Aspects of Somali Phonology

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Abstract

Somali is probably the best documented, in linguistic terms, of all of the Cushitic languages. Much work has been undertaken on the syntax and the morphology of the language. However, when it comes to the phonology of the language there is a distinct lack. The aim of this thesis is to help fill that gap. This will be done by taking the generative theory of lexical phonology as a basis of a model of Somali phonology; within that overall framework a model of melodic representation will be proposed as well as a model of prosodic representation. The proposals are made specifically with the Somali language in mind and explanations of certain aspects of Somali phonology will be set out both in the chapters discussing the models of representation as well as in the chapter specifically dealing with the explanation of a number of phonological phenomena manifested in the inflectional morphology of the language.

The thesis does not cover the whole set of phonological phenomena manifested in Somali, nor does it set out to produce a universal model of phonology. As far as Somali is concerned, it is hoped the work will provide a convenient springboard for the future study of phonological phenomena in Somali. As far as universal phonological matters are concerned it is hoped that the model proposed here for Somali will be another step in the continuing search for universal explanatory aspects of phonology.

Chapter one introduces the language and the main theoretical assumptions. Chapters 2 and 3 introduce the models of melodic representation and prosodic representation respectively. Chapter 4

provides explanations for certain phonological phenomena manifested in the inflectional morphology of Somali. Chapter 5 brings the whole together and looks forward to the future study of Somali phonology in light of this thesis.

Table of Contents

List of diagrams

Chapter 1

Chapter 2

Chapter 3

Chapter 4

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Abbreviations

This is an alphabetical list of acronyms, abbreviations and marks used in the text of the thesis. The particular diagrammatic conventions in the diagrams of phonological representations are discussed in the relevant chapters. Also abbreviations which are particular to a specific diagram and are not referred to elsewhere are not included in this list. The items in the list are given in the case in which they are found in the majority of cases, some occasionally also occur in the opposite case but this does not alter what they stand for (except in the case of PL and pl, both of which are given below).

Note also that features which are proposed here for Somali are all written in upper case letters.

AA	active articulator
ant.	anterior
C	consonant
ca.	circa
CG	close glottis
CONS	consonantal
CONT	continuant
COR	coronal
dist.	distributed
DOR	dorsal
env.	environment
f.	feminine
G	glide
GUTT	guttural
imper.	imperative
impf.	imperfect
intr.	intransitive
IPA	International Phonetic Alphabet
LAB	labial

laryng.	laryngeal
LAT	lateral
m.	masculine
NAS	nasal
n.d.	no date
neg.	negative
OCC	occlusion
p.	person or page
PAL	palatal
PC	pharyngeal constriction
perf.	perfect
PHON	phonation
PL	place
pl.	plural
RET	retroflex
RND	round
sg.	singular
SON	sonorant
SPE	*The Sound Pattern of English* (Chomsky, N. and Halle, M. (1968))
STOP	stop
supra.	supralaryngeal
supralaryng.	supralaryngeal
tr.	transitive
UR	underlying representation
V	vowel
WG	wide glottis
μ	mora
σ	syllable
<	derived from
*	following general convention this will be used to denote both ungrammaticality and protoform

!	this is used to denote an "odd" form, one which may or may not be acceptable
∴	therefore

Chapter 1. Introduction

1.1. Introduction to the language

1.1.1. The people, orthography and development of Standard Somali

Somali is a Cushitic language spoken in the Horn of Africa; the actual area being roughly all the land east of a line running south-south-west from Djibouti to the river Tana in Kenya. It is spoken, therefore, in the following countries: Somalia, Somaliland[1], Ethiopia, Djibouti and Kenya. The number of speakers is not accurately known, but is most probably around 7 - 10 million in all.[2]

The Somalis traditionally fall into two major socio-economic groups: the nomadic pastoralists and the sedentary agriculturalists. The agriculturalists live primarily in the area between the Shabeelle and Jubba rivers where they grow a variety of crops, while the pastoralists range over the rest of the area. There is an area in the north-west of the Somali speaking territories where agriculture is also practised. A further group of people are those who live in the towns. Although some of the coastal towns and cities are of great age, for example Muqdishu, Saylac or Marka, their populations have increased greatly over the last few decades. This is also the case in some inland towns, such as Hargeisa and Beledweyne.

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1 The Republic of Somaliland declared independence unilaterally in 1991 and incorporates the land which had been the British Somaliland Protectorate.

