋgo] 'neck'
/N + go/	[ŋgo] 'leopard'	/ma + Ngu/	[ma:ŋgu] 'quickly'

1 Surface (phonetic) representations will be roughly equivalent to the grossly allophonic representations of the traditional phonemicist.

2 For further discussion of rules with different domains see Chomsky and Halle (1968:12).

This constraint can be expressed by SSC9:

SSC9: If $\begin{bmatrix}+\text{ cons}\end{bmatrix}$ $\begin{bmatrix}+\text{ cons}\\ \alpha\text{ anterior}\\ \beta\text{ grave}\\ \gamma\text{ lingual}\end{bmatrix}$

Then $\begin{bmatrix}+\text{ nasal}\\ \alpha\text{ anterior}\\ \beta\text{ grave}\\ \gamma\text{ lingual}\end{bmatrix}$ $\begin{bmatrix}-\text{ nasal}\end{bmatrix}$

Phonotactic constraint 1 blocks any other consonant sequences in the surface phonetic representation. Several rules conspire to ensure that sequences which would, if left unmodified, violate this output condition are sorted out.

(i) When an underlying /CC/ sequence other than /NC/ occurs as in these examples:[1]

/ku + Ct + a/ [kut:a] 'to kill'

/ku + Cm + a/ [kum:a] 'to refuse'

/N + mese/ [m:ese] 'rat'

it is rejected by phonotactic constraints and goes to the traffic rules.

There traffic rule 3a indicates that it has to go to P-rule 2a for modification:

Traffic rule 3a: If $\begin{bmatrix}+\text{ cons}\\ \alpha\text{ nasal}\end{bmatrix}$ $\begin{bmatrix}+\text{ cons}\\ \alpha\text{ nasal}\end{bmatrix}$

Then [+ P-rule 2a] [+ P-rule 2a]

P-rule 3a consists of two simultaneous sub-rules[2]:

(i) $\begin{bmatrix}+\text{ cons}\\ \alpha\text{ nasal}\end{bmatrix} \rightarrow \begin{bmatrix}\overline{\text{long}}\end{bmatrix} \;/\; \begin{bmatrix}+\text{ cons}\\ \alpha\text{ nasal}\end{bmatrix} __$

(ii) $\begin{bmatrix}+\text{ cons}\\ \alpha\text{ nasal}\end{bmatrix} \rightarrow \emptyset \;/\; __ \begin{bmatrix}+\text{ cons}\\ \alpha\text{ nasal}\\ +\text{ long}\end{bmatrix}$

1 For detailed discussion see chapter 9.

2 Following Koutsoudas, Sanders and Noll (1974) we are not stipulating any extrinsic rule ordering.

(ii) Another rule is needed to block triconsonantal clusters which arise in the underlying representation when a nasal prefix is placed before a stem/root commencing with a /CC/ sequence. Such sequences are simplified in order to avoid a violation phonotactic constraints 1 which allows only [NC] sequences in the surface representation.

There are two strategies used to simplify triconsonantal sequences[1]. Where the root begins with a consonant followed by a nonnasal consonant, the first root consonant is deleted and an epenthetic [zi] syllable is inserted between the nasal prefix and the remaining root consonant which, after the deletion of the first consonant, now occupies the initial position.

Examples

infinitive		first person, singular, present tense	
/ku + Ct + a/	[kut:a] 'to kill'	/N + Ct + a/	[ɲzita] 'I kill'
/ku + Ck + a/	[kuk:a] 'to come (go) down'	/N + Ck + a/	[ɲzika] 'I come (go) down'
/ku + CB + a/	[kub:a] 'to steal'	/N + CB + a/	[ɲziβa] 'I steal'

These sequences are rejected by phonotactic constraint 1. They are consequently directed by traffic rule 3b to P-rule 3b for modification.

Traffic rule 3b: If [+ cons, + nasal] [+ cons] [+ cons, - nasal]

Then [+ P-rule 3b] [+ P-rule 3b] [+ P-rule 3b]

P-rule 3b: (i) [+ cons] → ∅ / [+ cons, + nasal] — [+ cons, - nasal]

1 See chapter 9 (passim) and (14.3.2) for discussion of other aspects of this problem. The analysis presented here was explained in (9.2.2.1) and (9.2.2.2).

(ii) $\emptyset \rightarrow$ [+ cons, + obstr., − stop, − grave, + voice] [− cons, − grave, − low] / [+ cons, + nasal] — [+ cons, − nasal]

Where the lexical root begins with /CN/ the initial consonant is deleted and the nasal prefix is realised as a strong palatal nasal [ɲ:]; epenthetic [i] is also inserted between the [ɲ:] and the nasal which after the deletion of /C/ occupies the initial position.

Examples

infinitive	1st person singular, present tense
/ku + Cm + a/ [kum:a] 'to refuse'	/N + Cma/ [ɲ:ima] 'I refuse'
/ku + Cɲ + Vk + a/ [kuɲ:uka] 'to leave work'	/N + Cɲ + Vk + a/ [ɲ:iɲuka] 'I leave work'

Traffic rule 3c sends these /NCN/ sequences to P-rule 3c to have their anomaly sorted out:

Traffic rule 3c: If [+ cons, + nasal] [+ cons] [+ cons, + nasal]
↓ ↓ ↓
Then [+ P-rule 3c] [+ P-rule 3c] [+ P-rule 3c]

P-rule 3c: (i) [+ cons, + nasal] → [− grave, − anterior, + long] / — [+ cons] [+ cons, + nasal]

(ii) [+ cons] → $\emptyset$ / [+ cons, + nasal, − grave, − anterior, + long] — [+ cons, + nasal]

(iii) $\emptyset$ → [− cons, − grave, − low] / [+ cons, + nasal, − grave, − anterior, + long] — [+ cons, + nasal]

All these three P-rules are obviously functionally related. They conspire together to prevent violations of Phonotactic constraint 1 which allows no consonant sequences in the surface representation except those specified by SSC9.

Implicational set 2:

$\sim > [+\text{ cons}] > \begin{Bmatrix}\text{P-rule 3a}\\ \text{P-rule 3b}\\ \text{P-rule 3c}\end{Bmatrix}$ [1]

(except SSC9)

where $>$ means 'no sequence greater than'

Another output condition affecting consonants is the requirement that any segment which is $\begin{bmatrix}-\text{ obstr.}\\ -\text{ nasal}\end{bmatrix}$ i.e. any one of the continuants /βlj/ is realised as a stop after a nasal.

Traffic rule 4: If $\begin{bmatrix}+\text{ cons}\\ +\text{ nasal}\end{bmatrix}$ $\begin{bmatrix}+\text{ cons}\\ -\text{ obstr.}\\ -\text{ nasal}\end{bmatrix}$

↓ ↓

[+ P-rule 4] [+ P-rule 4]

P-rule 4: $\begin{bmatrix}-\text{ obstr.}\\ -\text{ nasal}\end{bmatrix} \rightarrow \begin{bmatrix}+\text{ obstr.}\\ +\text{ stop}\end{bmatrix} / \begin{bmatrix}+\text{ cons}\\ +\text{ nasal}\end{bmatrix}$

Examples

/N + βuzi/ [mbuzi] 'goat' /ka + βuzi/ [kaβuzi] 'kid'

/N + liga/ [ndiga] 'sheep' /ka + liga/ [kaliga] 'lamb'

/ku + saNB + a/ [kusa:mba] 'to kick'

/ku + liND + a/ [kuli:nda] 'to wait'

See (0.4.1.2) and (0.4.1.3) for further discussion.

Earlier in (0.4.1.3) and (4.2.4) we argued for the maximum exploitation of the notion of redundancy and the minimum use of P-rules. On the basis of the arguments advanced there P-rule 4 will be replaced by SSC10 which states that the archiphoneme of a stop

1 For a fuller more formal statement of an implicational set see Implicational set 1 in (9.1.2)

and a continuant is realised as a stop following a nasal:

SSC10: If $\begin{bmatrix} + \text{cons} \\ + \text{nasal} \end{bmatrix}$ $\begin{bmatrix} + \text{cons} \\ - \text{nasal} \\ + \text{voiced} \\ - \text{strident} \\ + \text{F} \end{bmatrix}$

Then $\downarrow$ [+ stop]

where F stands for any place of articulation features. SSC10 avoids the arbitrariness of regarding the underlying segment following a nasal where no morpheme boundary as a continuant which P-rule 4 forces upon the linguist.

11.2 Vowel influence: Palatalisation

SSC11 If $\begin{bmatrix} + \text{cons} \\ + \text{obstr.} \\ - \text{anterior} \end{bmatrix}$ $\begin{bmatrix} - \text{cons} \\ - \text{low} \\ - \text{grave} \end{bmatrix}$

Then $\downarrow$ [- grave]

Obstruent, nonanterior consonants are palatalised before /i/. In that position the opposition between velars and palatals is suspended. That is why we have represented the voiceless segment that occurs in that position as /K/ and its voiced counterpart as /J/ (0.4.1.3).

Examples

/Ki + Ntu/ [ci:ntu] 'thing'

/Ki + βila/ [ciβiɬa] 'forest'

/mu + Kila [muciɬa] 'tail'

/ma + Ji/ [maɟi] 'eggs'

/Ji + no/ [ɟino] 'these' (class 4, plural)

11.3 Nasalisation

Vowels are nasalised before and after nasal consonants. Nasalisation is particularly strong when a vowel occurs between

two nasal consonants.

SSC12 $\begin{bmatrix} - \text{ cons} \end{bmatrix} \rightarrow \begin{bmatrix} + \text{ nasal} \end{bmatrix} \; / \; \begin{bmatrix} + \text{ cons} \\ + \text{ nasal} \end{bmatrix}$ [1]

Examples

/mu + naana/ [mũnã:nã] 'eight'

/mu + Ntu/ [mũ:ntu] 'person'

/N + maNBa/ [m:ã:mba] 'lungfish'

/e + Nsi/ [ẽ:nsi] 'the world'

/a + N + laβ + a/ [ã:ndaβa] 'he sees me'

/SiNga/ [siŋga] 'if'

11.4 The syllable

The phonotactic constraints discussed in this chapter are best looked at as output conditions on the syllable.

Several linguists in recent years have argued for the recognition of the syllable as a unit with theoretical status in generative phonology. They have objected to the fact that Chomsky and Halle (1968) replace the feature 'vocalic' with the feature 'syllabic' but do not recognise the syllable as a theoretical construct in the standard theory (cf. Anderson, 1969; Anderson and Jones, 1972; Fudge, 1969b; Brown, 1972; Hooper, 1972; Vennemann, 1972).

Of course, interest in the syllable is not new. Linguists have for a long time worked with the notion of the syllable.

1 For the mirror image convention see Bach 1968.

Traditionally a distinction has been drawn between the phonological and the phonetic syllable. The phonological syllable has been a construct employed to state constraints on segment sequence. This statement of Sommerfelt (1931) is representive:[1]

> ...la constitution syllabique fait partie du système phonologique, il faut le répéter. Elle est d'importance capitale pour l'explication phonologique.

And as for the phonetic syllable, there have been two main views: the motor theory, mainly associated with Stetson (1928) and the older acoustic/auditory theory which can be traced back to Jespersen and Saussure and to Sweet before them. Neither of these two views has proved altogether satisfactory (cf. Pike, 1943; Ladefoged, et al., 1958). Although there is no agreement yet on the nature of the syllable, many linguists find the syllable a useful construct in accounting for certain phonetic phenomena such as the distribution of various segments (cf. O'Connor and Trim: 1953) and rhythm (cf. Abercrombie:1967). Furthermore, a number of recent studies (e.g. Fromkin:1968, 1971, and references cited there) have produced evidence from tongue slip phenomena which very strongly suggests that speech is programmed in syllable size units.

Besides evidence from speech errors there is data from studies of neuro-muscular activity in articulation which seems to support unequivocally the claim that "the minimal linguistic unit corresponding to the motor commands which produce speech is larger than the phoneme, perhaps more of the order of a syllable"(Fromkin:1965:163). In their

1 The same point is made by Trubetzkoy (1939), Haugen (1956), O'Connor and Trim (1953), Rosetti (1963), Pulgram (1970). For a good textbook treatment see Abercrombie (1967).

influential monograph, Kozhevnikov and Chistovich (1965) also make the same point. They argue that if there were independent and discrete segmentially ordered commands for the execution of each phoneme no plausible explanation would be found for the way 'segments' slur into each other in the stream of speech. The fact that sounds slur into each other has been taken by these authors as evidence for the claim that it is the syllable rather than the phoneme which should be regarded as the unit of motor programming. The puzzle of sounds slurring into each other is not too baffling if one assumes that articulatory organs must be fed with information of the second sound when the first is being executed.

Some have even gone further. Ohala (1970), for example, envisages a model where an entire phonological phrase is temporarily stored, with all phonological units in their appropriate order in which they are going to be articulated; eventually a certain mechanism tracks this display by activating the requisite vocal cord command sets (op.cit., 133). The idea of larger-than-syllable units of phonological programming seems to be well supported vowel harmony rules which operate on several vowels in adjacent syllables and by consonant harmony rules like the Ganda Law whose scope covers several syllables. This last line of inquiry deserves serious attention, however, we shall not pursue it any further. We shall stick to syllable structure rules.

The aim of 11.4.1 has been to show that the syllable is a valid theoretical construct.[1] In the rest of this chapter we shall discuss the status of the syllable in Luganda and output conditions which regulate syllable structure in this language.

1 The syllable has to be justified in view of attacks on it by scholars like Kohler (1966).

11.4.1 The syllable in Luganda

The standard analysis. In the Standard analysis of the Luganda syllable (Ashton et al., 1954; Tucker, 1962; Cole, 1967), the following syllable types are distinguished by Tucker (1962):

short syllables (op.cit., p.120)

Initial	Medial	Final
CV-	-CV-	-CV
	(-$C^{w}/_{y}$ V-)	-$C^{w}/_{y}$V
V-		
N-		
G-		

Long syllables

Initial	Medial	Final
CVV-	-CVV-	(-CV)
$C^{w}/_{y}$V-	-$C^{w}/_{y}$V-	(-$C^{w}/_{y}$V)
CVN-	-CVN-	
CVG-	-CVG-	
VN-		
VG-		

where C= consonant

V = vowel

G = syllabic consonant before its geminate

N = syllabic nasal before homorganic consonant

$^{w}/_{y}$ = either [w] or [y]

The analysis used in this description. The syllabification proposed by Tucker is plausible but it clashes with the intuitions of native speakers. This point has already been made by Stevick (1969:3).

He writes:

> When a Ganda speaker pronounces a word a bit at a time, my data indicate that the breaks came after vowels: bafumba 'they cook' is ba fu mba, and not *ba fum ba. Similarly okujja 'to come' is o ku jja and not o kuj ja; okuliima 'to spy' is o ku lii ma and not *o ku li i ma. What we have represented by open space in these examples may appropriately be called 'natural syllaboid breaks'. They do not coincide with the syllable boundaries postulated by Cole (pp 14f.) or Tucker (p.133).

Stevick's observations are correct. When the syllable is regarded as a unit of neurological programming all evidence so far points to the correctness of Stevick's analysis.

In the present study we examined several varieties of children's 'secret languages' called 'Ludikya' in Luganda which depend crucially on the isolation of syllables and syllable nuclei.

The Ludikya data used in this experiment were gathered by the following method: ten sentences, all of them well-known proverbs, were written down by me in the standard orthography and presented to six primary school children in standard 7 by their teacher[1]. All of them were literate but none of them was a particularly sophisticated speaker of Luganda. They were given instructions to write those ten sentences down in one Ludikya 'dialect' with which they were conversant. (There are many versions of Ludikya). The sentences used in the experiment are given in appendix 1. In the text we have illustrated with sentence 9 which contains all the points we want to make about the syllable. Subjects' transcriptions are in the standard

1 Standard 7 is the last year of primary school.

orthography[1].

Examples

/N + taNBaal + i # ji + a # Ki + ɲomo # V + liCɲ + a # V + mu + tii # Nga # ji + e + tiCk + i + e # /

[nta:mba:zi ya: ciɲome:ɾiɲ:o:muti:ŋga ye:tis:e]

The Kinyomo (a large black ant) is an audacious chap, he climbs a tree with a load on his back.

A. Ntatifu mbaatifu zitifu yatifu kitifu nyotifu motifu etifu ritifu nyatifu otifu mutifu ngatifu yeetifu ssetifu

B. Ntabandakakata ya kinyondokoto erinyandakata omutindokoto nga yetissendekete

C. Ntambaababuzi ya kinyobunyo, eribunya omubunti nge yetibuusse

D. Zimbaanta monyoki ya nyarie timuo setiyenga

E. Zimbaanta monyikiya nyarie timuo nga ssetiye

We shall only outline the rules of Ludikya which are relevant to the syllable. Let us begin with dialect A. To arrive at his version subject A adds an extra rule to his grammar which inserts the nonsense syllables ti-fu after every syllable in the surface phonetic representation of Luganda. Any segment sequence analysed by speaker A as a syllable has tifu added after it. Thus standard Luganda ntambaazi becomes ntatifu mbatifu zitifu and similarly yeetisse becomes yeetifu ssetifu. It is important to note that in his treatment of NC sequences and of sounds which are written with two identical consonants the speaker of dialect A does not insert tifu (i.e. a syllable boundary) between the nasal and the following consonant or between the first of two identical consonants: for this

1 There are a few spelling mistakes in the sentences written by the pupils. Sometimes they write just one vowel or consonant instead of two. [one]

speaker these sequences are always seen as part of the same syllable regardless of their position in the word. Initial and medial NC are treated as part of one syllable cf. ntambaazi 'an impossible person' rendered in Ludikya as ntatifu mbaatifu zitifu. Similarly orthographical CC (and also underlying CC) sequences are assigned to a single syllable. Thus, for instance, the CC sequence in erinnya 'it climbs' -nnya ([ɲ:a]) is treated as a single syllable tifu is inserted after e, ri and nnya. Likewise, the CC sequence in yeetisse is assigned to a single syllable.

Data from the other dialects where it is relevant can also be used to support the view that VCV and CCV sequences anywhere in the word are taken by native speakers as single syllables. Thus in dialects D, E and F where rules which derive Ludikya from Luganda have the effect of rearranging in reverse order the syllables of a phonological word NCV and CCV sequences are treated as single syllables and written in reverse like any other syllable types.

This behaviour of naive native speakers who have no hang-ups about the syllable provides a serious counter-examples to the standard analysis of the Luganda syllable with regard to NC and CC sequences. Cole (1967:13) states that when initial the first consonant of an NC or CC sequence is syllabic and has tonal capacity but when medial the first consonant of CC sequence is non-syllabic but bears a tone; the nasal of an NC sequence loses both its tone and syllabic value medially. If this analysis were correct CC and NC would not be analyzed as belonging to one syllable. But in fact they are as we have shown above. The native speaker's intuitions about the syllable structure of Luganda cannot be adequately characterized, it would seem, by an analysis where there are closed syllables: for the native speaker

all syllables must have a vocalic nucleus finally. All syllables are open . It is therefore claimed here that the analysis of underlying CC sequences as geminates in the surface representation is incorrect. We shall regard underlying CC sequences as being realised phonetically as one strong syllable initial consonant[1]. Similarly NC sequences should be assigned to one and not to two syllables for the same reason.

These Ludikya data provide only indirect evidence for the syllable as a unit of speech programming. The psycho-neurological mechanisms which underly speech are not available for direct observation. The inferences we make about those mechanisms are at this stage of our science no more than informed guesses: the behaviour of syllables in Ludikya does not conclusively prove that they are the unit of speech programming. We shall therefore supplement the suggestive but elusive evidence presented in this section with more concrete data in the next section.

11.4.2 The syllable and rhythm

In this section we shall discuss the syllable as a unit of phonetic realisation - a unit in terms of which statements about the distribution of phonetic segments and about rhythm will be made.

The Luganda syllable has two parts: a nucleus which is obligatory and an onset which is optional. The nucleus is composed of a vowel which may be long or short[2]. The onset may be composed of

1 See Chapter 13 (passim) for a discussion of the phonetic characteristics of strong consonants.

2 We are ignoring for the moment syllabic [m] which may occur finally when a following [u] is dropped.

any one of the following: C, C: , CG, C:G, NC, NCG, where C = consonant and G = a glide (i.e. nonsyllabic [y] or [w].

Three syllable types can be distinguished on the basis of the number of morae they contain[1]. In (11.4.5) syllables are classified as short, medium and long depending on whether they have one, two, or three morae. A single underlying vowel has one mora, two underlying vowels have two morae; a single underlying consonant has no mora but a sequence of two underlying consonants has the value of one mora in the surface representation (Stevick:1969:1). The mora is essentially a tone bearing unit but it is also intimately related to length. Consequently this simple algorithm for predicting mora values of segments will not always work because of the interference of rules which regulate consonant and vowel length (11.4.3.1) and (11.4.3.2).

Output conditions governing the distribution of morae provide the key to the structure of the Luganda syllable.

(i) The syllable onset may contain one mora or none at all.

a) The syllable onset contains no mora where it is C or CG (G = nonsyllabic high nonconsonant i.e. a glide)

Examples[2]

C /tem + a/ [tema] 'cut!'

CG /lu + jejo/ [lwe:yo] 'broom'

b) The N of an NC syllable onset has one mora.

Examples

/N + βuzi/ [mbuzi] 'goat'

/sa + NB + a/ [sa:mba] 'kick!'

1 The mora is the tone bearing unit. There may be more than one mora is a syllable. Luganda is a mora-counting and not a syllable-counting language (cf. Trubetzkoy:1939:173) and also see Tucker (1962).

2 For further examples of syllable types see (11.4.5)

c) A strong consonant functioning as a syllable onset also has one mora.

Examples

/C + paapaali/ [p:a:pa:li] 'paw-paw'

/mu + CDo/ [mud:o] 'grass'

ii) The syllable nucleus, which is as a rule, a vowel (but see (c) below) must contain at least one mora but it cannot exceed two morae (see 11.4.3.1).

a) The nucleus vowel has one mora except when it is long.