2 El-Solami-Mewis, C. (1987) gives a figure of ca. 3.5 million (p.13), the *Cambridge Encyclopedia of Africa* (Oliver, R. & Crowder, M. (eds.) (1981)) gives ca. 4 million (p.85) and Lewis, I.M. (1980) ca. 4.5 million (p.1). Lewis also gives the following breakdown of the figure: ca. 200,000 in Djibouti, ca. 1 million in Ethiopia, ca. 3.25 million in Somalia and ca. 250,000 in Kenya (Lewis, I.M. (1980) p.1).

In 1972 the dialect of Somali, which has come to be known as Standard Somali, was provided with an official orthography and was made the official language of Somalia by the government of the time[1]. It became the language of administration and the civil service, of the media, both broadcast and printed, and was used in the education system. Committees discussed and decided upon Somali words to translate concepts new to the culture, such as western scientific terms. The writing of the language also led to the development of a written literature, something new to Somali literature which had been almost exclusively oral in nature beforehand.

The dialect group which forms the basis of Standard Somali is the northern dialect group (see section 1.1.3.) which is the most widely spoken, primarily by the nomadic population. A further reason for this development is that this dialect group is the main medium for much Somali oral poetry which plays a very important role in Somali society. This poetry, when good, may travel very far and very quickly by word of mouth, thus aiding the diffusion over the years of the dialect in which it is composed. As a consequence of this diffusion the northern dialect group became something of a lingua franca. In more recent decades the broadcast media, especially radio, has reinforced this process.

During the course of writing this thesis, Somalia has been in the throes of brutal and bloody civil wars in which thousands of people have been killed and hundreds of thousands of people displaced. Man-made famine has also ravaged parts of the country and a total lack of security has led to widespread banditry, looting and killing. There cannot be a Somali family which has not been affected by this horrific conflict.

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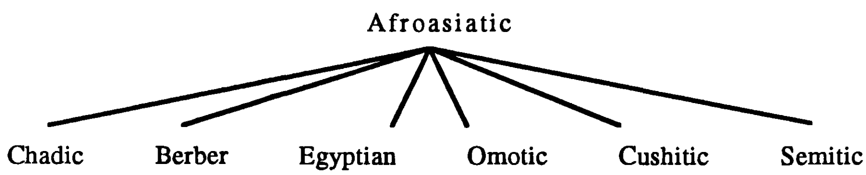
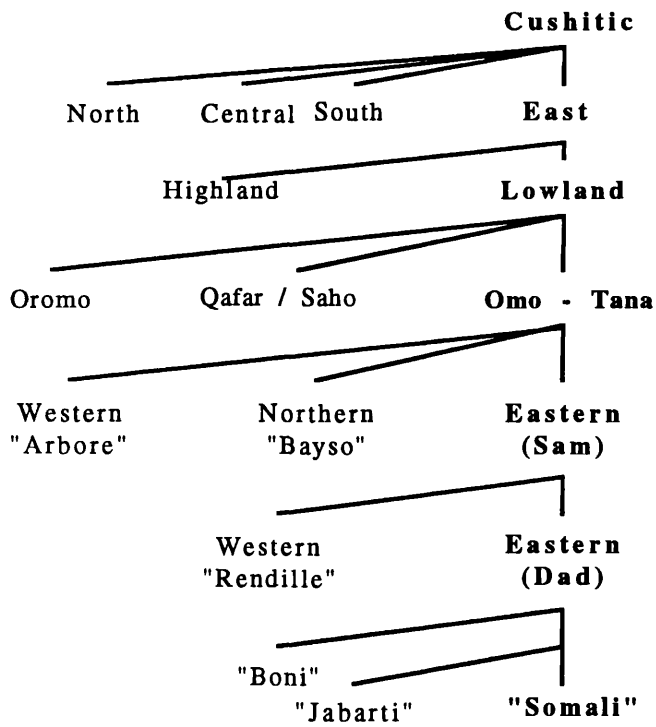
1 For details of the discussions and disputes surrounding the choice of script see Laitin, D.D. (1977) particularly chapters 4 and 5.

1.1.2. The language's position in Afroasiatic

Somali is a member of the Afroasiatic superfamily. Specifically it is a member of the Lowland East branch of the Cushitic language family. Tree diagrams showing its affiliation are given below.

(1.1) Somali's position in Afroasiatic and Cushitic





Pillinger, S. (1989) (p.17)

The Afroasiatic tree diagram is relatively uncontroversial although there is still discussion as to the precise affiliation of the Omotic languages, whether they are a separate branch in their own right or whether they constitute part of the Cushitic branch. The Cushitic tree is more controversial, especially in the low level classification. The tree here is an adapted version of that found in Pillinger, S. (1989). In common with Pillinger, we are not concerned here with the matter of the genetic classification of Somali, and thus the above diagram is meant merely to illustrate how Somali fits into the Cushitic family as a whole. Furthermore, the matter of the internal classification of Somali, that is the classification of the various dialects, will not be illustrated as this is also a matter of debate and will not form part of the subject matter of this thesis, although dialectal evidence will occasionally be used in some of the arguments.

1.1.3. Dialects of Somali

Despite the fact that Somali is seen as a homogenous language unit, it is made up of a number of dialects. The main dialect groups are:

- Northern Somali dialects
- Benaadir dialects
- Ashraaf dialects
- May dialects
- Digil dialects[1]

(From Lamberti, M. (1986a) pp.13-14)

The reader interested in learning more about Somali dialects will find the following works particularly useful and interesting in this area: Lamberti, M. (1986), (1986a), Ehret, C. & Mohamed Nuuh Ali (1983), Saeed, J.I. (1980), (1982).

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1 Lamberti suggests that one member of this group, Af-Jiiddu, may form a sixth dialect group on its own (see Lamberti, M. (1986) p.14).

1.1.4. Linguistic minorities in the Somali speaking area[1]

Within the area in which Somali is spoken there are some pockets in which other languages are spoken. Lamberti gives the following languages:

Oromo
Af-Boon
Af-Mushungulu
Swahili

(Lamberti, M. (1986a) p.13)

Oromo is spoken in the Gedo region (the dialects of Oromo being Af-Arussi, Af-Qotto, Af-Boraan and Af-Garre) and in the southern part of the Jubbada Hoose (Lower Juba) region where, according to Lamberti's informants, the dialects Af-Garre and Af-Wardeyg are spoken. Lamberti points out that the Oromo speakers, as is the case with the other speakers of minority languages, are very much integrated into the Somali society and men and young people can often speak fluent Somali.

Af-Boon is considered to be a Cushitic language which is in the process of dying out. Spoken in an area between the town of Jilib and the coast, only elderly people use the language as a mother tongue.

Af-Mushungulu is a Bantu language which, according to W.J.G. Möhlig corresponds to the Shambaa language of Tanzania. It is spoken along the banks of the Jubba in the vicinity of the town of Jamaame[2] .

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1 All of the information given in this section is taken from Lamberti, M. (1986), pp.5-9.

2 A personal communication to Lamberti. See footnote 5 to Chapter 1 on p. 413 of Lamberti, M. (1986).

The Swahili speaking minority is divided into two groups. The speakers of a dialect known as Ki-Bajuni live along part of the coastal strip in the Jubbada Hoose region and especially in the town of Kismaayo. The second group, speaking a dialect known as Chi-Mwiini, live in the town of Baraawe (Brava) and along the coast adjacent to the town.

1.1.5. The data used in the thesis

The data used in this thesis is not taken from any one particular corpus of material. Since the phonological phenomena which are to be considered here have been adequately described it has not been necessary to collect a large amount of new data. Although written descriptions of phonological phenomena in Somali have been used to a great extent, the author has worked with Somali speakers in London (see acknowledgments), confirming or confuting the published observations, and has personally listened to and checked all of the Somali examples given in the thesis, along, of course, with many other examples. Furthermore, the author has been fortunate enough to work with staff members of the Somali section of the BBC World Service which has provided the opportunity of being in an almost fully Somali speaking environment. Listening to broadcasts by the BBC in Somali has also been of great use in picking out examples of phonological phenomena.

The major written works which, among others, have been used are the following: Andrzejewski, B.W. (1968), Armstrong, L.E. (1934), Cardona, G.R. (1981), Hyman, L. (1981b), Lamberti, M. (1988) and Moreno, M.M. (1955) (see the bibliography for other references).