Examples

/mu + kazi/ [mukazi] 'woman'

/βa + laβ + a/ [βalaβa] 'they see'

b) The nucleus vowel has two morae if it is long.

Examples

/mu + ana/ [mwa:na] 'child'

/βa + ana/ [βa:na] 'children'

c) The nucleus may consist of a bilabial nasal. Syllabic [m̩] is restricted to word (or phonological phrase) final position and it seems (on the basis of rather sketchy preliminary observations) to occur only in allegro speech; it is very unlikely to occur in citation forms. Syllabic [m̩] arises when /mu/ is realised as [m̩] with the final /u/ being deleted. The [m̩] takes over the mora(e) and tone(s) of the following underlying vowel(s)

Examples

Morphophonemic representation	Citation Form	Allegro form	
/mù + límú/	[mùlímú]	[mùlím̩]	'work'

1 Tones are indicated where they are relevant to the problem under discussion. Here they help to resolve questions of length and underlying representation: a falling tone indicates two underlying vowels.

Morphophonemic representation	Citation form	Allegro form	
/mù + témú/	[mùtémú]	[mùtém]	'murderer'
/ʀì + ɲúmú/	[cìɲúmú]	[cìɲúm]	'merry-making'
/Ǹ + kúmù/	[ŋ̀kúmù]	[ŋ̀kúm]	'plenty'
/βù + múù/	[βùmû:]	[βùm̂]	'at one'
/βù + vùmúù/	[βùvùmû:]	[βùvùm̂]	'boldness'
/Ǹ + tàmúù/	[n̩tàmû:]	[n̩tàm̂]	'cooking pot'

Experimental evidence to support the claim that /m/ may be realised as syllabic and finally is given in (13.4).

(iii) The constraints stated in (i) and (ii) above mean that the maximum number of morae a syllable may have is three. All permissible syllables in Luganda conform to the requirements imposed by these three output conditions. Various combinations of onsets and nuclei within these limitations yield the syllable types shown in (11.4.5)[1].

So far the mora has been taken for granted and no justification has been offered for decisions concerning mora assignment. In the remainder of this section we shall show the motivation for claiming that certain segments have one or two morae. Two types of evidence will be used: Kiganda music rhythm and the behaviour of tones.

1 The structure of the Luganda syllable could be profitably approached in dependency terms (Anderson and Jones:1972). It could be argued that there is a dependency relation holding between the onset mora and the nucleus mora(e) in syllable which have an onset mora. The mora of the onset is subordinate to that of the nucleus
a) in the sense that the nucleus is the peak of sonority in the syllable and therefore the onset mora is inferior to it in prominence,
b) it is dependent in the more formal sense: the occurence of an onset presupposes the presence of a nucleus, but not vice versa.

Several scholars (e.g. Tucker, 1962; Cooke, 1970) have observed that constraints on Luganda speech rhythm are carried over into Kiganda song so that remarks valid for one will generally also be valid for the other.

Cooke (op.cit.) has observed that in bakisimba dance songs (a very common song type in Buganda) an isochronous clap usually accompanies song, and when drums are used the deepest drum (called the mpuunyi) underlines this clap. This isochronous clap and drum beat is central to Kiganda song rhythm. In bakisimba songs the clap pulse falls on every sixth mora. On the basis of this information it is relatively easy to count the number of morae in an utterance.

Note that it is sometimes impossible to state unequivocally where the clap pulse (and mora) falls. This is especially true where a vowel is followed by an NC sequence. It is for all practical purposes impossible to draw the line between the vowel and the following nasal (14.4). In such cases it may be more rewarding to regard the mora as belonging partially to the vowel and partially to the nasal of the NC sequence.

Song rhythm can be regulated by the handclap coming on every sixth mora because morae are roughly equal in length. To ensure that morae are approximately equal in duration various phonetic rules shorten or lengthen segments where necessary. For instance a C in an NC sequence will be much shorter than a C elsewhere (see chapters 13 and 14, passim).

Cooke (op.cit.) in his remarks about the two Kiganda xylophone techniques (the amadinda and the akadinda styles), again illustrates the role of the mora in regulating song rhythm. In both styles

players strike the xylophones metronomically, at mora regulated intervals. In the amadinda style the interval is two morae and in akadinda style the interval is three morae. A long syllable nucleus counts in both styles as two morae. The two xylophone techniques furthermore provide support for the claim that the nasal in an NC sequence and a strong consonant have the value of one more: each of these has an ancillary note struck for it on the xylophone. The fact that both of them get only an ancillary note suggests that we are correct in regarding them as dependent on the nucleus to which they are subordinate in sonority.

Musical evidence which shows the importance of the mora as a unit in terms of which statements about Luganda rhythm can be made is only indirectly relevant. In the remaining paragraphs of this section we shall adduce tonal evidence, which is internal to linguistics, to support our syllabification. Tone is referred to only in so far as it is relevant to syllabification[1].

Let us begin by making the following preliminary observations:

a) Consecutive low tones are perceived as having approximately the same pitch:

/mù + sòtaá/ [mùsòtâ:] 'snake' (- - ¯ -)

/βì + gèléé/ [βìgèrê:] 'feet' (- - ¯ -)

b) Consecutive high tones are also perceived as having the same pitch:

/tóótóóm + á/ [to:to:má] 'grumble!' (¯ ¯ ¯ ¯ ¯)

/βì + súmúlúzó/ [βìsúmúlúzó] 'keys' (- ¯ ¯ ¯ ¯)

c) When a mora bearing a low tone follows a mora bearing a high tone

1 This is not meant to be a detailed analysis of tone in Luganda; for that the reader may refer to Tucker (1962, 1967), Cole (1967), Meeussen (1965, 1966), Stevick (1969a) and Heny (1971).

the tone of the second mora drops considerably - about a major fourth (Tucker:1967:xviii). In all these examples therefore the low tone on the final mora will be much low tone on the mora of the initial syllable.

Examples

/kù + kól + à/ [kùkóɭà] 'to work' (- ¯ _)

/kù + zín + à/ [kùzínà] 'to dance' (- ¯ _)

/mù + tím + à/ [mùtímà] 'heart' (- ¯ _)

d) In a sequence H_1LH_2 (where H = high tone and L = low tone), H_2 will be only slightly higher in pitch than L and considerably lower than H_1. Consequently in a long phonological word or in a phonological phrase successive high tones, if interrupted by low tones, will be perceived as increasingly less high in pitch. This phenomenon is known as downdrift. It is responsible for the falling intonation contour which characterises most non-interrogative utterances in Luganda and citation forms (a rising intonation contour is associated mainly with interrogative utterances). Compare the examples in (i) which show no downdrift with those in (2) which do.

Examples

(i) /Kì + sumúlúzó/ [cìsumúɭúzó] 'key' (- ¯ ¯ ¯ ¯)

/lù + lágálá/ [lùɭágáɭá] 'plantain leaf' (- ¯ ¯ ¯)

/kù + taβ + áNg + Vk + á/ [kùtáβá:ŋgúká] 'to be stirred up'(- ¯ ¯ ¯ ¯ ¯)

(2) /kù + laβ + àgán + á/ [kùɭàβàgánà] 'to see each other' (- ¯ _ - -)

/mù + tálìlá/ [mùtáɭìɭá] 'lanky person' (- ¯ _ -)

/kù + jím + Vl + Vl + á/ [kùyímìɭíɭá] 'to stand up' (- ¯ _ - -)

1 As only segments which count as morae bear tone, no marking will be made under consonants to show that they have morae where they are marked for tone.

It will have probably already become clear from the examples above that a phonetically short syllable nucleus has the value of one mora and that a long nucleus has two morae. Here are some more examples:

<u>short nuclei</u>

/mù + límú/ [mùlímú] 'work'

/lù + lágálá/ [lùlágálá] 'plantain leaf'

<u>long nuclei</u>

/kù + síím + á/ [kùsí:má] 'to be grateful'

/mú + ànà/ [mwâ:ná] 'child'

/léèt + á/ [lê:tá] 'bring'

A long syllable nucleus must have two morae and bear two tones as the last two examples show (we regard a falling tone (^) as a combination of high plus low tone). Some analysts have accepted this kind of analysis word medially but not word finally. Ashton, et al., (1954:6) and Stevick (1969a:3-4) have stated that word final vowels are short except in certain morpho-syntactic environments where they are followed by certain enclitics, in words like the following:

/mù + gòléè/ [mùgòlê:] 'bride'

/βì + súà/ [βìswâ:] 'anthills'

/mù + sòtáà/ [mùsòtâ:] 'snake'

/mù + sòlóò/ [mùsòlô:] 'tax'

They would regard the final vowel as being phonetically short though it bears a falling tone which is a sign of two morae. It is inconsistent to regard a falling tone medially as belonging to a long

syllable but to consider a falling tone finally as belonging to a short syllable. In fact experimental evidence shows that generally word final vowels are not short and that word final vowels with a falling tone are actually long (14.1.3).

Earlier in this section evidence from musical rhythm was adduced to support the claim that nasals in NC sequences and strong consonants count as one mora each and bear a tone. Now we are going to support this claim using internal linguistic evidence. We shall show that strong consonants and nasals in NC sequences cause the same tonal perturbations as vowels bearing tones we are ascribing to these consonants would.

In words with the tone pattern HLH as we saw above the final high tone is considerably lower than the first one. In the examples below the tone pattern of CVC:V words is identical to that of CVCVCV words.

Examples

/βí + βàlá/ [βíβàlá] 'fruit' (¯ _ -)

behaves like HLH words with a strong consonant bearing a low mora:

/kú + C̀m + á/ [kúm̀:á] 'to refuse' (¯ _ -)

/kú + C̀t + á/ [kút̀:á] 'to kill' (¯ _ -)

/mú + C̀B + í/ [múb̀:í] 'thief' (¯ _ -)

/lú + C̀zí/ [lúz̀:í] 'well' (¯ _ -)

/mú + C̀gó/ [múg̀:ó] 'stick' (¯ _ -)

/mú + C̀ká/ [múk̀:á] 'smoke' (¯ _ -)

And words with strong consonants which have the tonal pattern LHHHHH behave in the same way as CVCVCVCVCVCV words with the same tonal pattern.

Examples

/kù + súm + V́l + V́k + V́k + á/ [kùsúmúlúkúká] 'to come open' (- ‾ ‾ ‾ ‾ ‾)

is similar to

/kù + ĆkáĆk + án + á/ [kùḱ:áḱ:aná] 'to become mild' (- ‾ ‾ ‾ ‾ ‾)

/kù + gáĆŋ + ám + V́k + á/ [kùgáŋ́:amúká] 'to be at one's wits end'

(- ‾ ‾ ‾ ‾ ‾)

/kù + gáĆŋ + ál + ám + á/ [kùgáŋ́:alámá] 'to lie down anyhow' (- ‾ ‾ ‾ ‾ ‾)

/lù + saĆjálála/ [lùsáɲ́:alálá] 'flabby man' (- ‾ ‾ ‾ ‾ ‾)

/C̀ + súĆkámúĆgá/ [s̀:úḱ:amúǵ:á] 'mason-wasp'

From these data it is clear strong consonants have tone. Whether it is a low or a high tone can easily be inferred from the pitch perturbations which occur in vowels following strong consonants.

Evidence from tonal perturbations will also be used to support the claim that nasals in an NC sequence bears a tone. In the list below words with NC sequences have the same LHLH tonal pattern as a CVCVCVCV word like /mù + fálìsó/ [mùfálìsó] 'mattress' (- ‾ _ -); the second high tone is considerably lower than the first. This indicates that a low tone separates the two high tones. (This is the downdrift rule we mentioned earlier. See also Schachter and Fromkin 1968:106ff)).

Examples

/Ǹ + βáNBa/ [m̀:á:m̀bá] 'lung fish' (- ‾ _ -)

/Ǹ + fáNBa/ [ŋ̀fá:m̀bá] 'gross idler' (- ‾ _ -)

/Ǹ + káNBi/ [ŋ̀ká:m̀bi] 'encampment' (- ‾ _ -)

/mù + síNDé/ [mùsí:ǹdé] 'tramp of feet' (- ‾ _ -)

/lù + jíNBá/ [lùyí:m̀bá] 'song' (- ‾ _ -)

Where the nasal has a high tone it does not cause this kind of downdrift. If it is followed by a high tone that tone will have

approximately the same pitch. The words with NC sequences in the examples below have the same tonal pattern as /kù + téléβ + V́k + á/ [kùteɾéβúká] 'to lose hope' (- ‾ ‾ ‾ ‾)

Examples

/kù + liNB + V́k + á/ [kùlí:m̩bíká] 'to cause to overlap' (- ‾ ‾ ‾ ‾)

/kù + vúNB + V́k + á/ [kùvú:m̩bíká] 'to put under embers' (- ‾ ‾ ‾ ‾)

/kù + paŃg + V́l + á/ [kùwá:ŋ́gúlá] 'to conquer' (- ‾ ‾ ‾ ‾)

/kù + saŃg + V́l + á/ [kùsá:ŋ́gúlá] 'to erase' (- ‾ ‾ ‾ ‾)

/mù + téNDélá/ [mùté:n̩déɾá] 'stretch of land' (- ‾ ‾ ‾ ‾)

Earlier in our discussion of musical rhythm we observed that it is not possible to decide unambiguously whether the clap comes on the V: or on the N in a V:NC sequence. The same can be said about tone. It is not possible to decide in a principled way whether a tone belongs to the V: or to the N in a V:NC sequence because there is no discrete boundary between the long vowel and the nasal (14.4). Here we have placed the tone marking on the nasal; we could have equally well placed it on the long vowel.

It seems to me that one satisfactory solution would be to recognise the possibility on syllables with improper bracketing and abandoning the idea that all syllables must have discrete boundaries which has been shown to be wrong by acoustic phonetics (cf. Anderson and Jones:1972). If improper bracketing is allowed, then phonetically the tone of the nasal in a VCN sequence is assigned to two adjacent syllables simultaneously. For example [mùté:n̩déɾá] 'stretch of land' may be analysed as follows:

(mù) (té:(n̩)dé)(ɾá)
1 1 2 3 2 34 4

Note that we are claiming that this bracketing is only valid for the

syllable as a unit of phonetic realisation; for the syllable as a unit of motor programming the analysis we made earlier which would mean dividing [mùté:ndéɾa] into [mu, te:, ndeɾa] still stands. The syllable as a unit of phonetic realisation may end in a coda e.g. [té:n] but the syllable as a unit of motor programming always ends in a vowel.

11.4.3 Quantity

In this section we shall examine syllable structure from the point of view of duration. As duration is intimately related with morae and tone this section will complement the last one. Various processes affecting vowels and consonants will be seen in terms of conspiracies to maintain certain syllable structures with certain morae combinations.

11.4.3.1 Syllable nucleus morae regulating rules

There is an output condition on the syllable which stipulates that the maximum number of morae a syllabic nonconsonant may have is two and a corollary which states that syllabic nonconsonants may not abut in the domain of a phonological phrase. These phonotactic conditions are absolute. No surface representation in Luganda can violate them. To ensure that they are respected the grammar of Luganda has several rules which conspire to prevent inadmissible vowel sequences from occuring in the surface representation.

In a sequence of vowels where the first is [-low] and the second is [+ low] the former will be realised as nonsyllabic and the latter only will be syllabic. The second non-consonant will also be lengthened in compensation and get the mora of the non-low vowel.

a) Examples (within word boundaries)

/li + ato/ [lyâ:tó] 'boat'

/βi + oto/ [βyo:to] 'fire-places'

/mi + ojo/ [myo:yo] 'souls'

/mu + ana/ [mwa:na] 'child'

/mu + ojo/ [mwo:yo] 'soul'

/tu + e + taag + a/ [twe:ta:ga] 'we need'

/mu + tue/ [mutwe:] 'head'

b) Examples (across word boundaries)

/V + mu + ziNBi# o + no/ [omuzi:mbyo:no] 'this builder'

/V + lu + naku # V + lu + o/ [oɭunakwo:ɭwo] 'that day'

/V + mi + limu # V + mi + lala/ [emiʃimwe:miʃaɭa] 'other jobs'

/V + mu + limi # V + mu + lala/ [omuɭimyo:muɭaɭa] 'another farmer'

SSC13 expresses this constraint on the distribution of non-low vowels. It states that [i] and [u] never occur immediately before low vowels: /i/ and /u/ are realised as [y] and [w] respectively in that environment and the following low vowel is lengthened.

SSC13 If $\begin{bmatrix} -\text{cons} \\ -\text{low} \end{bmatrix}$ $\begin{bmatrix} -\text{cons} \\ +\text{low} \end{bmatrix}$

Then [-syllabic] [+ long]

(1) In the case discussed above a redundancy rule is enough to ensure that the constraint on vowel sequences in the surface representation is observed. Elsewhere, however, phonological rules are required to prevent a violation of the output condition. Consider the following examples showing:

a) The deletion of /u/ following /f/ or /v/ before a low vowel within a phonological word[1]:

1 When /u/ is deleted in this environment some speakers slightly labialise [f] and [v] which are then realised as [f] and [v] respectively (cf. Cole 1967:8)

Examples

/ku + fu + a/ [kufa:] 'to die'

/ku + vu + a/ [kuva:] 'to come from'

and across word boundaries within a phonological phrase:

/V + mu + nafu # o + no/ [omunafo:no] 'this lazy person'

/mu + saNvu # a + βili/ [musa:ŋva:βili] 'seven twenty'

/V + ma + savu # a + ga + li + e/ [amasava:galye:] 'let him eat the fat'

/V + βa + Ntu # V + mu + saNvu # a + βa + laβ + a/

[aβa:ntwo:musa:ŋva:βalaβa] 'he sees the seven people'

b) the deletion of /i/ following /s/ or /z/ before a low vowel within a phonological word:

Examples

/zi + a + ni/ [za:ni] 'whose?' (class 9 possessed; class 1, singular possessor; interrogative)

across word boundaries within a phonological phrase:

/V + mu + kazi # o + no/ [omukazo:no] 'this woman'

/V + βa + leNzi # a + βa + kol + a/ [aβale:nza:βakola] 'boys who work'

/V + lu + Czi # V + lu + paNvu/ [oluzi:o:luwa:ŋvu] 'a deep well'

/V + Nsi # e + no/ [e:nse:no] 'this country'

/V + mu + pakasi # a + li + kol + a/ [omupakasa:likola] 'the porter will work'

An underlying representation with $\begin{Bmatrix} s \\ z \end{Bmatrix}$ followed by /i/ or $\begin{Bmatrix} f \\ v \end{Bmatrix}$ followed by /u/ before a low vowel is blocked by the constraint on vowel sequence.

Traffic rule 5a: If $\begin{bmatrix} + \text{ cons} \\ \alpha \text{ grave} \end{bmatrix}$ $\begin{bmatrix} - \text{ cons} \\ - \text{ low} \\ \alpha \text{ grave} \end{bmatrix}$ $\begin{bmatrix} - \text{ cons} \\ + \text{ low} \end{bmatrix}$

↓ ↓ ↓

Then [+ P-rule 4a] [+ P-rule 4a] [+ P-rule 4a]

P-rule $5a_1$: $\begin{bmatrix} -\text{ cons} \\ -\text{ low} \\ \alpha\text{ grave} \end{bmatrix} \longrightarrow \emptyset \;/\; \begin{bmatrix} +\text{ cons} \\ +\text{ obstr.} \\ -\text{ stop} \\ \alpha\text{ grave} \end{bmatrix} __ \begin{bmatrix} -\text{ cons} \\ +\text{ low} \end{bmatrix}$

P-rule $5a_2$ $\begin{bmatrix} -\text{ cons} \\ +\text{ low} \end{bmatrix} \longrightarrow \begin{bmatrix} \text{———} \\ +\text{ long} \end{bmatrix} \;/\; \begin{bmatrix} +\text{ cons} \\ +\text{ obstr.} \\ -\text{ stop} \\ \alpha\text{ grave} \end{bmatrix} \begin{bmatrix} -\text{ cons} \\ -\text{ low} \\ \alpha\text{ grave} \end{bmatrix} ____$

P-rule $5a_1$ deletes /i/ and P-rule $5a_2$ lengthens the low vowel in compensation. The two rules apply simultaneously.

(2) Another P-rule is required to sort out anomalies which would arise from the juxtaposition of

$\begin{bmatrix} +\text{ cons} \\ +\text{ lingual} \\ -\text{ anterior} \end{bmatrix}$ $\begin{bmatrix} -\text{ cons} \\ -\text{ grave} \end{bmatrix}$ $\begin{bmatrix} -\text{ cons} \\ +\text{ low} \end{bmatrix}$

Any such sequence, regardless of the underlying representation which gives rise to it, is impermissible in the surface representation. It has to undergo certain mutations in order to satisfy the well-formedness condition on vowel sequences in the surface representation.

Examples

a) within word boundaries[1]:

/Ki + alo/ [ca:lo] 'village'

/Ki + eja/ [ce:ya] 'drought'

/mu + Kiala/ [muca:la] 'wife'

/Ji + a + ni/ [ja:ni] 'whose' (class 4 possessed; class 1, singular, possessor, interrogative)

/ji + a + ni/ [ya:ni] 'whose' (class 9 possessed; class 1 singular, possessor interrogative)

1 The reader should remember that before /i/ the opposition between velar and palatal consonants is suspended. (0.4.1.3)

b) across word boundaries within a phonological phrase

/V + ma + Ji # Ø + βili/ (amaʃa:βiɬi) 'two eggs'

/V + mu + kazi # V + mu + luNJi # ɔ + li/

(omukazo:mulu:ɲʃo:li) 'that beautiful woman'

/V + lu + pi # V + lu + lala/ (oluyo:luɬaɬa) 'another slap'

/V + ka + taaji # V + ka + tono/ (akata:ya:katono) 'a tiny swallow'

/V + mu + geɲi # ɔ + mu/ (omugeɲo:mu) 'one guest'

/V + ka + kukuɲi # a + ka + lala/ (akakukuɲa:kaɬaɬa) 'another tiny flea'

This particular strategy of preventing a violation of the constraint on vowel sequences is implemented by the simultaneous rules of P-rule 5b.