1.2. Introduction to the theory

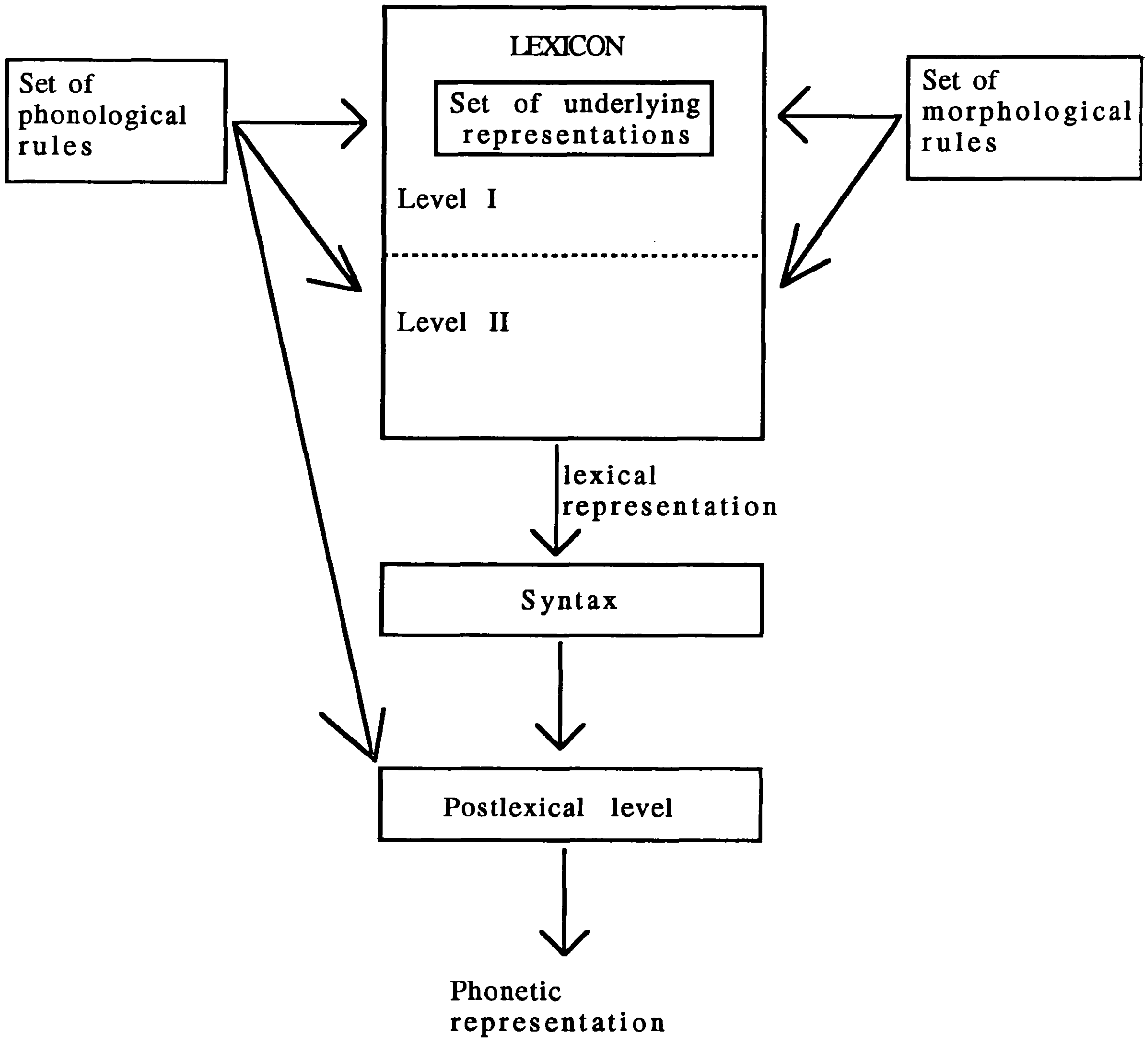
1.2.1. This study and phonological theory

As mentioned in the abstract, the aim of this thesis is to provide an explanatory model of Somali phonology. With this aim in mind it is hoped that the thesis will contribute both to the study of the Somali language and to the study of generative phonology in general. It must be pointed out at this stage that the ideas on phonological rules and representations, their structure and organization will be discussed specifically in relation to Somali. This is not to say that, because something offers insights into Somali it necessarily offers insight into phonological behaviour in a universal sense. Although universal implications will be noted at appropriate stages they will not be pursued in detail. It will be left to further work to discuss in greater detail the universal implications of the model developed here for Somali phonology.

1.2.2. Outline of lexical phonology

This section will provide an outline of the model of lexical phonology assumed in the thesis. It is not intended here to provide any particular justification for lexical phonology, nor shall lexical phonology be compared with the SPE model or any other model of phonology. Some general works which deal with such matters are: Kaisse, E.M. & Shaw, P.A. (1985), Mohanan, K.P. (1986), Durand, J. (1990) (pp.168-197) and Goldsmith, J.A. (1990) (pp.217-273). Diagram (1.2) shows the model of grammar assumed in this thesis, showing also the way in which the phonological component of the grammar fits into the general schema.

(1.2) The model of grammar assumed in this thesis



1.2.2.1. The lexicon

The model of the lexicon assumed here is that of a lexicon divided into levels. This idea is fundamental to the majority of theories of lexical morphology and phonology. The lexicon for Somali will be assumed to consist of two levels. Level I will be labelled the derivational level and level II the inflectional level.

This assumption of two levels may be justified in Somali by the behaviour of the following coalescence process, given here informally as /l/+/t/→ [ʃ]. Without entering into the details of the process we must assume it to apply only at level II, the inflectional level, since it only occurs when inflectional suffixes are added to a form. This is exemplified below where the concatenation of two distinct morphemes, which happen to have the same melodic shape, results in two distinct surface representations.

ul + tan	→	u[ʃ]an	"this stick"
ul + tan	→	u[lt]an	"fight together with sticks"

In the first example the suffix **-tan** is a feminine demonstrative suffix which may only be added at the inflectional level (level II). Whereas the suffix **-tan** in the second example is a verb forming derivational suffix which may only be attached to a root at the derivational level (level I). Given this, the difference in behaviour between the two may be explained in terms of the fact that the phonological process /l/ + /t/ → [ʃ] only applies at level II of the lexicon. Without the assumption of a lexicon divided into levels, the facts given above would have to be explained in other terms. For example, the derivational suffix would need to be marked as not undergoing the rule.

This matter demonstrates a further aspect of lexical phonology, namely that the domain of application is an inherent aspect of any phonological rule formalism (see Mohanan, K.P. (1986) p.13). The actual rule component is separate from the lexicon (see (1.2) above) and rules are stated only once in this component. The assumption of two levels in the Somali lexicon is based on observations of behaviour such as that exemplified above. No indications have been found to prompt the assumption of further levels existing within the lexicon in Somali. A thorough examination of matters such as word compounding in Somali would be required, however, before any firm assertion, as to whether more than two levels exist, may be made.

A further constituent of the lexicon is the set of underlying representations. This is the list of all the free morphemes of the language, a morpheme being defined here as a minimally specified phonological representation along with all the idiosyncratic semantic, syntactic and morphological information. For convenience sake, in this thesis, the term "underlying representation" will denote only the phonological information inherent in a particular morpheme in the lexicon prior to any phonological process whatsoever. The term "underlying morphemic representation" will denote the morpheme as a whole, that is, a representation which includes all the idiosyncratic information (phonological, semantic, syntactic and morphological) of a particular morpheme. In addition to free morphemes we must address the status of bound morphemes. The phonological information of these morphemes will be assumed to be present as part of the word formation rule which manipulates the bound morpheme in question. Despite this difference as to where these different morphemes are listed, we shall assume there to be no difference in the manner in which the morphemes are listed phonologically. In other words, when we talk of the underlying representation of a particular morpheme it is of no concern whether it is a free or a bound morpheme since we are simply interested in the phonological melody. In handling bound morphemes in this way we are following works such as Aronoff, M. (1976) and Kiparsky, P. (1982) (further details are given in section 4.1.).

There is one type of morpheme which does not easily fit into this view, namely what we may term "process morphemes". In Somali these are exemplified by the process of forming the plural of certain nouns by altering the gender of the noun and thereby also altering the tonal accent pattern. Another example is the process of reduplication which occurs in Somali and involves the copying of a string of segments and associating them to a reduplicative affix (see section 3.3.2.1.). In such cases, it is clear that there is no morpheme, in the sense of a melodic string, which is manipulated by a word formation rule. Rather, in these cases the word formation rule is itself a process which in some way transforms the string.

The fact that level II of the lexicon was described above as the inflectional level indicates that we assume the lexicon to be "strong". That is to say, we assume the strong lexicalist hypothesis which includes inflectional processes in the set of morphological (and therefore lexical) processes. The opposite stance, known as the weak lexicalist hypothesis, assumes such processes to be part of the syntactic component.

As an initial hypothesis we shall assume both levels in the lexicon to operate in a cyclic manner.