Traffic rule 5b: If [+ cons, + lingual, - anterior] [- cons, - low, - grave] [- cons, + low]

Then [+ P-rule 5b] [+ P-rule 5b] [+ P-rule 5b]

P-rule $5b_1$: [- cons, - low, - grave] $\longrightarrow \emptyset$ / [+ cons, + lingual, - anterior] — [- cons, + low]

P-rule $5b_2$: [- cons, + low] $\longrightarrow$ [+ long] / [+ cons, + lingual, - anterior] [- cons, - low, - grave] —

(3) Whenever a sequence of two nonconsonant with the same value for the feature 'low' occurs, uninterrupted by a consonant or by a phonological phrase boundary the first nonconsonant is deleted and the second is simultaneously lengthened in compensation.

Examples

a) within a phonological word:

/li + iso/ [li:so] 'eye'

/ku + siim + a/ [kusi:ma] 'to be grateful

/lu + tuula/ [lutu:ɬa] 'hunting net'

/βa + ana/ [βa:na] 'children'

/ku + loot + a/ [kuɭo:ta] 'to dream'

/ku + leet + a/ [kuɭe:ta] 'to bring'

/βa + e + βak + a/ [βe:βaka] 'they sleep'

/ka + e + pan + Vk + o/ [ke:waniko] 'excessive pride'

b) across word boundaries within a phonological phrase:

/lu + moNDe # e + li/ [lumo:ndo:ɭi] 'that potato'

/tu + li + saNB + a # V + mu + pila/ [tuɭisa:mbo:mupi:ʃa] 'we shall kick the ball'

/tu + li + laβ + a # V + βi + Ntu/ [tuɭiʃaβe:βi:ntu] 'we shall see the things'

/N + βogo # e + no/ [mboge:no] 'this is a buffalo'

Traffic rule 5c: If $\begin{bmatrix} -\text{cons} \\ \alpha\text{low} \end{bmatrix}$ $\begin{bmatrix} -\text{cons} \\ \alpha\text{low} \end{bmatrix}$

Then [+ P-rule 5c] [+ P-rule 5c]

P-rule $5c_1$: $\begin{bmatrix} -\text{cons} \\ \alpha\text{low} \end{bmatrix} \rightarrow \emptyset \; / \; \text{---} \; \begin{bmatrix} -\text{cons} \\ \alpha\text{low} \end{bmatrix}$

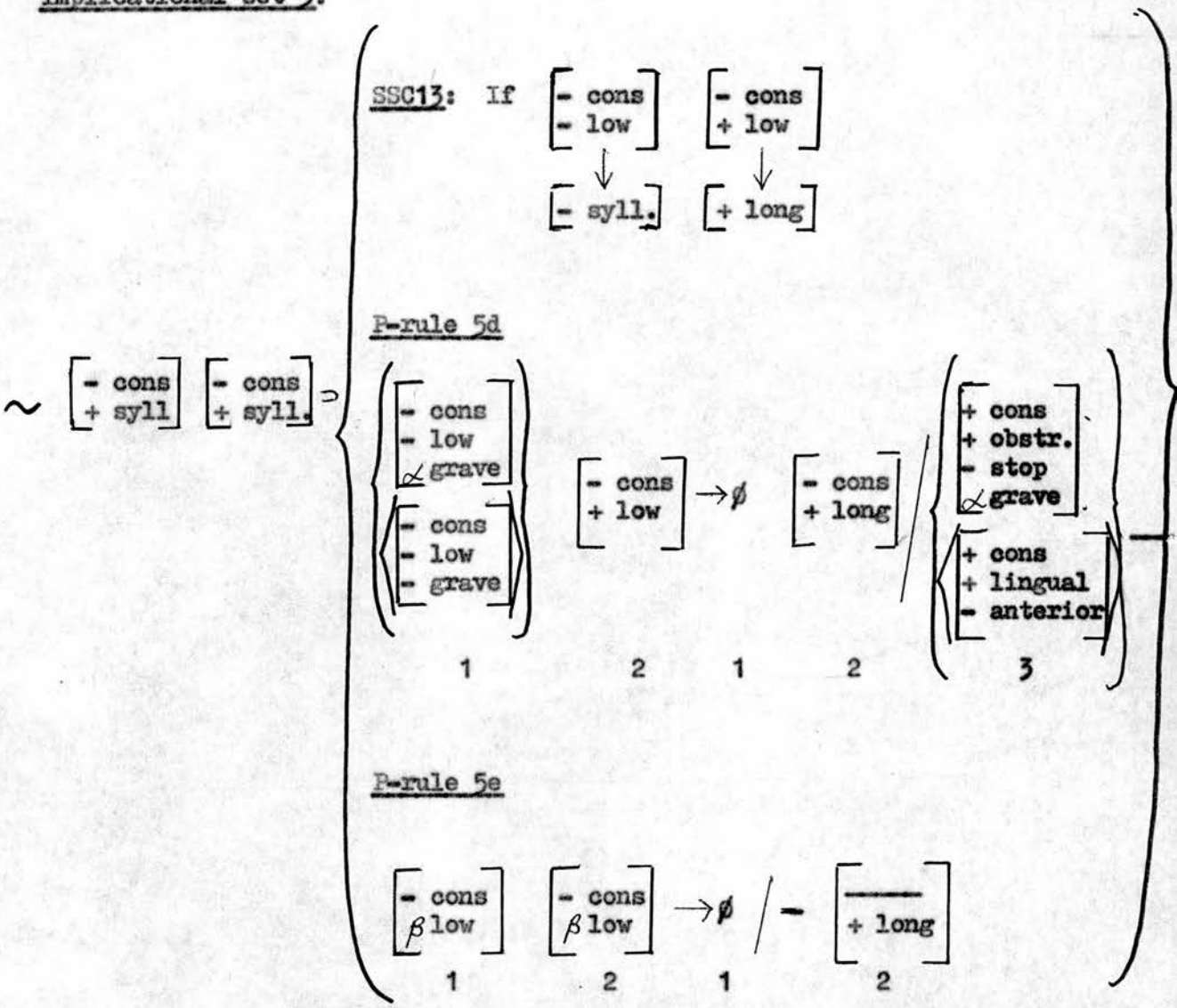
P-rule $5c_2$: $\begin{bmatrix} -\text{cons} \\ \alpha\text{low} \end{bmatrix} \rightarrow \begin{bmatrix} \text{---} \\ +\text{long} \end{bmatrix} / \begin{bmatrix} -\text{cons} \\ \alpha\text{low} \end{bmatrix} \text{---}$

The two sub-rules apply simultaneously[1].

The conspiracy to prevent syllabic vowels from abutting can be summarised in Implicational set 3

1 Two exceptions have been found which are not affected by P-rule 5c. /mu + jiko/ [mwi:ko] 'trowel' and /mu + jiniino/ [mwi:ni:no] 'uninvited'(adverb). After the deletion of /j/ (8.2.2)the non-low vowels /u/ and /i/ abut. No explanation has been found so far for /u/ becoming [w] and not being deleted in that environment.

Implicational set 3:



where 5d is an amalgamation of 5a and 5b; and 5e is a restatement of 5c.

As a general rule whenever the first of two underlying vowels is deleted or realised as non-syllabic the second one is lengthened in compensation. Lengthening also occurs when a vowel precedes an NC sequence.

Examples

within a phonological word:

/o + li + N + laβ + a/ [oli:ndaβa] 'you will see me'

/aNti/ [a:nti] 'surely'

/ku + taNB + Vl + a/ [kuta:mbula] 'to walk'

/ka + toNDa/ [kato:nda] 'God, god'

/tu + lisiND + Vk + a/ [tulisi:ndika] 'we shall push'

/mu + paNDi + Vk + i/ [muwa:ndi:si] 'writer'

across phonological word boundaries within a phonological phrase:

/βa + naa + tuND + a # N + teβe/ [βana:tu:nda:nteβe] 'they will sell chairs'

/tu + li + e + fuNB + Vl + a # N + koko/ [tulye:fu:mbiʃa:ŋkoko] 'we shall cook chicken for ourselves'

/V + ka + leNzi # ka + naa + luND + a # N + liga/ [akaʃe:nzikana:ʃu:nda:ndiga] 'the small boy will herd sheep'

/βa + li + N + saNg + a # N + teg + Vk + a # N +βaga/ [βaʃi:nsa:ŋga:ntegeka:mbaga] 'they will find me preparing for the feast'

/a + li + jiNB + a # N +βuzi # N + saata/ [aʃiyi:mba:mbuzi:nsa:ta] 'he will tether the barren goat'

All these lengthening rules are subject to an absolute output condition which stipulates that no syllable nucleus may exceed two morae. This constraint overrides any rule which would otherwise lengthen a vowel (Tucker:1962:150). Tucker has pointed out the fact that the constraint limiting the number of morae in a syllable means that in Luganda lengthening is not cumulative. Thus, for example, an underlying vowel which satisfies both the structural description of the rule which lengthens the second of two adjacent vowels and also satisfies the structural description of the rule which lengthens vowels before NC sequences does not undergo cumulative lengthening.

Examples

/βa + ∅ + goβ + a/ (βagoβa) 'they chase'

/βa + a + goβ + a/ (βa:goβa) 'they chased'

/βa + ∅ + N + goβ + a/ [βa:ŋgoβa] 'they chase me'

/βa + a + N + goβ + a/ [βa:ŋgoβa] 'they chased me'

/βa + ∅ + kuβ + a/ [βakuβa] 'they hit'

/βa + a + kuβ + a/ [βa:kuβa] 'they hit'

/βa + ∅ + N + kuβ + a/ [βa:ŋkuβa] 'they hit me'

/βa + a + N + kuβ + a/ [βa:ŋkuβa] 'they hit me'

/mu + liaNgo/ [mulya:ŋgo] 'door'

/li + aNDa/ [lya:nda] 'charcoal'

/Ki + oNDoo/ [co:ndo:] 'bay'

/mi + eNge/ [mye:ŋge] 'beers'

/mu + eNDaa/ [mwe:nda:] 'nine'

/βu + oNgoo/ [βwo:ŋgo:] 'brain'

The examples above have shown the operation of this condition within word boundaries; it applies equally across word boundaries, within a phonological phrase.

Examples

/V + βu + βuzi # V + βu + a # V + βa + o # V + βa + kazi/

[Oβuβuzo:βwa:βa:βakazi] 'those women's small goats'

/V + mu + tue # V + gu + a # o + ji + o # V + mu + kazi/

[omutwo:gwo:yo:mukazi] 'that woman's head'

This constraint which proscribes syllable nuclei with more than two morae is matched in rigour by the output condition which stipulates that onsets may not have more than one mora (11.4.3.2).

Besides the rule which does not allow a syllable nucleus to have more than two morae there is another rule which states that a syllable

nucleus may not exceed one mora when it is followed by a strong consonant. This phonotactic constraint overrides any other rule which may have required the lengthening of the vowel before the strong consonant. It applies everywhere its structural description is satisfied within a phonological phrase.

Examples

within a phonological word:

/mu + luaCDe/ [mulwad:e] 'a patient'

across word boundaries:

/Nti ## a + ∅ + CB + a/ [ntyab:a] 'that he steals (it is reported)'

/Nga ## o + ∅ + Ck + a/ [ŋgok:a] 'when you are coming (going) down'

/ji + e ## a + ∅ + Ct + a/ [yat:a] 'it is him that kills'

/ji + a ## CBaNBa/ [yad:a:mba] 'it is Ddamba's (class 9 sing., possessed)

Tucker (1962:138) also points out that certain reflexes of PB */i$_{2}$puV/ which are found in contemporary Luganda also inhibit the lengthening rule. Vowels are always short following a syllable onset with [g:] derived from Proto-Bantu */i$_{2}$puV/, where V is a low vowel (see chapters 7 and 9)

Examples

/C + guako/ [g:wako] 'pregnancy (of an animal)'

/C + guale/ [g:wale] 'stubborness'

/C + guaji/ [g:waji] 'centre post of a house'

/C + guolezo/ [g:wolezo] 'courtroom'

/C + guan + Vk + a/ [g:wanika] 'store'

All these are class 5 nouns. They must have had the representation */di$_{2}$ + puV/ in Proto-Bantu.

Note that this is a very minor regularity, a morphophonological constraint which applies only to a single subsystem in the phonology. It is not an absolute phonotactic constraint like the condition which prosribes long vowels before strong consonants. Thus long vowels may follow a syllable onset [g:] provided that [g:] is not a reflex of PB */ipùV/
1

Examples

/C + guopoo/ [g:wo:wo] 'savoury smell'

/C + guolezo/ [g:wo:ɹezo] 'custom-house'

/C + puaNga/ [g:wa:ŋga] 'nation'

11.4.3.2 Syllable onset mora regulating rules

Earlier on, in (11.1) we discussed the output condition on consonant sequences which allows no juxtaposition of consonants except where the first consonant is nasal and the second non-nasal[1]. This output condition and the rules which implement it were expressed by implicational set 2.

These constraints on consonant sequences can be looked at from another angle as being part of the conspiracy which ensures that no syllable onset has more than one mora. As we stated in (11.4.2) C in a syllable onset has no mora value; N in an NC sequence counts as one mora, and a strong consonant C : also counts as one mora. One mora is the maximum a syllable onset may have in Luganda.

This output condition would be violated if underlying /NCC/ sequences were realised as (NC:) with both the homorganic nasal and

1 It is important to bear in mind the fact that all our phonotactic constraints are claimed to be absolute in adagio speech. They do not necessarily apply in very fast speech.

the strong consonant being assigned a mora each. The effect of implicational set 2 (11.1) which sorts out any underlying representation which would result in a juxtaposition of a homorganic nasal with a strong consonant is to prevent onsets with two morae from occuring.

The combined effect of the syllable nucleus and the syllable onset mora regulating rules is to exclude the possibility of syllables with less than one mora on one hand or more than three morae on the other. They can be summarised as follows:

(1) A syllable must have a nucleus and may optionally have an onset;

(2) The nucleus must have at least one mora and at most two;

(3) The onset may have one mora or none at all;

(4) Only vowels (except in the case of [m̩] (11.4.2)) can function as nuclei.

(5) Only consonants and non-syllabic vowels (i.e. the glides (y) and (w) can function as onsets.

In a word, implicational sets 2 and 3 are complementary. They form part of the conspiracy that excludes syllables with more than three morae; the function of the rules in implicational set 2 is to ensure that the onset has a maximum of one mora, and that of implicational set 3 is to limit the morae in the nucleus to two at the most.

11.4.4 Constraints on tone in the syllable.

In (11.4.2) we stressed the importance of the mora as a unit of rhythm and pointed out the fact that Luganda is a mora rather than a syllable counting language (Trubetzkoy:1939:173ff) and in (11.4.3.1) and (11.4.3.2) we discussed the rules which conspire to regulate the number of morae in a syllable. In this section we shall consider output conditions on tonal patterning in the syllable.

The constraint on tone sequences in a syllable specifically concerns nuclei. If the syllable nucleus contains two morae it may have two level H (high) or two level L (low) tones or, alternatively, a falling tone (i.e. high plus low tone) but it may not have a rising tone (i.e. low plus high tone) (cf. Tucker:1962).

Examples

(i) LL

/kàsòòká/ [kàsò̋:ká] 'since'

/kù + lózòòl + V1 + á/ [kùlózò̋:Jéɾá] 'to stare idiotically'

/kù + sìij + á/ [kùsì̋:yá] 'to hiss'

(ii) HH

/kù + síím + á/ [kùsí̋:má] 'to be grateful'

/kù + léég + á/ [kùlé̋:gá] 'to tighten'

/kù + tééβ + á/ [kùté̋:βá] 'to guess'

(iii) HL (i.e. a falling tone)

/kù + sáàg + á/ [kùsâ:gá] 'to jest'

/mú + àká/ [mwâ:ká] 'year'

/mù + tíì/ [mùtî:] 'tree'

/kù + lí + à/ [kùlyâ:] 'to eat'

(iv) No LH sequences can occur in any syllable.

The effect of this output condition can be seen in nominal or verbal forms which have an underlying root initial /j/ which is deleted leaving a low tone on a prefix adjacent to a high tone on the initial root syllable[1]. Such a sequence is sorted out by a tone assimilation rule which may be informally stated as follows: in a syllable nucleus re-write L as H if L is followed by H. Thus, for example [mwá̋:vù] 'poor person' may be derived informally as follows:

1 For /j/ deletion rules see (8.2.2)

(i) /mù + jávù/

(ii) /mùávù/

(iii) /mwà́:vù/

(iv) [mwā́:vù]

Further examples[1]

/kù + ját + Vk + á/ [kwā́:tíká] 'to break'

/kù + jágàagál + á/ [kwā́:gà̰:gá̰lá] 'to stretch out'

/lù + játù/ [lwā́:tù] 'openly'

11.4.5 Syllable types

We shall conclude this discussion of syllable structure constraints by exemplifying the permissible syllable types in the surface representation in Luganda.

The following symbols will be used:

V : vowel (= syllable nucleus)

C : consonant (= syllable onset)

N : nasal (= syllable onset)

G : glide (i.e. non-syllabic vowel = syllable onset)

: : length

/ : high tone

\ : low tone

^ : falling tone.

All these symbols have been used already; they are only repeated here for convenience.

Syllables will be classified on the basis of the number of morae they contain. We shall recognise three syllable types: short

1 The steps in the derivation of the remaining forms are as for (mwā́:vù)

syllables which have only one mora; medium length syllables which have two morae and long syllables which have three morae[1].

TABLE 11.1 Luganda syllable types

---

(1) Short syllables

	Initial	Medial	Final
V	/à + ní/ [àní] 'who ?'	——	——
	/à + téè/ [àtê:] 'so, then'		
	/è + lí/ [èɾí] 'towards'		
	/ò + nó/ [ònó] 'this' (class 1, singular)		
CV	/mù + tímà/ [mùtímà] 'heart'	/mù + tímà/ [mùtímà] 'heart'	/mù + tímà/ [mùtímà] 'heart'
	/lù + βútò/ [lùβútò] 'belly'	/lù + βútò/ [lùβútò] 'belly'	/lù + βútò/ [lùβútò] 'belly'
	/kù + góβ + á/ [kùgóβá] 'to chase'	/kù + góβ + á/ [kùgóβá] 'to chase'	/kù + góβ + á/ [kùgóβá] 'to chase'
	/mù + zíla/ [mùzíɾa] 'hero'	/mù + zíla/ [mùzíɾa] 'hero'	/mù + zíla/ [mùzíɾa] 'hero'
	/mù + kázì/ [mùkázì] 'woman'	/mù + kázì/ [mùkázì] 'woman'	/mù + kázì/ [mùkázì] 'woman'

1 The reader might recall that syllable overlap is permitted in this model. At the end of (11.4.2) we suggested that it is desirable to assign the nasal in a VNCV sequence to two syllables simultaneously using improper bracketing of this kind:
(V:(N)CV)
1 2 1 2

	Initial	Medial	Final
C			/mù + límu/ [mùlím] 'work' /βù + làmúù/ [βùlàm] 'life, health'

(2) Medium length syllables

CV:	/síig + á/ [sí:gá] 'smear'	/kù + síig + á/ [kùsí:gá] 'to smear'	/mù + tíì/ [mùtî:] 'tree'
	/lí + ìsó/ [lî:só] 'eye'	/βù + líika/ [βùlí:ká] 'usury'	/kà + βíì/ [kàβî:] 'danger'
	/ø + taáta/ [tâ:tá] 'my father'	/kù + kóól + á/ [kùkó:lá] 'to uproot'	/mù + sótáà/ [mùsótâ:] 'snake'
	/kaakáno/ [kà:káno] 'now'	/kù + kaàβ + á/ [kùkâ:βá] 'to cry'	/kà + lóólóò/ [kàló:lô:] 'fowl flea'
CGV	/lí + àto/ [lyâ:tó] 'boat'	/kù + βíàl + á/ [kùβyâ:lá] 'to plant'	/kù + lí + à/ [kùlyâ:] 'to eat'
	/mú + àná/ [mwâ:ná] 'child'	/mù + kúanó/ [mùkwâ:nó] 'friendship'	/kà + βúa/ [kàβwâ:] 'small dog'
	/mí + àló/ [mwâ:ló] 'harbour'	/mù + túalo/ [mùtwâ:ló] 'load'	/kù + tí + à/ [kùtyâ:] 'to fear'
NCV	/N + βúzi/ [mbúzi] 'goat'	1(CV:(N)CV) 2 1 2 /kù + taNB + V1 + á/ [kùtá:mbúlá] 'to walk'	1(CV:(N)CV) 2 1 2 /Kì + saNBi/ [cisá:mbí] 'thigh'

	Initial	Medial	Final
	/N + pisi/	/mu + teNDela/	/lu + gaNDa/
	[mpisi] 'hyena'	[muténdeɬa] 'stretch of land'	[lugá:nda] 'Luganda'
C:V	/C + pipa/	/ku + CB + Vk + a/	/ku + tiCp + a/
	[p:ipa] 'barrel'	[kub:ika] 'to immerse'	[kutip:a] 'to tie tightly'
	/C + taβi/	/mu + Czukulu/	/mu + Cga/
	[t:aβi] 'branch'	[muz:ukulu] 'grandchild'	[mug:a] 'river'
	/C + gulo/	/ku + CkaCk + an + a/	/li + Cɲo/
	[g:úlo] 'evening'	[kuk:ak:ana] 'to become mild'	[liɲ:o] 'tooth'
	/N + ɲama/	/ku + CKal + Vl + a/	/Ki + Cve/
	[ɲ:ama] 'meat'	[kuk:alíɬa] 'to sit at ease'	[civ:e] 'incest'
C:GV	/C + guako/	/V + C + guako/	/mu + CJua/
	[g:wako] 'pregnancy (of an animal)'	[eg:wako] 'pregnancy (of an animal)'	[muɟ:wa] 'nephew'

(3) Long syllables

C:V:	/C + βeele/	/Ku + Cvuun + Vl + a/	/KioCkaa/
	[b:e:ɬe] 'breast'	[kuv:unula] 'to translate'	[cok:a:] 'but'
	/C + paapaali/	/ku + Csuuk + a/	/βa + o + Cnaa/
	[p:a:pâli] 'pawpaw'	[kus:u:ka] 'to recover from an illness'	[βon:â:] 'all of them'
	/N + naanaNsi/	/ku + CtuNk + a/	/Csoo/
	[n:a:nansi] 'pineapple'	[kut:u:nka] 'to rise up (of smoke)'	[s:ô:] 'whereas'

	Initial	Medial	Final
C:GV:	/Ǹ + múáɲí/	/V̀ + Ǹ + múáɲí/	/CDíò/
	[m̀:wa:ɲi] 'coffee plant'	[em̀:wá:ɲí] 'coffee plant'	[d̀:yô:] 'right hand'
	/Ć + súákàβá/	/V̀ + C̀ + lúán + V1 + ó/	/C̀ + túè/
	[s:wa:kaβa] 'nonsense'	[èd:wánífo] 'battle-field'	[t̀:wê:] 'huge head'
NCV:	/Ń + βáátá/	/Kù + túNBí + V1 + á/	/βù + òNɠóò/
	[mba:ta] 'duck'	[kùtu:mbi:ʃa] 'to soar'	[βwò:ŋgô:] 'brain'
	/Ǹ + fúúzí/	/mù + CnáNfúúsí/	/mù + èNDáà/
	[ŋfû:zí] 'orphan'	[mùn:á:ŋfú:sí] 'hypocrite'	[mwè:ndâ:] 'nine'
NCGV:	/Ǹ + βúàgúló/	/V̀ + Ǹ + súásúá/	/Ǹ + βúà/
	[mbwâgúló] 'raw potatoes'	[è:nswa:swá] 'monitor lizard'	[mbwâ:] 'dog'
	/Ǹ + kúálè/	/V̀ + Ǹ + díáNgá/	/Ǹ + kúà/
	[ŋkwa:lè] 'partridge'	[è:ndyá:ŋgá] 'leather bag'	[ŋkwâ:] 'tick'

PART 3

PHONETICS

12 INSTRUMENTAL TECHNIQUES

12.1 Aims and scope

The aim of this chapter is to provide a brief account of Luganda phonetics. We shall back our phonetic statements with experimental evidence. The very tentative nature of the phonetic findings reported here must be pointed out at the outset. All the utterances which constituted the data for this study were taken from a small sample of utterances produced by the present investigator. In view of the fact that only a small sample of utterances by a single speaker was analysed, no definitive conclusion about the characteristics of Luganda phonetics can be reached on the strength of our findings. However, since, as far as I know, no scholar has until now systematically backed his claims about Luganda phonetics with evidence gathered in the phonetics laboratory, this study, despite its severe limitations, should be of some interest and, hopefully, the lines of inquiry adumbrated here will be explored more systematically in the future.

We could not possibly investigate all aspects of Luganda phonetics. We therefore decided to concentrate on those characteristics which appear to us most controversial or linguistically most significant. We have focussed our attention mainly on general phonetic processes which are most typical of Luganda phonetics and only briefly treated individual segments. Of course, another linguist might have made a different choice of the most important characteristics of Luganda phonetics.

12.1 Instrumental techniques

Several methods were used to obtain the results reported here. As all the methods we used are very well-known, a few remarks about them will suffice. For further details the reader may refer to the works cited below.

12.2.1 Direct palatography

The use of direct palatography has been described by Abercrombie (1957) and Ladefoged (1957)[1]. The upper surfaces of the subject's mouth are sprayed with a thin coat of a fine mixture of charcoal and chocolate powder. Then the subject utters the word with the sound under investigation three times - care has to be taken in choosing words to ensure that the only contact between the articulators occurs during the production of the sound being investigated.

This technique is limited to the investigation of lingual sounds. It enables the investigator, using an elaborate system of lights and mirrors to locate the place where contact occurs between the tongue and the upper surfaces of the mouth - the charcoal/chocolate mixture is wiped off at that place by the tongue. The wipe-off area is photographed and the picture is called a palatogram. Palatograms are zoned as in Firth (1948). The numbers refer to both the left and the right side unless otherwise stated. See fig.12.1 overleaf.

1 See also Balasubramanian (1972) and Nihalani (1972).

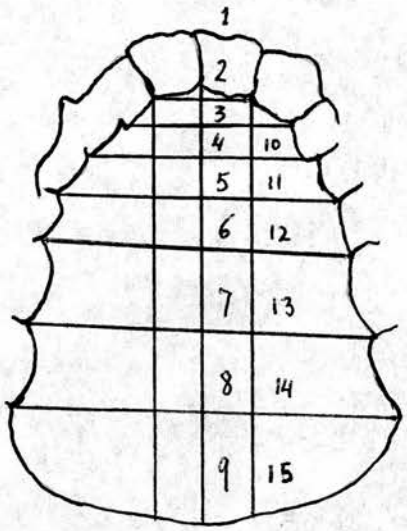


Fig.12.1 Palatogram zones

To supplement the palatograms a plaster cast of the subject's mouth was produced. It was made in the following manner: a dental tray filled with a soft, wet mixture of identica and water was inserted in the subject's mouth. It was pushed hard against his upper teeth and the roof of his mouth so that an impression thereof could be imprinted in the identica. The tray was left for a few minutes in the mouth in order to allow the identica to set. When the identica had set the tray was removed. An impression of the upper teeth and the roof of the mouth was left in the identica.

Then a mixture of water and plaster of Paris was poured into the impression in the identica. It was left for a few minutes so that it might solidify. When that had happened the plaster of Paris was separated from the identica. An impression of the subject's upper teeth and the roof of his mouth had now formed in the plaster of Paris. Next a picture of the plaster cast was taken. See plate 1. overleaf.



Plate 1 A section of a plaster cast of the roof of the subject's mouth

The plaster cast was made in order to show the depression in the centre of the subject's alveolar ridge which is responsible for his alveolar sounds having a broken crescent shape instead of a full crescent in their wipe-off. See for example palatograms 13 and 17. The tongue cannot reach the bottom of the furrow in the centre of the alveolar ridge.

12.2.2 Electrokymography

The kymograms used in this description were made using an Electro-Aerometer, type AM 508/4 manufactured in Denmark by B. Fønkjaer-Jensen. This instrument was used to record separately oral and nasal expiratory air flows. A mask with air-tight compartments which houses the mouth and the nose separately, was utilised for this purpose. At the same time, a microphone connected to an amplifier was placed at the larynx to register vocal cord vibrations.

The output of the air pressure transducers and the voicing envelope registered by the larynx microphone were recorded on a rotating roll of paper by a mingograph. The time calibration was 50 c.p.s (i.e. each cycle lasted for 20 milliseconds (MSC's). The air pressure measurements obtained from the aerometer are qualitative rather than quantitative.

The technique described above was used to produce four channel kymograms. In addition to these, larger kymograms with tracings for eight parameters were also produced. This was done by joining several accessories to the apparatus described above.

To investigate pitch we used a Pitch Meter made by B.Frøkjaer-Jensen of Denmark. This instrument was calibrated to record frequencies in the range of 60 cps to 450 cps in 19 different steps. The Pitch Meter, like the aerometer and the larynx microphone, was connected to a mingograph and its output was recorded on the same roll of paper.

Furthermore, to record the intensity, an Intensity Meter calibrated to register amplitude in the range of 10 db to 50 db was used. It too was connected to a mingograph which recorded its output on the roll of paper.

The aerometer itself had two valves turned on to register oral and nasal inspiratory airflow. The output of these channels was again recorded by a mingograph on the roll of paper. A duplex larynx oscillogram was also supplied. The other parameters remained as before in the four channel kymograms. The paper speed was 1 cps and the time calibration was 50 cps.

12.2.3 Spectrography

The spectrograms were made using a Kay Electric sono-Graph manufactured by Kay Electric Company of New York. All the spectrograms

used here are wide band spectrograms with a range from zero to 4000 cps. Spectrography has been widely discussed in the literature (cf. Potter et al., 1947; Fant, 1960; Pulgram 1959).

13 CONSONANTS

In this chapter we shall concentrate on strong consonants and other problems connected with the realisation of consonants will be dealt with very briefly. This is because in our view strong consonants are probably the most important single characteristic which sets Luganda phonetics apart from that of most other Bantu languages[1], although Luganda is not unique in having strong consonants in the Bantu sub-family (cf. Meinhof:1932:26-27). In the first part of this chapter we shall focus on the articulatory and auditory/acoustic cues for distinguishing strong from weak consonants. In the second part we shall briefly consider other phonetic peculiarities of Luganda consonants which the present investigator considers particularly important.

13.1 Strong consonants

As is normally the case in language there is more than one phonetic feature involved in the phonological opposition between strong and weak consonants - it is rare that a linguistic contrast is implemented by a single phonetic feature though all cues are usually not equally important.

13.1.1 The length of strong consonants

Length is probably the most important cue for distinguishing between strong and nonstrong consonants in the surface representation. Strong consonants are as a rule much longer than the nonstrong ones. This hypothesis was kymographically tested. The results obtained are tabulated overleaf.

1 In part II we saw that very many of the complications in Luganda phonology involve strong consonants. See Chapters (9, passim); (11.1) and (11.4.3.2).

Results

TABLE 13.1 The duration of voiced strong consonants

Initially		duration in MSC's	Medially		duration in MSC's
/C + βala/	[bːala] 'spot'	140	/V + C + βala/	[ebːala] 'spot'	200
/N + mese/	[mːese] 'rat'	120	/V + N + mese/	[emːese] 'rat'	180
/N + male/	[mːale] 'lung fish'	200	/V + N + male/	[emːale] 'lung-fish'	220
/C + diNDa/	[dːiːnda] 'xylophone'	120	/V + C + diNDa/	[edːiːnda] 'xylophone'	180
/N + naanaNsi/	[nːaːnaːnsi] 'pineapple'	160	/V + N + naanaNsi/	[enːanaːnsi] 'pineapple'	180
/C + zike/	[zːike] 'chimpanzee'	140	/V + C + zike/	[ezːike] 'chimpanzee'	200
/N + ɲama/	[ɲːama] 'meat'	220	/V + N + ɲama/	[eɲːama] 'meat'	240
/C + jeNBe/	[ɟːeːmbe] 'horn'	120	/V + C + jeNBe/	[eɟːembe] 'horn'	180
/C + goNgolo/	[gːoːŋgolo] 'millipede'	100	/V + C + goNgolo/	[egːoːŋgolo] 'millipede'	160
/C + vuu/	[vːuː] 'ashes'	240	/V + C + vuu/	[evːuː] 'ashes'	240
	average	156		average	198

The results for voiceless strong consonants are given in table 13.2 overleaf.

TABLE 13.2 The duration of voiceless strong consonants

Initially[1]		Medially	
	duration in MSC's		duration in MSC's
		/V + C + peela/ [ep:e:ɬa] 'guava'	220
		/V + C + pipa/ [ep:ipa] 'barrel'	200
		/V + C + taβi/ [et:aβi] 'branch'	260
		/V + C + saɲu/ [es:aɲu] 'joy'	220
		/V + C + cupa/ [ec:upa] 'bottle'	180
		/V + C + kuβo/ [ek:uβo] 'road'	240
		Average	220

TABLE 13.3 The duration of voiced weak consonants medially[2]

	duration in MSC's
/ka + mese/ [kamese] 'small rat'	80
/ka + male/ [kamale] 'small lung fish'	100
/ma + diNDa/ [madi:nda] 'xylophones'	100
/ka + naanaNsi/ [kana:na:nsi] 'small pineapple'	60
/ma + zike/ [mazike] 'chimpanzees'	80
/ka + ɲama/ [kaɲama] 'small piece of meat'	100
/ma + Ji/ [maʄi] 'eggs'	80
/ma + goNgolo/ [mago:ŋgolo] 'millipedes'	80
/βa + Vuβ + a/ [βavuβa] 'they fish'	80
average	84

1 No results are given for voiceless strong consonants in initial position because it is not possible to decide with any certainty when a voiceless consonant in initial position begins.

2 The term 'weak' is used instead of the clumsy but more accurate 'non-strong' to refer to consonants which have not undergone strengthening; it does not mean consonants which have undergone lenition.

TABLE 13.4 The duration of voiceless weak consonants medially

	duration in MSC's
/ma + peela/ [mape:ʃa] 'guavas'	120
/ka + pipa/ [kapipa] 'small barrel'	80
/ma + taβi/ [mataβi] 'branches'	100
/ma + saɾu/ [masaɾu] 'pleasures'	100
/ma + cupa/ [macupa] 'bottles'	80
/ma + kuβo/ [makuβo] 'roads'	120
average	100

Discussion [1]

These results strongly support the claim that what has sometimes in the past been regarded as a distinction between single and double consonants (Ashton, et al., op.cit.; Cole:1967) is in fact primarily a length distinction. Medial strong consonants are about twice as long as their weak counterparts as the tables above show.

It is important to note also that as a rule voiceless consonants are slightly longer than their voiced counterparts and that, furthermore, tokens of the same strong consonants in initial position are generally slightly shorter than tokens of that consonant in word medial position.

All the observations so far have been based on words in isolation but they are also valid for normal connected speech. For instance in kgm.1 the weak [p] of [p:a:pa:ɻi] 'pawpaw' is half the length of the strong [p:]; the former is 60 MSC and the latter 120 MSC's. Similarly,

1 The following abbreviations will be used: 'pgm.' for palatogram, 'kgm.' for kymogram and 'sgm.' for spectrogram.

in kgm.2 the two [g:]'s are each 180 MSC's while [ɣ] (see 13.2) is just 60 MSC's. Again in kgm.3 the strong consonants are consistently longer than the weak ones: [n:] is 160 MSC's while the two [n]'s are just 80 MSC's each; and strong [t:] is 140 MSC's compared to [t] which is only 80 MSC's long.

However, these data suggest that though strong consonants are relatively longer than weak ones in connected speech, the differences are not as big as they are in citation forms where the aim is to bring out the differences between strong and weak consonants for then the differences tend to be exaggerated. Note also that tempo and rhythm are important factors in regulating the duration of consonants since the opposition between long and short is only relative. Even after that qualification has been made it is still the case that generally strong consonants are at least one and a half times as long as weak ones.

13.1.2 Intensity

In addition to length, it has been suggested in the literature, one of the most important features that distinguishes strong consonants is intensity. Thus we read in Nsimbi and Chesswas (1963:19) that:

> In Luganda consonants are normally hit softly. But there are times when a consonant is pronounced with emphasis and/or there is a slight delay on the consonant while it is being pronounced.

In 13.1.1 we focussed on the 'slight delay' on strong consonants. Here we shall consider the claim that strong consonants are uttered with more "emphasis" i.e. more acoustic energy than weak ones. This hypothesis was investigated by producing kymograms. First we examined words in isolation:

Results

TABLE 13.5 The intensity of strong and weak consonants initially

strong consonants	intensity	weak consonants	intensity
/C + duβi/ [d:uβi] 'depths'	47 db	/dum+ a/ [duma] 'rush!'	38 db
/C + naβe/ [n:aβe] 'red ant'	46 db	/ne + βa + o/ [naβo][1] 'with them'	40 db
/∅ + Cgaβa/ [g:aβa] 'Ggaba, (place name)'	46 db	/gaβ + a/ [gaβa] 'give out!'	40 db
average	46.3 db		39.3 db

TABLE 13.6 The intensity of strong and weak consonants medially

strong consonants	intensity	weak consonants	intensity
/∅ + laCDu/ [lad:u] 'thunder'	46 db	/mu + dumu/ [mudumu] 'tap'	46 db
/βa + o + Cna/ [βon:a] 'all of them, class 2'	46 db	/βa + na/ [βana] 'four, class 1'.	42 db
/ # ʊ + a + e # ∅ + Cgaβa/ [weg:aβa] 'inhabitant of Ggaba'	47 db	/tu + ∅ + gaβ + a/ [tugaβa] 'we give out'	48 db
average	46.3 db	average	45.3 db

Discussion

Although higher intensities were registered for strong consonants, especially word initially, no firm conclusions can be drawn from that. The sample used was very limited and moreover as

1 See (14.1) and (14.1.3)

the words were said in their citation forms with the express purpose of emphasizing the difference between strong and weak consonants, it is possible that the intensity of strong consonants was somewhat exaggerated. It is therefore not surprising that results from samples in connected speech do not show any consistent correlation between strong consonants and the amount of acoustic energy. In kgm.2, for example, [ɣ] (see 13.2) is 40 db like one of the [g:]'s and the other [g:] is just 38 db. Similar inconsistency is shown by the nasals in kgm.3, with [n:] at 48 db and the two [m]'s at 46 db and 48 db respectively.

It is safe to conclude for the time being that while in citation forms where the aim is to emphasize differences between weak and strong consonants the latter have more acoustic energy than the former, in normal speech there is, apparently, no systematic correlation between amplitude and strength/weakness of consonants. Of course, this is a provisional conclusion. More thorough inquiry may show that strong consonants have more acoustic energy than weak ones.

13.1.3 Voice onset time (VOT)

Kymograms were produced to test the hypothesis that in the voiceless stop series one important cue for distinguishing weak from strong consonants is that there is a greater time lag between the release of the plosive and the onset of voice in the latter than in the former which gives the impression that strong voiceless plosives are slightly more aspirated than their weak counterparts. This claim was tested with words in isolation.

Results

TABLE 13.7 Strong voiceless plosives' VOT

Initially		VOT	Medially		VOT
/C + peela/	[pːeːla] 'guava'	60 MSC	/V + C + peela/	[epːeːla] 'guava'	60 MSC
/C + taβi/	[tːaβi] 'branch'	20 MSC	/V + C + taβi)	[etːaβi] 'branch'	20 MSC
/C + cupa/	[cːupa] 'bottle'	40 MSC	/V + C + cupa/	[ecːupa] 'bottle'	20 MSC
/C + kuβo/	[kːuβo] 'road'	20 MSC	/V + C + kuβo/	[ekːuβo] 'road'	20 MSC
	Average	35 MSC		Average	30 MSC

TABLE 13.8 Weak voiceless plosives medially

		VOT
/ma + peela/	[mapeːla] 'guavas'	40 MSC
/ma + taβi/	[mataβi] 'branches'	20 MSC
/ma + cupa/	[macupa] 'bottles'	40 MSC
/ma + kuβo/	[makuβo] 'ways'	40 MSC
	Average	35 MSC

Discussion

These tentative results show that there is greater VOT with strong voiceless plosives initially than medially and that there is no difference in VOT between weak medial and strong initial voiceless plosives. There seems to be no invariant correlation between VOT

and the strength/weakness of a consonant. VOT seems to be a function of the place in a word of a voiceless plosive rather than a function of its strength/weakness. This is not only true in citation forms but also in connected speech. Thus in kgm.1 and kgm.3 for example, comparison VOT of intervocalic [p] and [t] with intervocalic [p:] and [t:] yields the following mean results:

[p]	20 MSC	[p:]	20 MSC
[t]	20 MSC	[t:]	20 MSC

While VOT may not play a crucial role in distinguishing strong from weak consonants, it is vital for the distinction between voiced and voiceless consonants. Often the opposition between the so-called voiced and voiceless consonants is not one of voicing but rather one of VOT differences after the release of an obstruent.

Generally there is no delay between obstruent release and voice onset for so-called voiced consonants but there is, on the other hand, a delay averaging roughly 20 MSC between the release of a voiceless stop and the onset of voicing. Perhaps the opposition in Luganda would be more appropriately characterised in terms of fortis / lenis than voice/voiceless. In kgm.3, for example, the [k] is weakly voiced throughout and the [t:] is weakly voiced for the first 20 MSC's. In kgm.7 the [j:] is not voiced for the last 40 MSC's. Note also that voicing from the vowel leaks into [s:] for the first 40 MSC's.

Spectrograms 1, 2 and 3 provide the same kind of evidence. The [b] in the NC cluster in sgm.1 is voiceless; the [d:]'s of sgms.2 and 3 are weakly voiced at the beginning and not voiced at all at the end.

In all these cases it is VOT which is crucial. It might well be that what has traditionally been regarded as a voiced-voiceless

opposition in Luganda is really a VOT opposition.

13.1.4 Pulmonic air pressure

Ladefoged (1971:24) has pointed out that one of the differences between weak and strong consonants in Luganda is that there is more pulmonic air pressure involved in the production of the latter than of the former.

The correctness of this observation can be seen by looking at kgms.5 and 6. The pressure of air flowing out of the mouth registered for [k:] and [t:] is respectively 3.5 mm and over 4 mm compared to 2.1 mm and 2.7 mm for [k] and [t][1]. Similarly in connected speech there is more oral expiratory air pressure involved in the production of strong consonants than in that of weak ones. In kgm.1 the pressure recording is approximately 2.5 mm while that for [p:] is 3.4 mm; in kgm.3 the pressure recording for [t] is 1.8 mm while that for [t:] is 2.4 mm. One might expect in view of the greater pulmonic air pressure accompanying strong consonants that they are perceived as aspirated. Occasionally they might be, but aspiration is not an important cue for recognising strong consonants because for aspiration to be perceived there should be "a brief period of voicelessness during and immediately after the release of an articulatory stricture" (Ladefoged:1971:8) which is systematically correlated with a particular consonant articulation. As we saw in (13.1.3) that is not the case in Luganda. VOT in Luganda is, in Firthian terms, a prosody of word initial position: regardless of whether they are strong or weak consonants have a greater VOT initially than medially (13.1.3). Consequently, the greater puff of air accompanying

1 Measurements of expiratory airflow in terms of millimeters is intended to give some crude quantitative idea of the air pressure; the aerometer itself gives only a qualitative measure.

strong consonants medially is not perceived as aspiration because there is not a sufficient time lag, and the puff of air which accompanies strong consonants initially may be interpreted, in Firthian terms, as a prosody of word initial position.

13.1.5 Area of contact between articulators

We also investigated the hypothesis that there is a wider area of contact between the articulators and a firmer closure in the articulation of strong consonants than in that of their weak counterparts. We used the technique of direct palatography to test this hypothesis.

Results

(1) The following results were obtained for the plosive series:

[t:] - *p*gm.15: wipe off in zones 2,4,5,10,11,12[1].

[t] - *p*gm.16: wipe off in zones 2,4,5,10,11,12

[d:] - *p*gm.11: wipe off in zones 3,4,10,11,12. The wipe off is slightly cleaner than that in *p*gm.12 for [d].

[d] - *p*gm.12: wipe off in zones 3,10,11 and the tongue brushes very slightly zone 4.

[k:] - *p*gm.5: wipe off in zones 9 in the centre and 14 and 15 on both sides and very slightly in 13 on the right[2].

[k] - *p*gm.6: wipe off in zones 13,14,15 on the right and 14 and 15 on the left, as well as 9 in the centre. There is a much cleaner wipe off in zone 9 in Kgm.5 than in this one.

1 The wipe off is not crescent shaped as one might expect for alveolars. Because of the furrow in the centre of the subject's alveolar ridge wipe off in zones 4 and 5 is discontinuous between the left and the right hand side. See (12.1) above.

2 Generally, this subject's articulation is asymmetrical - the wipe off on the right hand side is consequently both more extensive and cleaner.

[gː] - pgm.3: wipe off in zones 8,9,13,14 and 15. The wipe off is very clean generally but again it is cleaner and more extensive on the right than on the left.

[g] - pgm.4: wipe off in zones 14 and 15 on the left, zone 9 in the centre and 13,14,5 on the right. The wipe off is, however, not as clean as that in pgm.3 especially in zone 9.

(2) The following results were obtained for nasals:

[ŋː] - pgm.1: wipe off in zones 13,14 and 15 on the right, 8 and 9 in the centre and 14 on the left. The wipe off is very clean.

[ŋ] - pgm.2: wipe off in zones 14 and 15, 9 in the centre and 15 on the left. The wipe off is clear only in zone 9, elsewhere it is faint and patchy.

[ɲː] - pgm.7: wipe off in zones 1,2,3,4,5,6,7,8,10,11,12,13, with the wiping cleanest in 13 and 7 on the right hand side.

[ɲ] - pgm.8: wipe off in zones 4,13,12,11 and 10 and 5 on the right hand side and just a very slight wipe off the teeth on the left in zones 10,11,12,13,14 and 15.

[nː] - pgm.13: wipe off in 12,11,10,3,4,5

[n] - pgm.14: wipe off in zones 10,3,2 on the right hand and 3 on t he left. The tongue also brushes 4 and 5 on the right.

(3) The following results were obtained for affricates:

[jː] - pgm.9: wipe off in zones 5,6,7,11,12,13 on the right and 5 and 6 on the left.

[j] - pgm.10: wipe off in zones 5 and 6 on the left and 4,5,10,11,12 and 13 on the right.

(4) The following results were obtained for fricatives:

[s:] - pgm.17: wipe off in zones 10,11,12,4 and 5.

[s] - pgm.18: wipe off in zones 10,11,12,4 and 5 but it is not as clean a wipe off as that in pgm.17.

Discussion

At this early stage in our investigations it seems that generally strong consonants have a more extensive and cleaner wipe off than weak ones. This is particularly true of velar consonants where the wipe off for strong consonants is definitely greater than that for weak consonants. For alveolar consonants, however, the wipe off differences between weak and strong consonants are less marked. Perhaps strong consonants have a wider area of wipe off because they are more deliberately produced - they are longer than short ones - the tongue has more time to execute with precision the articulatory gesture involved.

13.2 Stop /Continuant alternation

The rules that regulate the alternation of stops and continuants were discussed in (11.1). We noted that the only admissible consonant sequences are NC sequences.

Phonetically in such sequences the nasal tends to be very much longer than the following consonant where that consonant is a voiced stop; indeed the voiced oral stop is often barely audible because it is so short. In Kgm.2, for example, the following measurements were obtained for NC clusters:

nasal		voiced oral stop	
[n]	80 MSC	[d]	40 MSC
[m]	60 MSC	[b]	40 MSC
[n]	60 MSC	[d]	40 MSC
[n]	40 MSC	[d]	20 MSC

And this is typical. The nasal is usually about one and a half times as long as the oral voiced stop following it. Where it is a voiceless stop that follows the nasal it is also short. See Kgm.3 where the [t] of [t:u:ntu] is 60 MSC's compared to 80 MSC's for [n] and Kgm.1 where the [p] in [mpe] is just 40 MSC's compared to 100 MSC for the [m].

Another interesting feature of NC sequences is that sometimes an underlying archi-segment following a nasal which is supposed to be realised as a voiced stop is sometimes realised by a voiceless stop. See Sgm.1 where /B/ is realised as [p] instead of [b] (see also 13.1.3).

It has been assumed all along that the statement that continuants alternate with voiced stops with the former occuring initially and intervocalically and the latter after nasal consonants is adequate.

In fact that statement is not altogether phonetically accurate. When an underlying continuant occurs at the beginning of a phonological phrase or initially in a word in isolation, it is sometimes realised as a continuant and sometimes as a very weak voiced stop. In Kgm.11, for example, /β/ is realised as a very weak [b]. It is clearly not a continuant. The air flowing through the mouth is completely stopped as the tracing for oral expiratory air flow indicates.

In (10.2.1) we remarked about the strange behaviour of /g/: it

looked like the odd man out in the Ganda Law; for all the other consonants involved in this process are non-obstruent continuants and it is the only stop which participates in a phonological process which is otherwise exclusively limited to nonobstruent continuants. Traditionally Luganda /g/ is not said to have a continuant allophone. That makes its involvement in the Ganda Law all the more curious as all the other consonants which undergo the Ganda Law have continuant allophones which occur medially.

In the course of our investigations we found some experimental support for classifying [g] together with other consonants which are subject to the Ganda Law. We found that although often /g/ is realised as [g] even medially, it can sometimes be realised as [ɣ]. See, for example, Kgm.2 where underlying /a + ∅ + geND + e/ is realised as [aɣe:nde] and not as [age:nde] There is no complete closure for the velar consonant. If this is not a freak result, and it is in fact the case that Luganda /g/ is sometimes realised as [ɣ] intervocalically, then there is nothing curious about /g/ undergoing the Ganda Law[1].

The realisation of /l/ also deserves special comment. It has several phonetic realizations:

/l/ → [l] / # —

[d] / /N/—[2]

[d:] / /C/—

These representations of /l/ are not controversial. The realisation of /l/ intervocalically, however, is less straightforward.

1 In view of this segment structure rule 6 in (5.2.1) has to be abandoned.

2 In this position the opposition between /l/ and /d/ is suspended (0.4.1.3)

Traditionally /l/ is said to be realised intervocalically by the alveolar trill [r] after the front vowels [i] and [e] and by the lateral approximant /l/ after the back vowels [a,o,u].

In the speech of the present writer /l/ is not realised like that intervocalically. After front vowels underlying /l/ is realised as an alveolar tap, [ɾ] and never as a trilled alveolar, [r].

Examples

/mu + sili/ [musiɾi] 'field'

/mu + sela/ [museɾa] 'full'

After back vowels underlying /l/ is not realised as a lateral approximant, [l], but as an alveolar tapped lateral. In the past this sound has been identified with [l] because of its laternalness, and not enough attention has been paid to the fact that it is a tap. Maybe this is because lateral taps are rare in the languages of the world. The Luganda sound can approximately be represented as [ɺ], the sound described in the IPA alphabet as being intermediate between [d] and [l] (cf. IPA, p.14).

Examples

/mu + ∅ + sal + a/ [musaɺa] 'you cut'

/mu + sol + oo/ [musoɺo:] 'tax'

/mu + ∅ + sul + a/ [musuɺa] 'you spend the night'

Palatograms 19,20 and 21 show the place of articulation of [l], [ɾ] and [ɺ] respectively. In Pgm.19 the tip of the tongue wipes clean zones 3,10, and 11 and the blade brushes slightly zones 4,5 and 12 in the articulation of [l]. The articulation of both [ɾ] and [ɺ] takes place in the alveolar region. There is wipe off in zones 3,4,5, 10 and 11 in the production of [ɾ] as Pgm.20 shows; and there is wipe off in zones 4,5,10 and 11 on the right and in zones 4,5, and

(very slightly) in zone 11 in Pgm.21 during the articulation of [ɺ]. Because of the furrow in the alveolar ridge the wipe off in Pgms.20 and 21 is not crescent shaped. The wipe off for [l], however, does not have a broken crescent shape like that of [ɾ] and [ɺ] because in Pgm.19 [l] is alveo-dental. The wipe off is mostly in zones 3 and 10 where it is uninterrupted by the furrow in the alveolar ridge. One conclusion that can be drawn from the palatographic evidence is that the main difference between [l], [ɾ] and [ɺ] is not that they have different places of articulation. It is rather that [l] is a lateral continuant, [ɺ] a lateral flap and [ɾ] a non-lateral flap. In fact [ɾ] is very similar to the voiced alveolar stop [d]. It only differs from it in duration.

It seems to me that duration is a crucial factor in the relationship between all the various phonetic realisations of /l/. Disregarding for the moment differences in manner of articulation we can relate the phonetic realisations of /l/ in the following way (5.1) (assuming that the feature long has three relevant phonetic values -1, 0 and +1):

[-1 long] : [ɾ] [ɺ]

[0 long] : [l] [d]

[+1 long] : [d̩:]

Thus in Kgm.4, for example [ɾ] and [ɺ] are each 40 MSC's and [d̩:] is 120 MSC's; in Kgm.11 [l] is 60 MSC's and in Kgm.12 [d] is 100 MSC's. As we earlier noted in this section [d] is shorter after a nasal than it is elsewhere. Thus in Kgm.2 [d] is only 40 MSC. It should be borne in mind that length is always relative. We cannot consider the three degrees of length in isolation; they have always to be related to some specific context.

Pgm.1 / ∅ + ɲoon + a / [ɲo:ŋa] 'low (like a cow)!!

Pgm.2 / N + ɲo / [ɲ:o] 'banana bud'

Pgm.3 /∅ + Cgaβa / [g:aβa] 'Cgaba (a place name)'

Pgm.4 / ∅ + gaβ + a / [gaβa] 'give out!'

Pgm.5 / C + kuβo / [k:uβo] 'road'

Pgm.6 / ku / [ku] 'on'

Pgm.7 / N + ɲama / [ɲ:ama] 'meat'

Pgm.8 / ∅ + ɲaam + a / [ɲa:ma] 'be off!'

Pgm.9 / C + je / [j:e] 'army'

Pgm.10 / ∅ + jeem + a / [je:ma] 'rebel'

Pgm.11 / C + duβi / [d:uβi] 'deep water'

Pgm.12 / ∅ + dum + a / [duma] 'rush about madly'

Pgm.13 / ∅ + Cnaava / [n:a:va] 'daughter of a princess'

Pgm. 14 / na / [na] 'with'

Pgm.15 / C + temu / [t:emu] 'highway robbery'

Pgm.16 / ∅ + tem + a / [tema] 'cut!'

Pgm.17 / C + sa / [s:a] 'compartment'

Pgm.18 / ∅ + sa + a/ [saβa] 'ask!'

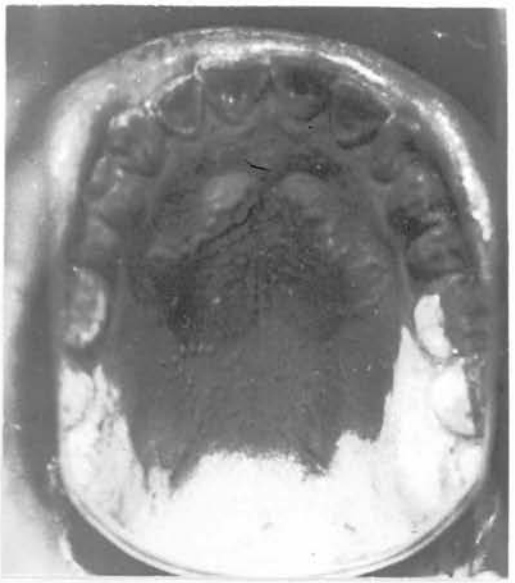
Pgm.19 / ∅ + laβ + a / [laβa] 'see!'

Pgm.20 / mi + limu / [miɾimu] 'jobs'

Pgm.21 / ∅ + βul + a / [βula] 'vanish,disappear!'



Pgm.1



Pgm.2



Pgm.3



Pgm.4



Pgm.5



Pgm.6



Pgm.7



Pgm.8



Pgm.9



Pgm.10



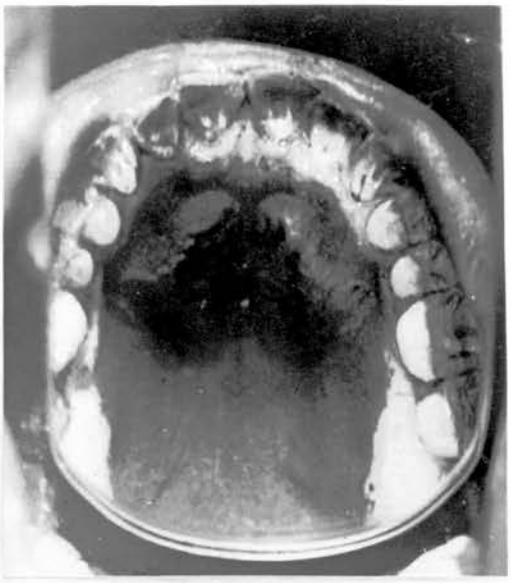
Pgm.11



Pgm.12



Pgm. 13



Pgm. 14



Pgm. 15



Pgm. 16



Pgm. 17



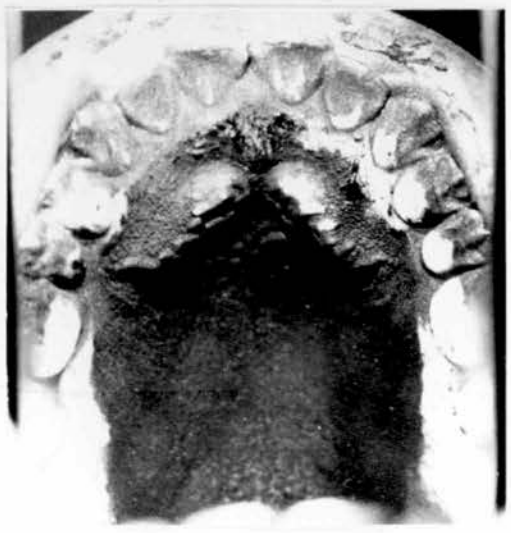
Pgm. 18



Pgm.19



Pgm.20



Pgm.21

Key to kymograms

I : intensity

F : fundamental frequency

LO: larynx oscillogram

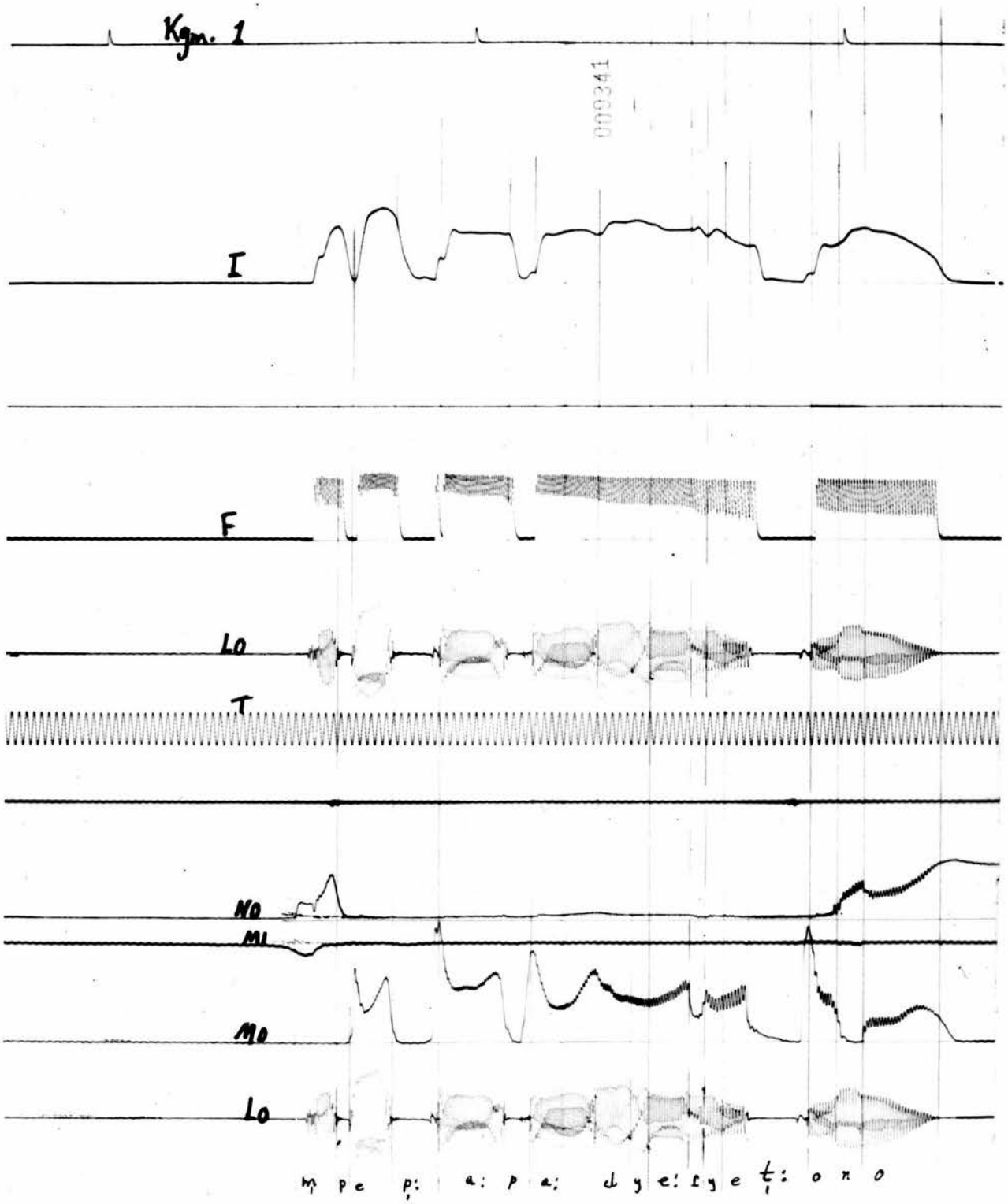
T : time

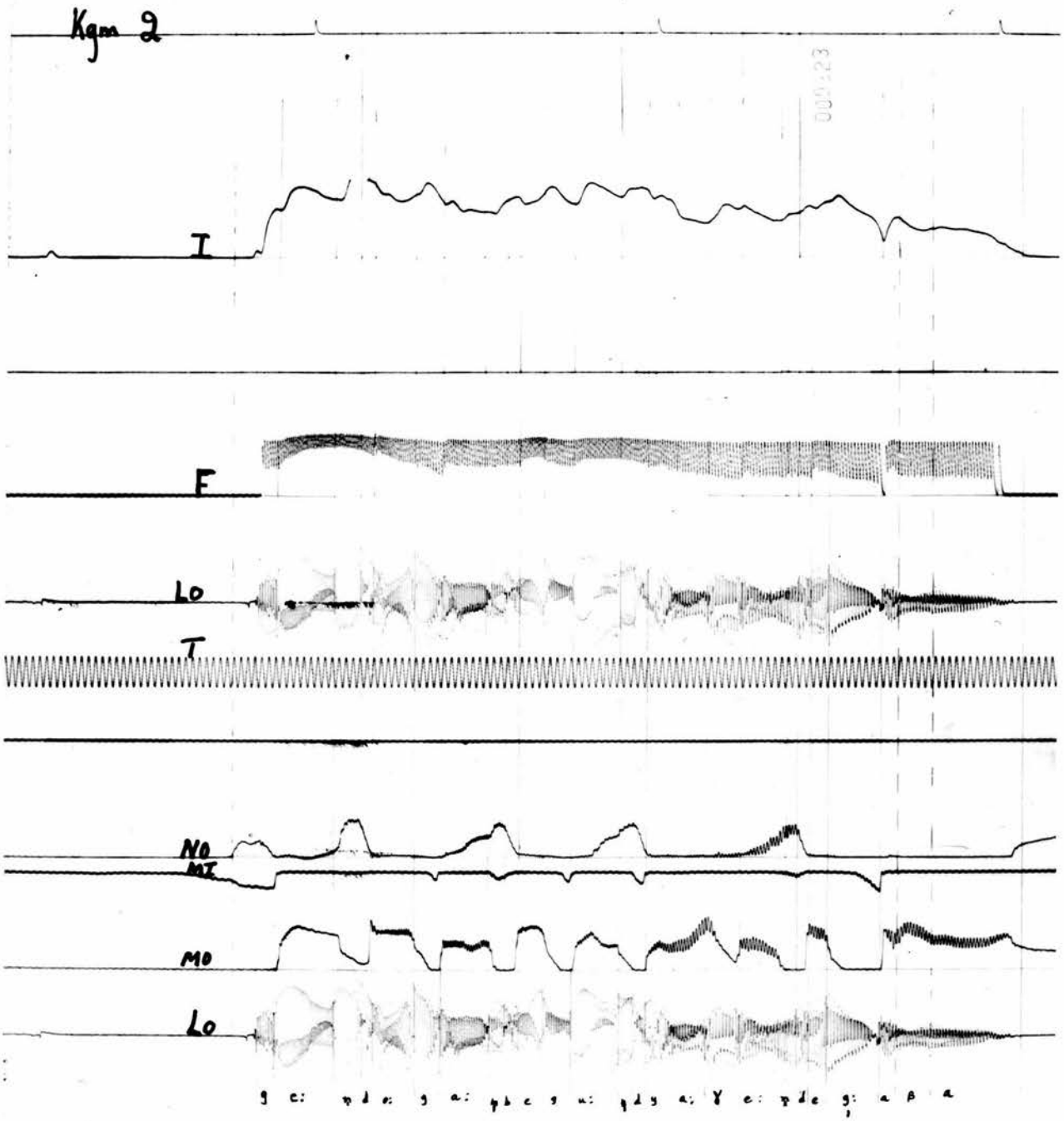
NO: nose air out

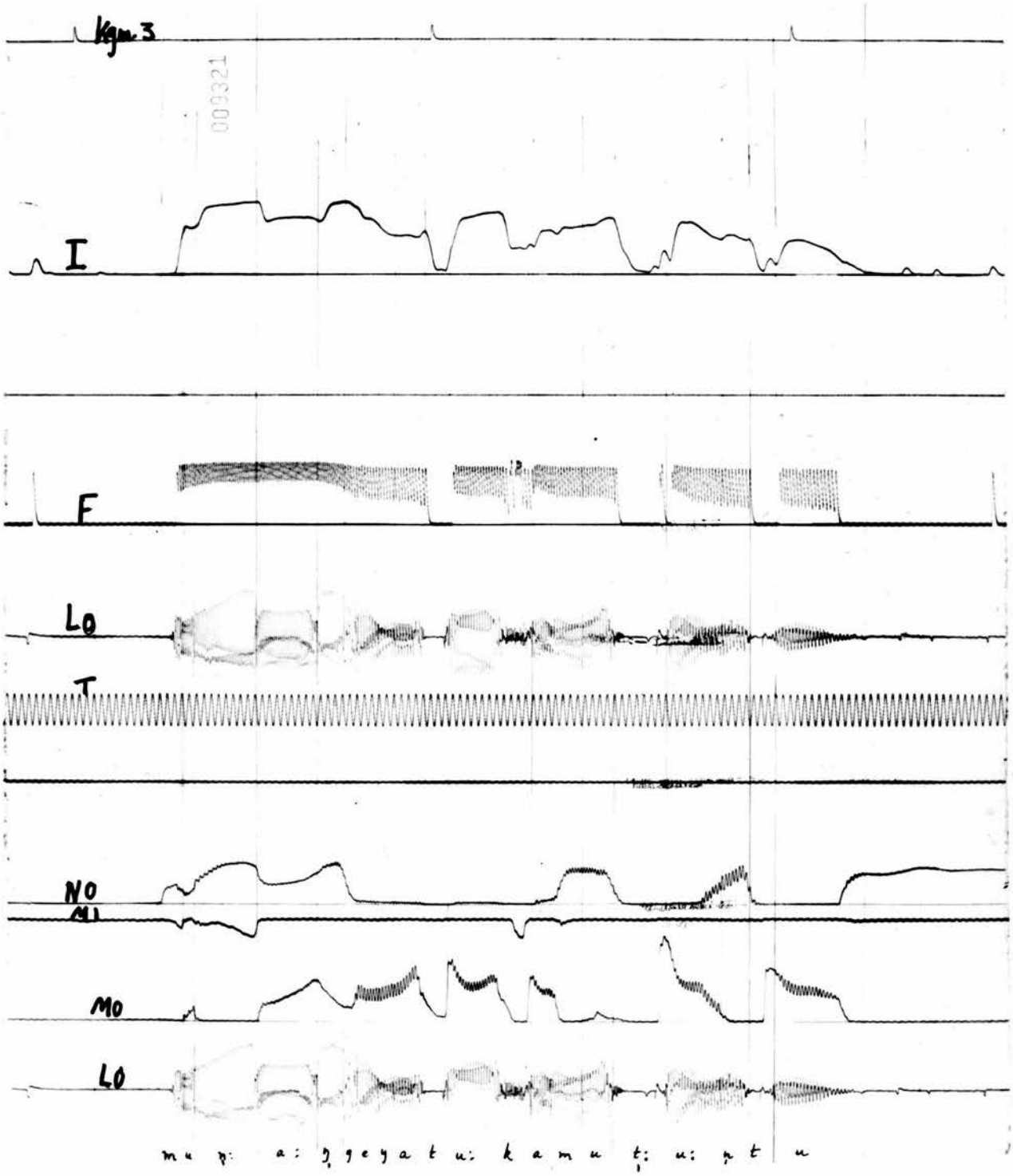
MI: mouth air in

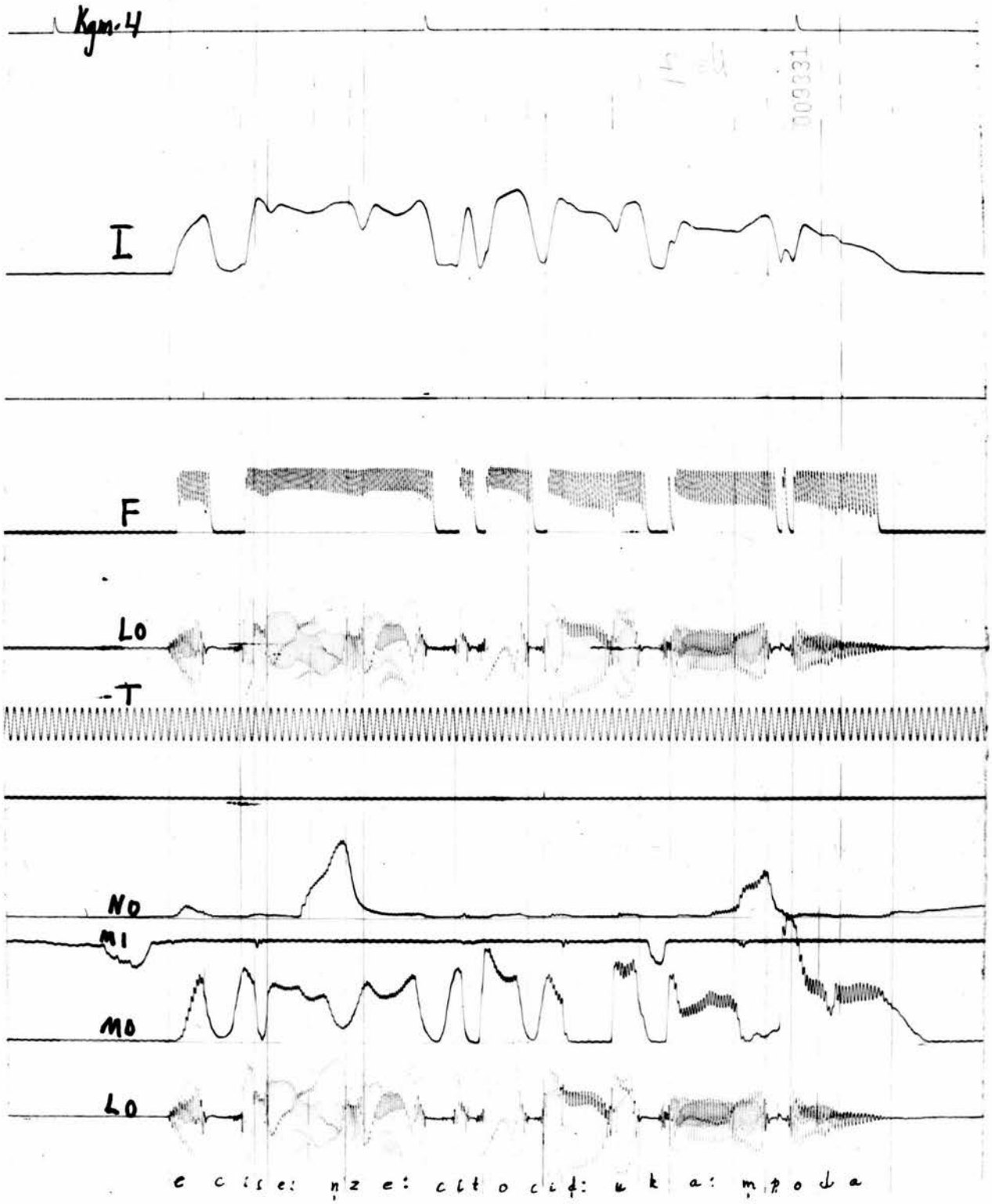
MO: mouth air out

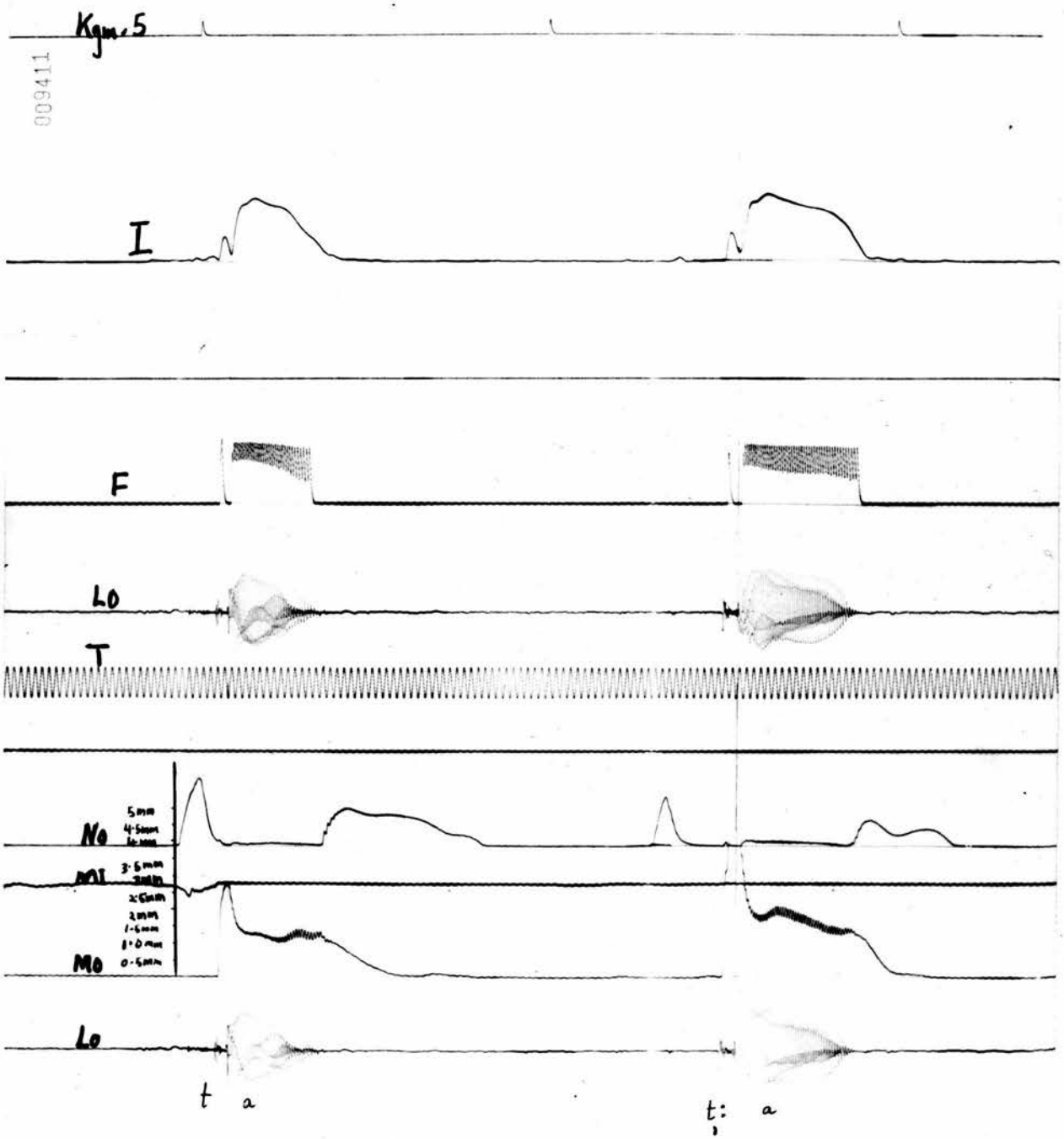
P : pitch (where the focus was on investigating pitch using a pitch meter)

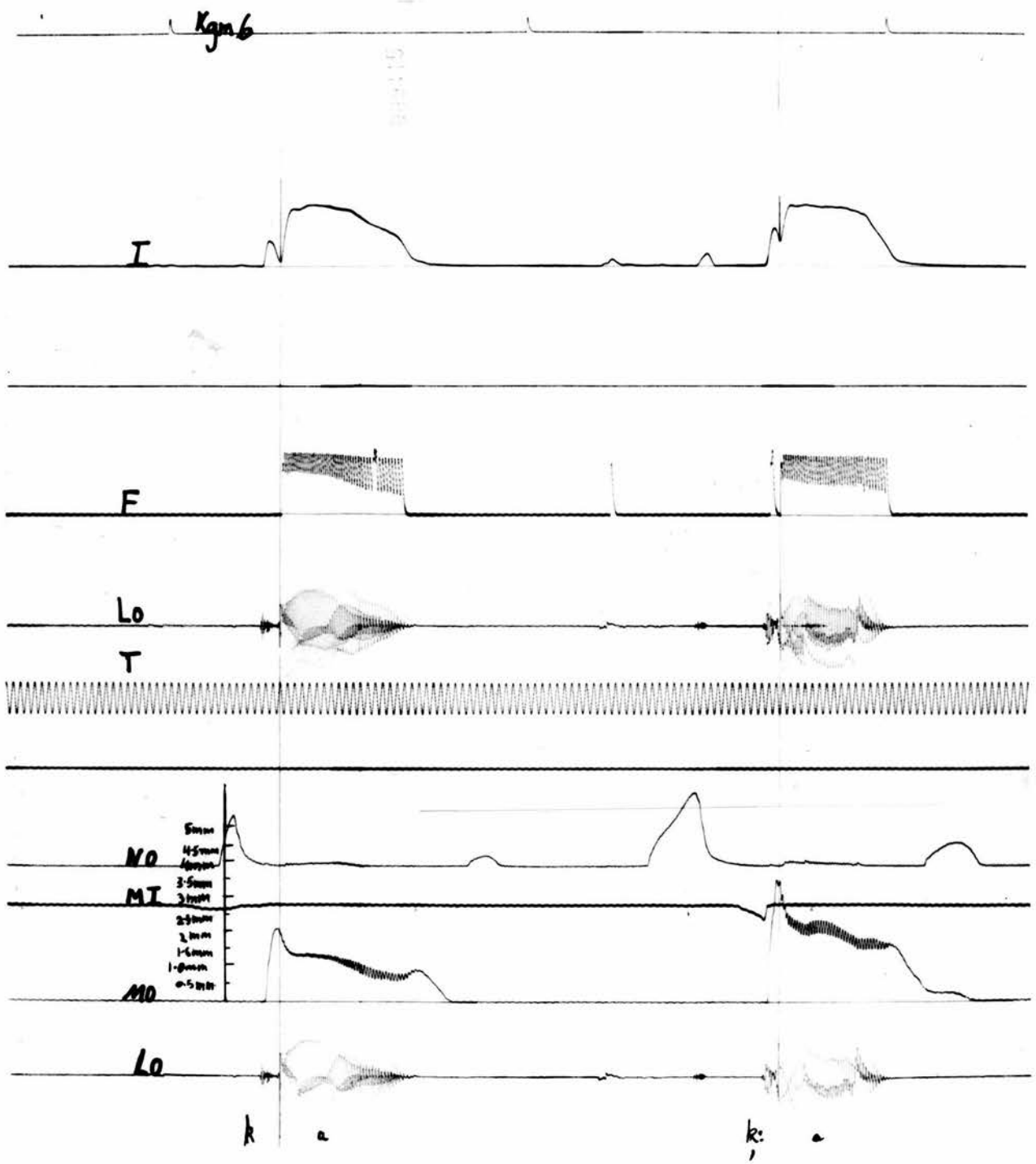

Kgm. 1
000341
I
F
LO
T
NO
MI
MO
LO
m p e p: a: p a: d y e: ɾ y e t: o n o

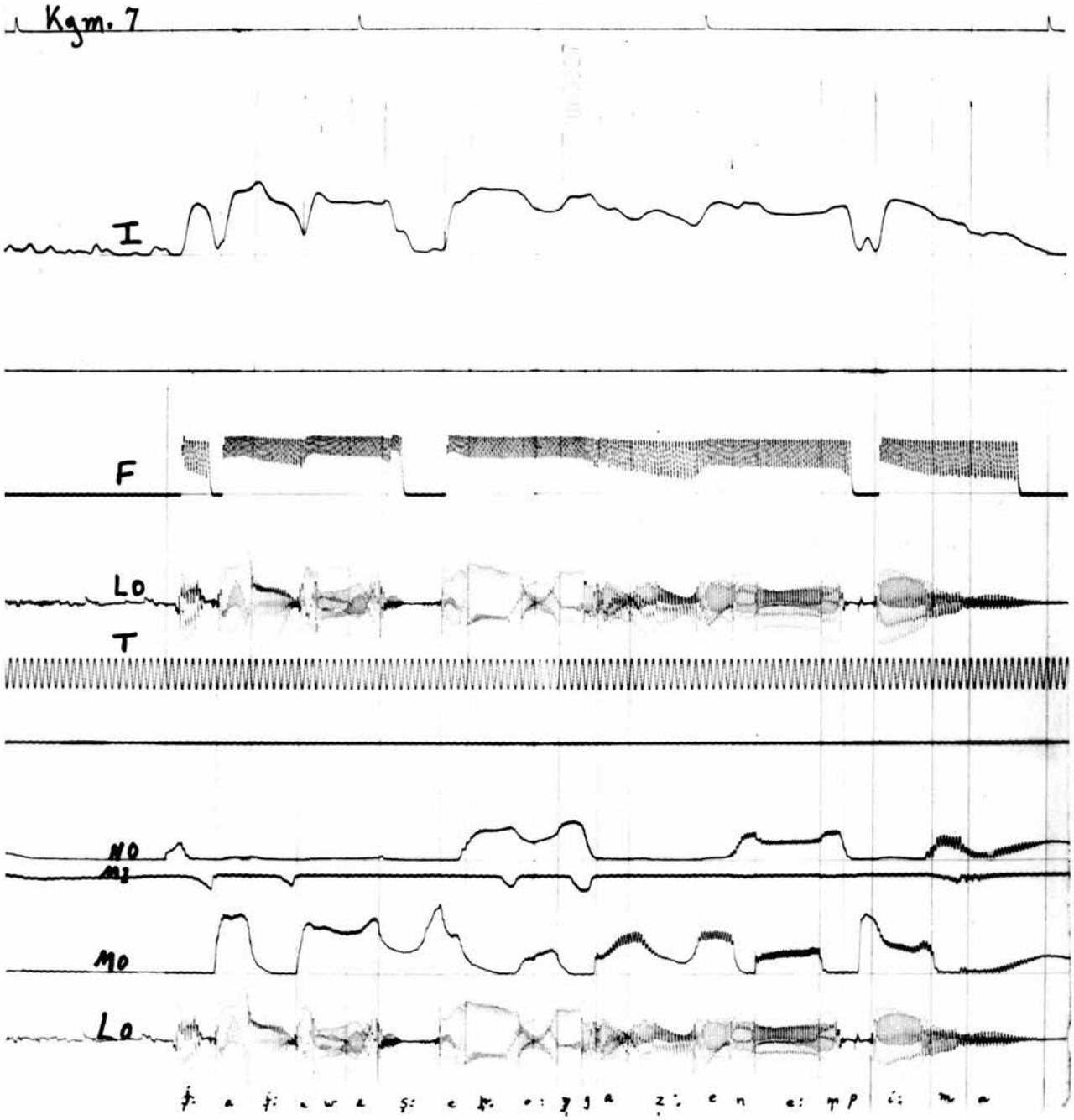

Kgm 2
I
F
Lo
T
NO
MI
MO
Lo


Kym. 3
003321
I
F
LO
T
NO
MO
LO
mu p: a: ŋ ge ya t u: k a m u t; u: p t u

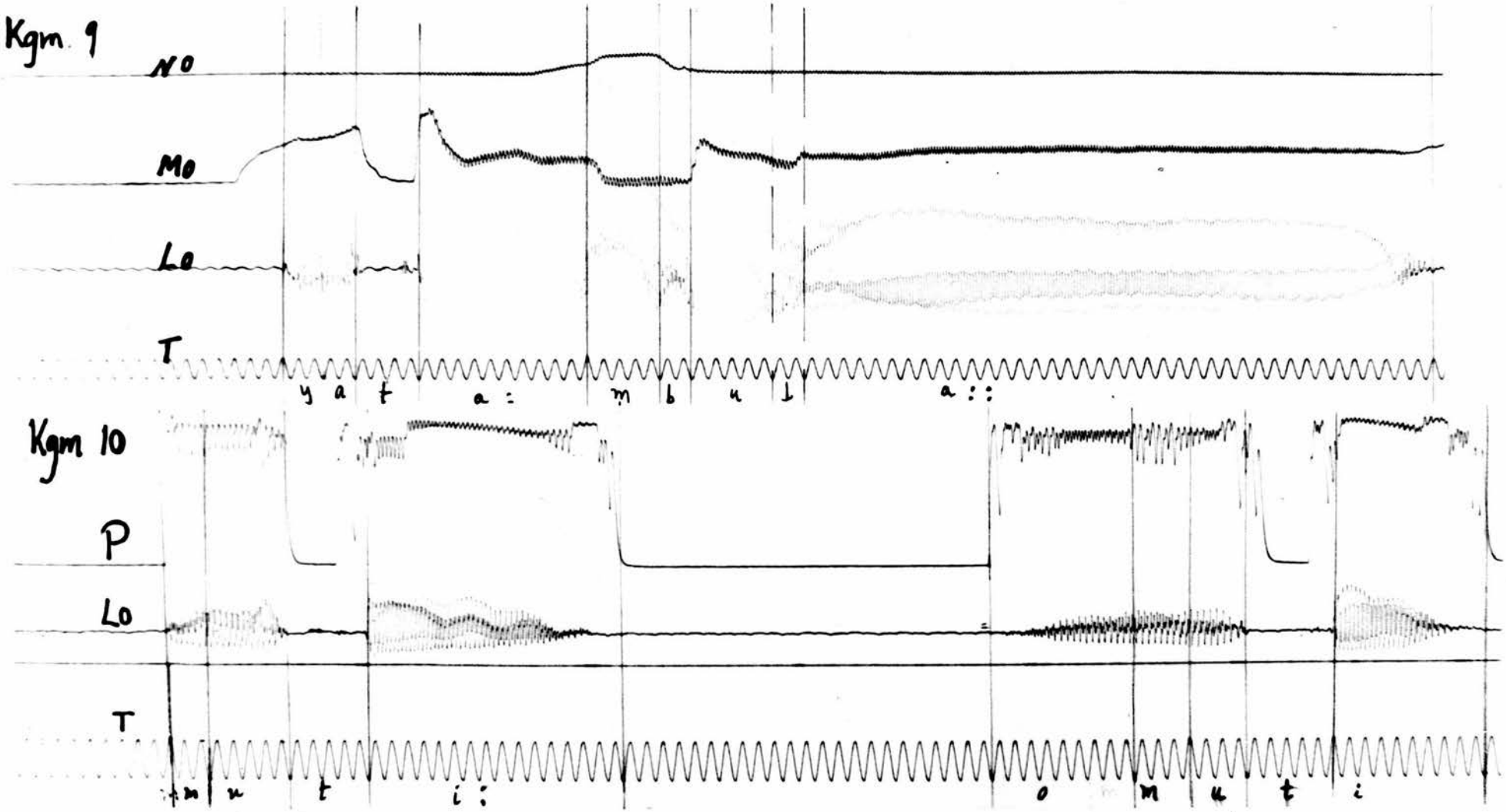

Kym.4
I
F
LO
T
NO
M1
MO
LO
e c i s e: n z e: c l t o c i ɕ: ɯ k a: m p o d a

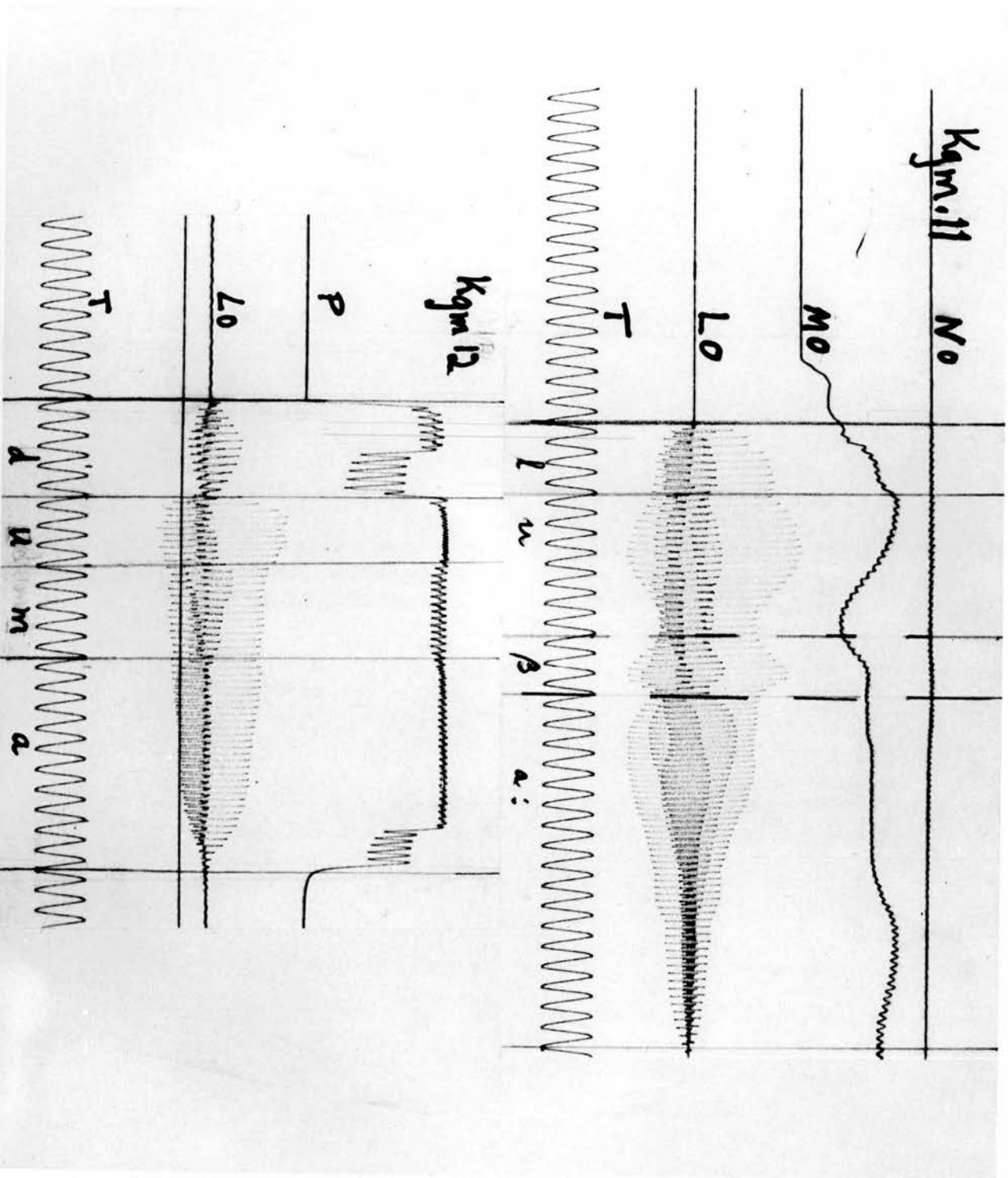

Kym. 5
009411
I
F
LO
T
No
MOI
MO
Lo
t a
t: a

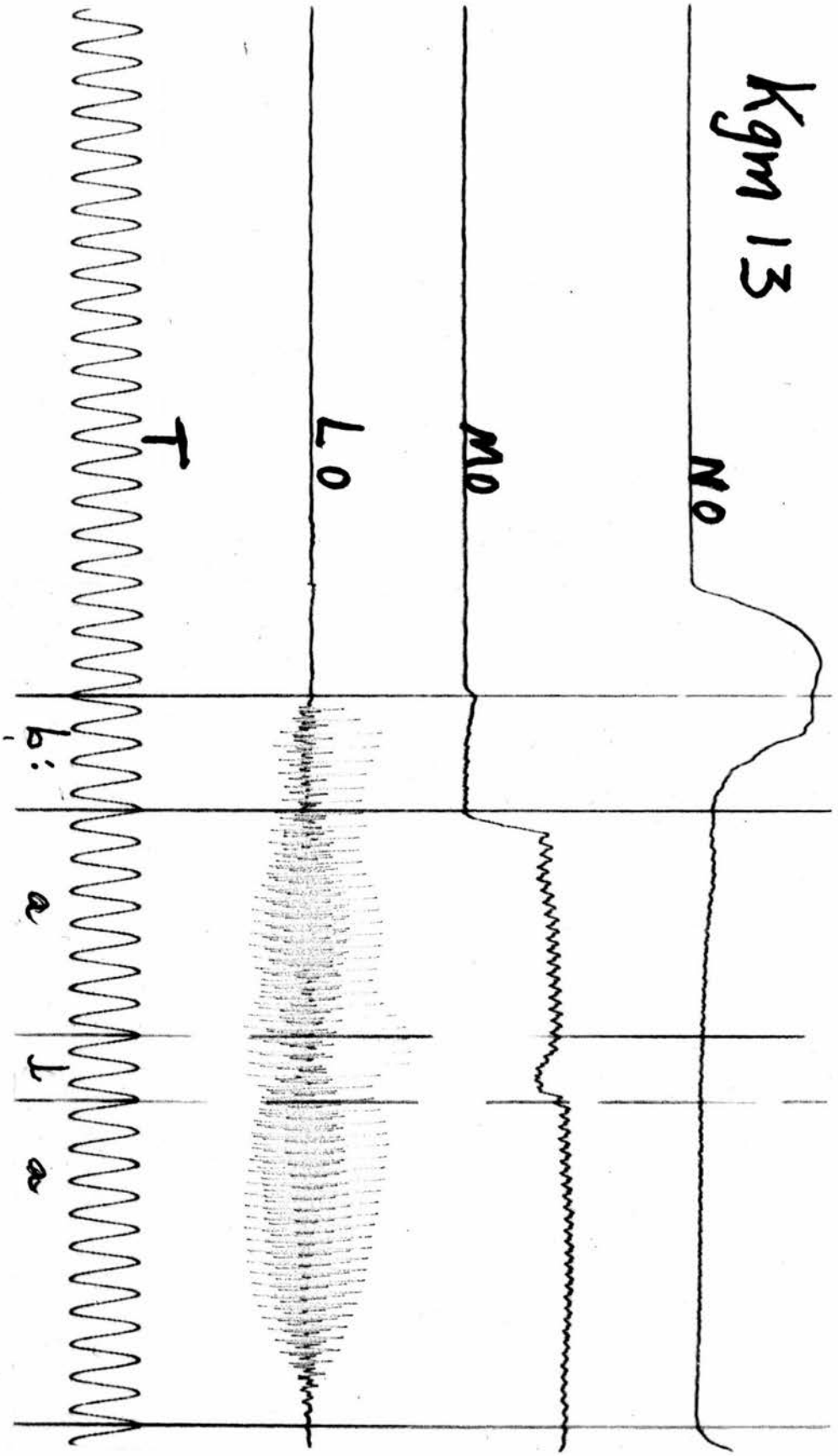

Kgn6
I
F
Lo
T
NO
MI
MO
Lo
k
a
k:
a

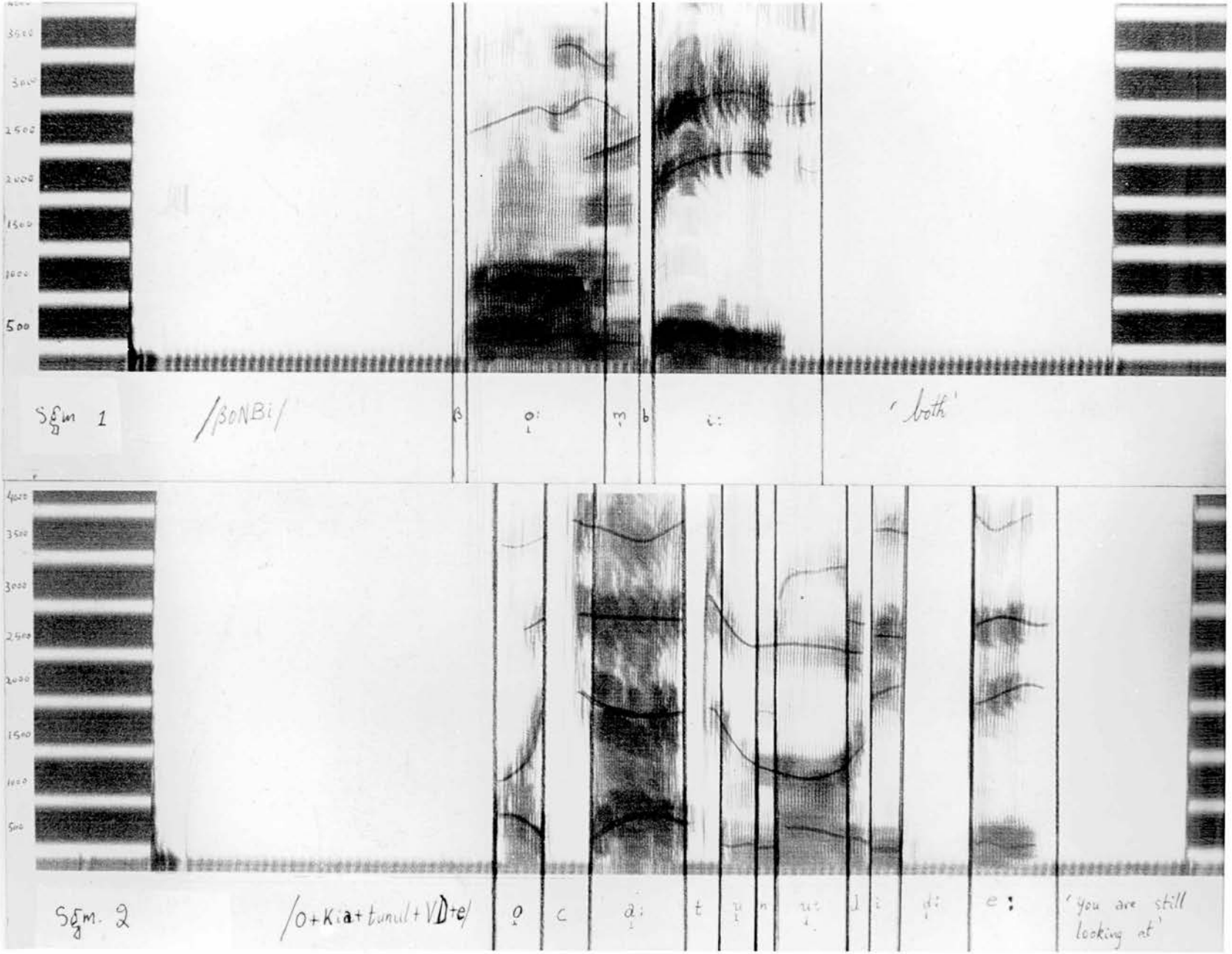

Kgm. 7
I
F
Lo
T
NO
M1
MO
Lo

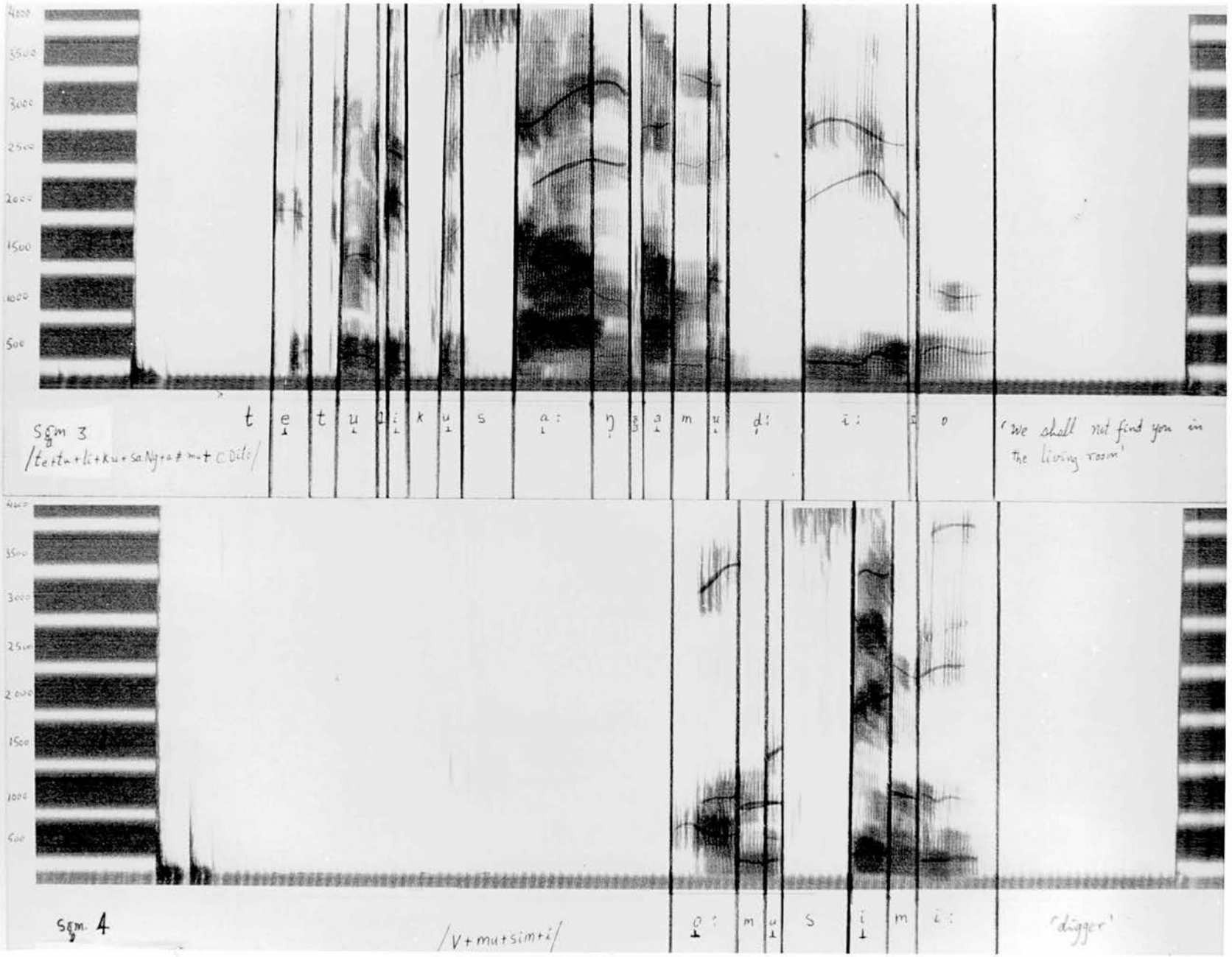

Kym 8
I
F
Lo
T
NO
M1
MO
Lo
e ɣ k o k e: β i: k a: m a ʃ i

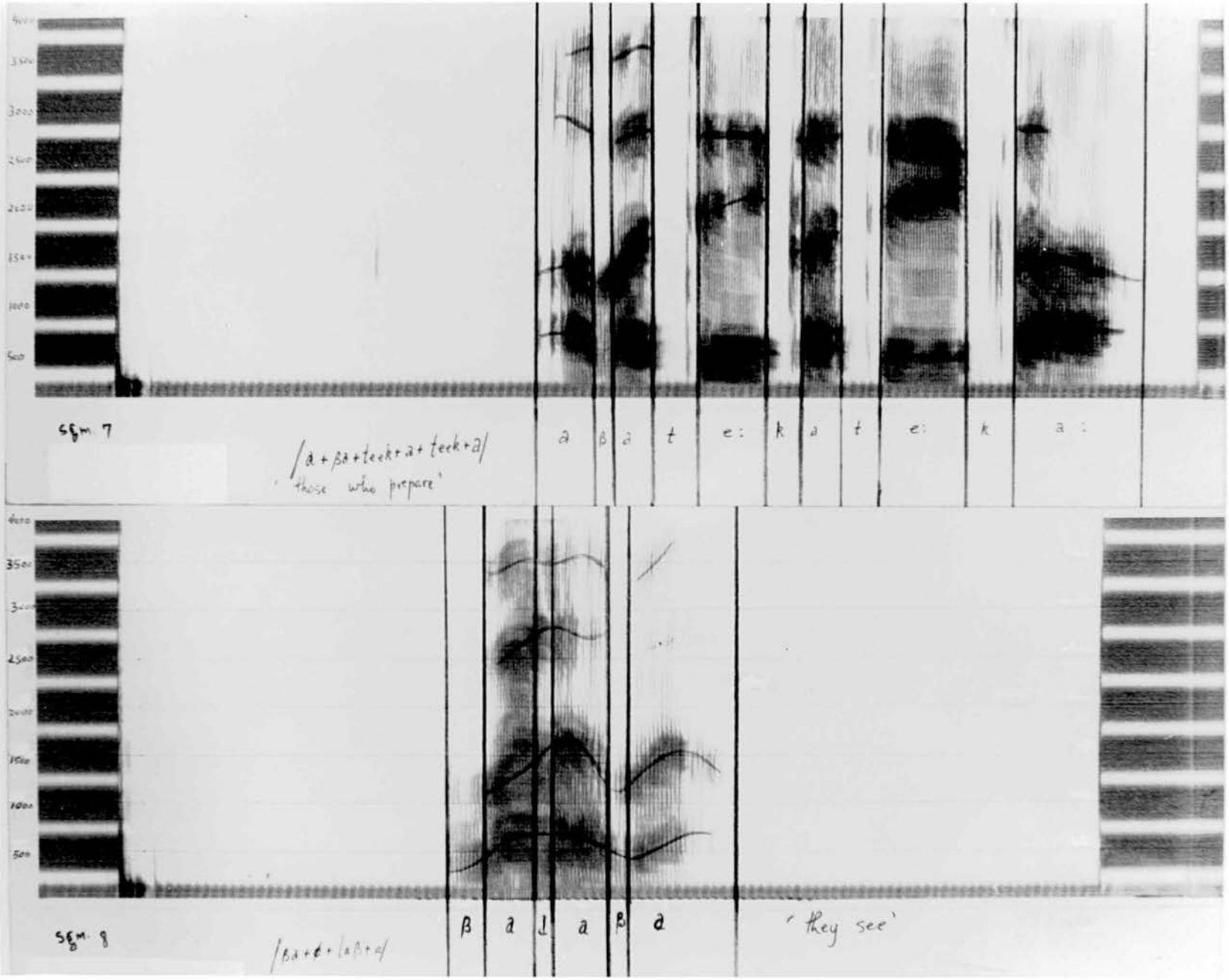

Kgm. 9
NO
MO
LO
T
y a t a : m b u l a : :
Kgm 10
P
LO
T
m u t i :
o m u t i

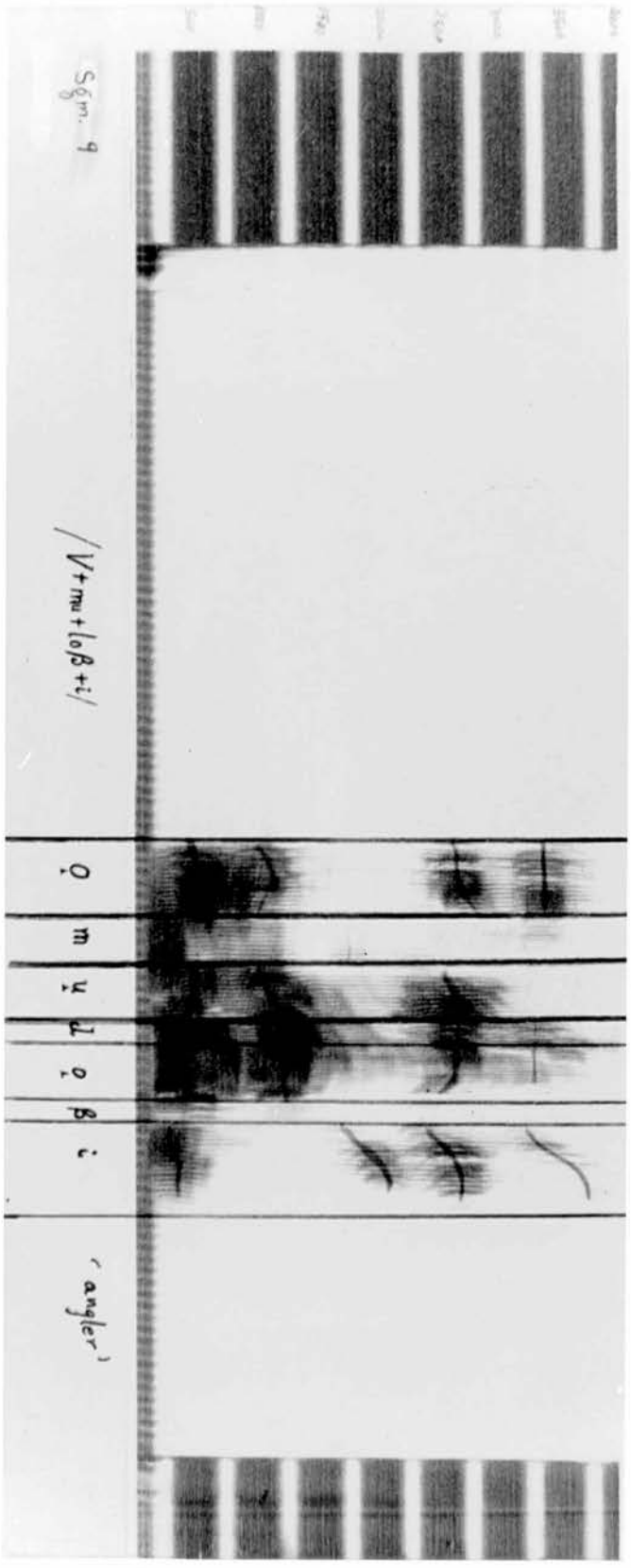

Kym.11
No
MO
LO
T
l
n
β
a
Kym.12
P
LO
T
d
u
m
a


Kgm 13
No
Mo
Lo
T
b
a
a


3500
3000
2500
2000
1500
1000
500
Sgm 1
/βoNBi/
β
o:
m
b
i:
'both'
4000
3500
3000
2500
2000
1500
1000
500
Sgm. 2
/o+K:a+tunul+VD+e/
o
c
a:
t
u
n
u:
l
i
di
e:
'you are still looking at'


4000
3500
3000
2500
2000
1500
1000
500
t e t u i k u s a: ŋ a m u d: i: o
'we shall not find you in the living room'
Sgm 3
/te+tu+li+ku+saNg+a+mu+di:/
4000
3500
3000
2500
2000
1500
1000
500
Sgm. 4
/V+mu+sim+i/
o: m u s i m i:
'digger'


Sgm 7
/a + βa + teek + a + teek + a/
'those who prepare'
a β a t e: k a t e: k a:
Sgm. 8
/βa + t + laβ + a/
β a l a β a
'they see'


Sgm. 9
/Vtmutoβti/
o
m
u
t
o
β
i
'angler'

14 VOWELS

14.1 Length

Quantity is as important for making surface phonetic differences between vowels as it is for consonants. It plays a distinctive role in some environments and a demarcative one in others. But, as we shall see presently, often there is more than just duration involved in the opposition between long and short consonants.

14.1.1 Word initial vowel length

In Cole (1967:5) we read:

> In word initial position (except when preceding geminate consonant clusters (....), vowels appear to be phonetically longer than medial single vowels.

Kymographic experiments were performed to test this hypothesis.

Results

The results obtained are shown in table 14.1

TABLE 14.1 The duration of word initial vowels

before C:	duration in MSC's	before C:	duration in MSC's	before NC:	duration in MSC's
/a + Ø + Ct + a/ [at:a] 'he kills'	120	/a + Ø + pim + a/ [a:pima] 'he measures'	160	/V + N + koko/ [e:ŋkoko] 'chicken'	140
/e + CDa/ [ed:a] 'later'	120	/a + Ø + sim + a/ [a:sima] 'he digs'	260	/V + N + te/ [e:nte] 'cow'	280
/O + Ø + Cm + a/ [om:a] 'you refuse'	120	/a + Ø + naaβ + a/ [a:na:βa] 'he washes'	280	/V + N + liga/ [e:ndiga] 'sheep'	180
/O + Ø + Ck + a/ [ok:a] 'you come (go) down'	100	/e + Ø + goβ + a/ [e:goβa] 'it chases'	140	/a + Ø + N + laβ + a/ [a:ndaβa] 'he sees me'	200

/V + C + diNDa/	60	/V + mu + Ntu/	200	/ō + ø + N + ta + e/	220
[ěd:inda]		[o:mu:ntu]		[o:nte:]	
'xylophone'		'person'		'that you may release me'	
average 100		average 208		average	204

Discussion

The basis of comparison is word medial vowels sandwiched between two short consonants which average 80 MSC's. These results show that the claim that word initial vowels tend to be longer than medial ones is valid. They also show that initially before strong consonants vowels are not as long as they are before C or NC sequences. These data are based on words in isolation but they are also valid for connected speech.

Although usually the word initial vowel is phonetically long, we have not marked its length in the rest of this description so as to avoid confusing the purely demarcative length of word initial vowels with the functional length of vowels elsewhere. The word initial vowel is always phonetically long but phonologically it is never long. It cannot contrast with a short vowel in that position.

It must be noted, however, that length for word initial vowels is not mandatory. In Kgm.4, for example, [e] is not long.

Besides length is not the only demarcative feature that characterises word initial vowels. Differences in the kind of voicing are used to characterise initial vowels. Often they begin with a [h] - like sound. The articulatory organs are placed in the appropriate posture for the vowel but there is a delay of a few MSC's in activating

the vibration of the vocal cords. This can be seen in Sgms.2,4 and 5, where the appropriate formant structure for the vowel is present but the voicing bar is absent for the initial part of the vowel.

Sometimes there is a glottal stop onset to the initial vowel. In Sgm.7, for example, before full voicing begins there are widely spaced striations which would indicate breathy voice if a voicing tracing was present. As there is no voicing they may reasonably be interpreted as an indication of a glottal stop.

14.1.2 Word medial vowel length

There is no controversy about the length of word medial vowels. Everybody agrees that there is a phonetic and phonological distinction between long and short vowels (11.4.3.1).

From kymograms these results were obtained for short and long vowels in words in isolation in minimal pairs. See table 14.2

TABLE 14.2 The duration of word medial vowels

short vowels	duration in MSC's	long vowels	duration in MSC's
/βag + a/ [βaga] 'fasten loosely!'	100	/βaag + a/ [βa:ga] 'cut up (an animal)!'	320
/lim + a/ [lima] 'cultivate!'	80	/liim + a/ [li:ma] 'ambush!'	280
/kol + a/ [koɻa] 'work!'	120	/kool + a/ [ko:ɻa] 'weed!'	360

In connected speech the quantity ratio between short and long vowels varies considerably depending on the tempo and style of speech. But as a rule long vowels are at least one and a half times as long

as short ones.

14.1.3 Word final vowel length

There is some disagreement about the length of word final vowels. Ashton, et al., (op.cit) has suggested that except in a very limited number of cases, word final vowels are short. These authors only recognise long vowels in word final position in some particular morphological environments.

To the present writer it seems that final vowels are usually long but their length is for the most part demarcative. There are no minimal pairs distinguished by final vowel length. However, final vowel length is often used in conjunction with tone to make phonologically significant distinctions. The claim that some final vowels are long was investigated kymographically. (see overleaf)

Results

TABLE 14.3 The duration of word final vowels

short vowels	duration in MSC's	long vowels	duration in MSC's
/mu + fu + a/ [mufa] 'you die'	200	/ku + fu + a/ [kufa:] 'to die'	300
/V + mutii/ [omuti] 'tree'	160	/mu + tii/ [muti:] 'tree'	280
/V + luβaa/ [ɔluβa] 'jaw'	140	/lu + βaa/ [luβa:] 'jaw'	340
/V + N + vuβuu/ [e:ŋvuβu] 'hippo'	160	/N + vuβuu/ [ŋvuβu:] 'hippo'	280
/ji + e ## mu + Cno/ [yemun:o] 'he is your friend'	100	/mu + Cno/ [mun:o] 'your friend'	240
/V + mu + sotaa/ [omusota] 'snake'	160	/mu + sotaa/ [musota:] 'snake'	260
/V + mu + palaa/ [omuwaɭa] 'girl'	140	/mu + palaa/ [muwaɭa:] 'girl)	340
/V + mu + vuβuka/ [omuvuβuka] 'youth'	160	/mu + vuβukaa/ [muvuβuka:] 'youth'	280
/V + lu + NBee/ [ɔlu:mbe] 'death'	140	/lu + NBee/ [lumbe:] 'death'	400
/V + li + eNvuu/ (ɛlye:ŋvu) 'banana'	160	/li + eNvuu/ [lye:ŋvu:] 'banana'	300
average	152	average	302

Discussion

These results show that phonetically word final vowels are longer than medial ones usually.

14.2 The effects of consonants on vowel length

In (11.4.3.1) we discussed the lengthening effect an NC sequence has on a preceding vowel and the way in which strong consonants inhibit the realization of vowels before them as long. Both these effects can be seen in kymograms used in this description.

The lengthening of a vowel before an NC sequence can be seen in kgms.3,4 and 7. In kgm.3 the [a] and the [u] preceding respectively [ŋg] and [nt] are long; in kgm 4 the [e] and [a] respectively followed by [nz] and [mp] are long and in kgm.7 the [o] before [ŋg] and the [e] before [mp] are long. Note that as we stated in (11.4.3.1) lengthening is a phonotactic rule applying across word boundaries. Thus in kgs.4 and 7 the vowels before NC sequences are lengthened.

As for the inhibition of lengthening which would otherwise have taken place when two underlying nonconsonants precede a strong consonant see kgms.1 and 7. In kgm.1 /N + Ø + pa + a # V + C + paapaali/ [mpep:a:pa:li] 'give me the pawpaw' there are three underlying vowels which abut /a + a + V/ no compensatory lengthening is allowed after the deletion of the two /a/'s: /a + a + V/→ [e], just 100 MSC's long. Similarly the two /a/'s before [z:] in kgm.7 are realised as (a) 100 MSC's duration without any compensatory lengthening.

14.3 Rhythm

Trubetzkoy (1939:17) distinguishes between syllable counting and mora counting languages. In the former the prosodic units of tone or stress always coincide with the syllable while in the latter such prosodic units do not necessarily coincide with the syllable -

they are sometimes smaller than it. In (11.4.2) we showed that Luganda is a mora counting language and in (11.4.5) we classified Luganda syllables on the basis of the morae they contain. We mentioned the fact that the mora is not only a tone bearing unit but also a unit of length.

This claim was investigated using electrokymography.

Results

The results obtained are shown in Table 14.4 below.

TABLE 14.4 Differences in duration of syllables

One mora syllables	Duration in MSC's	Two morae syllables	Duration in MSC's	Three morae syllables	Duration in MSC's
/βal + a/ [βaɭa] 'count!'	200	/C +βala/ [b:aɭa] 'spot'	280	/∅ + CBaala/ [b:a:ɭa] 'bar'	480
/mal + a/ [maɭa] 'finish!'	160	/N + ∅ + mal + a/ [m:aɭa] 'I finish'	280	/N + ∅ + maal + a/ [m:a:ɭa] 'I smear'	500
/βag + a/ [βaga] 'fasten loosely'	200	/N + ∅ + βaga/ [mbaga] 'I fasten loosely'	260	/N + ∅ + βaag + a/ [mba:ga] 'I cut up (an animal)'	480
/sim + a/ [sima] 'dig!'	200	/N + ∅ + sim + a/ [nsima] 'I dig'	280	/N + ∅ + siim + a/ [nsi:ma] 'I am grateful'	440
average	190	average	275	average	475

Discussion

From these kymographic data based on citation forms it is clear that the more morae there are in a syllable (in the same style of speech) the greater is its duration and that syllables with the same number of morae are roughly equal in length regardless of the

nature of their underlying phonological representations.

A similar pattern emerges in connected speech. For example, in kgm.1 the three syllable [p:a:] which has three morae is 300 MSC's while [mpe] and [pa:] with two morae each are respectively 260 MSC's and 240 MSC's. These great differences in the length of syllables have no important consequences for Luganda rhythm for it is the mora rather than the syllable that counts and morae are roughly the same length in utterances produced in the same style.

14.4 Nasalisation

Vowels are nasalised in Luganda before and after nasal consonants. Nasalisation is cumulative so that a vowel occuring between nasal consonants is more heavily nasalised than one which is preceded or followed by just one consonant. See kgms.1,2,3,4,7 and 8.

14.5 Vowel raising

In (10.1.3) it was stated that vowels are articulated with the tongue slightly fronted and lifted from the floor of the mouth. It was claimed that the acoustic effect of this vowel raising is a lowering of F_1 and the raising of F_2 values. This claim is supported by the spectrographic evidence in table 14.5 which shows the formant structure of sgms.6 and 9 which respectively represent the words /o + kuloβ + a/ [okuloβa] 'to hook' and /o + mu + loβ + i/ [omuloβi] 'angler'.

TABLE 14.5 Spectrographic evidence of vowel raising

		F_1	F_2	F_3	F_4
sgm6 [okuɻoβa] 1 2 3 4	o 1	500 cps	950 cps	2600 cps	3450 cps
	u 2	400 cps	1100 cps	2500 cps	-
	o 3	400 cps	1050 cps	2600 cps	3300 cps
	a 4	600 cps	1400 cps	2800 cps	3650 cps
sgm9 [ɔmuɻoβi] 1 2 3 4	o 1	500 cps	1000 cps	2600 cps	3300 cps
	u 2	300 cps	1150 cps	2600 cps	-
	o 3	400 cps	1200 cps	2600 cps	3250 cps
	i 4	300 cps	2000 cps	2600 cps	3600 cps

APPENDIX I

The following sentences written below in the standard Luganda orthography were used in the Ludikya experiment reported in (11.4.1)[1].

1. Bbugubugu, si muliro.
   'A big, roaring blaze is not a good fire'

2. Kulya ggi, kwesubya muwula
   'It is to eat the egg and only later to realise you cannot have a chicken'

3. Endege ziba nnyingi ne ziyoogaana.
   'Many bells jingle loudly'

4. Awagwa enkuba, tewagwa njala
   'Where it rains, there hunger does not fall'.

5. Ndi mugezi, nga mubuulire.
   'I am clever (says he), it is because he has been told'

6. Emmeeme katale, ky'esiima ky'egula.
   'One man's meat is another man's poison'.

7. Ekkonkomi ebbi, lye linnannyini kigagi
   'It may be an ugly lizard, but it is the owner of the aloe'.

8. Munno mu kabi, ye munno ddala.
   'A friend in need, is a friend indeed.

9. Ntambaazi ya kinyomo, erinnya omuti nga y'etisse
   'The kinyomo is an audacious chap, he climbs up a tree carrying a load'

10. Nnaku za mbwa, n'atagifuga aboggoza.
    'It is a sad life for a dog, anyone can make it bark'.

The Ludikya versions of these sentences which were written out by the pupils who participated in the experiment are given overleaf in their original form.

1 The translations are not perfect. They are only meant to give some idea of the content of these sentences.

A.1 Bbutifu gubifu butifugutifu, sitifu mutifu litifu rotifu.

2 Kutifu lyatifu ggitifu kwetifu sutifu byatifu mutifu wutifu latifu.

3 Etifu ndetifu, getifu zitifu batifu nnyitifu netifu zitifu yootifu gatifu natifu.

4 Atifu watifu gwatifu etifu nkutifu batifu, tetifu watifu gwatifu njatifu latifu.

5 Nditifu mutifu getifu zitifu ngatifu mutifu butifu litifu letifu.

6 Btifu mmetifu metifu katifu tatifu letifu, kyetifu siitifu matifu kyetifu gutifu latifu.

7 Etifu kkotifu nkotifu metifu etifu bbitifu lyetifu litifu nnatifu nyitifu nitifunitifu[1].

8 Mutifu notifu mutifu katifubitifu yetifu mutifu nnotifu ddatifu latifu.

9 Ntatifu mbaatifu zitifu yatifu kitifu nyotifu motifu etifu ritifu nyatifu otifu mutifu ngatifu yeetifu ssetifu

10 Nnatifu kutifu zatifu nbwatifu natifu tatifu gitifu gatifu atifu botifu ggotifu zatifu.

B.1 Mbugumbukutu simurindokoto.

2 Kulyandokata ggindikutu kwesubyandakata muwulandakata.

3 Endezendekete zibandakata nyindikoto neziyondokota.

4 Awagwandakata enkundakata tewaggwandakata njandakata.

5 Ndimugenzindakata nga muburindikata.

6 Enendekata kyesiimandakata kyegulandakata.

1 It is unclear whether the repetition at the end here and the failure to complete the sentence are deliberate.

7 Ekkonkomeniribi lyenelindi kirindirindi.

8 Munondolonda mukabi ndikiti ye munno ndolonda.

9 Ntabandakakata ya kinyondokoto erinyandakata omutindokoto nga yettissendekete.

10 Naku zambwandalanda natagifugandakata abogandakata.

C.1 Bugubugu simulibulo.

2 Alibudele eggibugi kwesububya muwabula.

3 Endegebuge zibuba nnyibungi ne ziyogabuna.

4 Awagwabugwa enkububa tewagwabugwa njabula.

5 Ndimugebuzi nga mubulibule.

6 Emmebune katabule, kyessibuma kyegubula.

7 Ekkonkobume (ebbi)[1] lye linanyibuni kigabugi.

8 Mubuno mukabubi ye mubuno ddabula.

9 Ntambaabulabuzi ya kinyobunyo, eribunya omubuti nge yetibuusse.

10 Nnakubuku Zambwa, natagifubuga aboggoboza.

D.1 Gubugubbu, rolimusi.

2 Lyaku ggi byasukwe lawumu.

3 Gendege bazi nginnyi nagaayoozine.

4 Gwawa a banku e, gwawate lanja.

5 "Zigemu ndi" relibumu nga.

6 Memme e letaka, masiikye lagukye.

1 It is unclear why the subject decided to put this word in brackets.

7 Minkoko e bii e ninyinnali lye gigaki.

8 Nnomu bikamu nno muye ladda.

9 Zimbaanta monyoki ya, nyarie timuo setiyenga.

10 Kunna mbwa za, gafugitana zagoboa.

E.1 Gubugubbu sirolimu.

2 Lyakuo ggi byasukwe lawumu.

3 Gende e bazi nginnyi nagayoozine.

4 Gwawa A bakuńe gwawate lanja.

5 Ndi zigemu nga relibumu.

6 Memme e letaka masiikye lagukye.

7 Mikonkko e bbie lye ninyinnali gigaki.

8 Nomu bikamu nnomu ye ladda.

9 Zibaanta monyikiya nyarie timuo nga ssetiye.

10 Kunna mbwaza gafugitana zaggoboa

Notes

1. It is an interesting fact that the phonological word is the domain in which Ludyika rule operates. Reversal of syllables as in D and E, the addition of harmonizing nonsense syllables to the rump of a word as in B and the insertion of the nonsense syllable bu as in C always occurs within a phonological word. One can tentatively infer from this that the phonological word is a relevant unit of phonetic programming; that is why when normal programmes for the production of Luganda utterances are systematically disrupted in the manner demonstrated above in order to produce Ludikya the phonological word constitutes the

domain of the disruption. Note, however, that the word does not always play a role in this process. Thus for subject A the Ludikya game involves only the syllable - the nonsense syllables - tifu are added to every syllable; the phonological word is not a relevant construct for the kind of disruption used by subject A.

2. There are many inconsistencies in the spellings of the pupils. No attempt has been made to correct them.

Bibliography

Abbreviations

Africa	Africa. London.
ALS	African Language Studies. London.
AS	African Studies. Johannesburg.
Afrika	Afrika und Übersee. Berlin.
BSOAS	Bulletin of the School of Oriental and African Studies. London.
C U P	Cambridge University Press. London.
EWPL	Edinburgh Working Papers in Linguistics. Edinburgh.
FL	Foundations of Language. International journal of language and philosophy. Dordrecht, Holland.
IJAL	International Journal of American Linguistics. Baltimore.
JAL	Journal of African Languages. London.
Lg.	Language. Journal of the Linguistic Society of America. Baltimore.
L & S	Language and Speech. Teddington, England.
Lingua	Lingua. International Review of General Linguistics/Revue internationale de linguistique générale. Amsterdam.
Linguistic Inquiry	Linguistic Inquiry. MIT, Cambridge, Massachusetts.
MIT Press	Massachusetts Institute of Technology Press. Cambridge, Massachusetts.
OUP	Oxford University Press. London.
Phonetica	Internationale Zeitschrift für Phonetik/ International Journal of Phonetics. Basle/ New York.
SOAS	School of Oriental and African Studies, London.
SAL	Studies in African Linguistics. University of California, Los Angeles.

TCLC — Travaux du cercle linguistique de Copenhague. Copenhagen.

TCLP — Travaux du cercle linguistique de Prague. Prague.

TPhS — Transactions of the Philological Society. Oxford.

Word — Word. Journal of the Linguistic Circle of New York. New York.

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