As is clear in diagram (1.2), the place where rules (both morphological and phonological) are stated is separate to the lexicon. Rules are stated only once, part of their definition being the domain of application. This may be a single level or a sequence of consecutive levels. Thus, for example, the rule informally labelled as

/l/+/t/→ [ʃ], includes, in its definition, its domain of application: level II.

One aspect of some models of lexical phonology which has not been so well received is the loop which is a device allowing "a morphological form to move from stratum n to stratum n-1" (Mohanan, K.P. (1986) p.52). We shall not discuss the loop here as it is a rather strong and undesirable device, and what is more there is no evidence from the aspects of Somali phonology discussed here that it is necessary in a model of Somali phonology.

The output of the lexicon is the lexical representation. This is a theoretically significant level of representation (see Mohanan, K.P. (1986) pp.10-12). One important way in which it is significant is that it is assumed that all lexical rules are structure preserving. This is to say that melodic structures which are not also possible underlyingly are prohibited. Thus, the lexical representation is the level of representation in a derivation at which the phonological structure of a string adheres to the principle of structure preservation. The lexical level is significant in a number of ways including the fact that it captures the intuitive significance of the concept *phoneme* within the framework of generative phonology. It has also been suggested that it has implications in the matter of psychological reality.

The principle of structure preservation may be exemplified by a process found in Somali, as well as in many other languages, known as nasal assimilation. In this process, nasals assimilate to the place of articulation of a following stop, as exemplified in the following words:

(1.3) Examples of nasal assimilation in Somali

(a)	inan + ta	→	ina[n̪t̪]a
	nin + ka	→	ni[ŋ]ka
	nin + ba	→	ni[m]ba[1]

(b) waxaan qoray → waxaa[N] qoray

Two of the nasals resulting from this process are not possible underlying segments of Somali: the velar and uvular nasals: [ŋ] and [N]. Thus, this process must be assumed to apply in the post-lexical component. That is to say, its domain of application, which is part of its formalization, is the post-lexical component of the phonology. A further indication of the rule applying post-lexically is the fact that it applies across words as in (1.3b) above. It is impossible for any rule to apply across words in the lexicon since it is only in the syntactic component of the grammar that words come together in a string, and the syntactic component follows the lexicon.

An important constituent of phonological representations in a derivation is brackets. The introduction of brackets will be assumed to be accounted for by a convention known as the "bracket introduction convention" which applies to all morphemes as they exit the set of underlying representations, as well as to each and every result of a morphological operation. Brackets are not assumed to be a part of the underlying representation of morphemes because they are not idiosyncratic information. We shall follow Mohanan in assuming the erasure of brackets to be the result of the following convention, known as the "bracket erasure convention" **ref** :

> Erase the internal brackets at the end of each cycle.
> (Mohanan, K.P. (1986) p.23

1 See Lamberti, M. (1988) p.33 for this example.

After the individual lexical representations have been organized syntactically they pass to the post-lexical level. This is a level at which phonological rules, but not morphological rules, may apply. The characteristics of rule application at the post-lexical level may be listed as follows:

- rule application is never cyclic
- structure preservation does not apply
- phonological rules may apply over a wider domain than the word
- there are no exceptions to rule application; all forms undergo relevant rule application, including underlying forms

1.2.3. Outline of feature geometry

The theory of representation of segments and of distinctive features in generative phonology is an area in which much research has been undertaken in the time since the publication of *The Sound Pattern of English* (Chomsky, N. and Halle, M. (1968)). One of the directions this research has taken is in the proposal of a hierarchical representation in which distinctive features are grouped into sets dominated by further nodes. This branch of research has been termed feature geometry. One of the aims of this thesis is to propose a set of features arranged within a framework of feature geometry for the segments of Somali. In this section an outline of the basic ideas implicit to feature geometry will be given; details will be given in chapter 2 of specific models of feature geometry as well as of the model to be proposed in this thesis.

Some of the major works on feature geometry, and those which have been primarily used here, are the following: Clements, N. (1985), Sagey, E.C. (1986) and McCarthy, J.J. (1988). The main impetus behind feature geometry is the search for a way of grouping certain features and sets of features in a principled way, providing a more explanatorily adequate way of dealing with certain phonological phenomena which, in linear models, may not be explained as adequately. An example of this greater explanatory adequacy is given below in the process of nasal assimilation outlined above.

A linear account of nasal assimilation using standard features might look as follows:

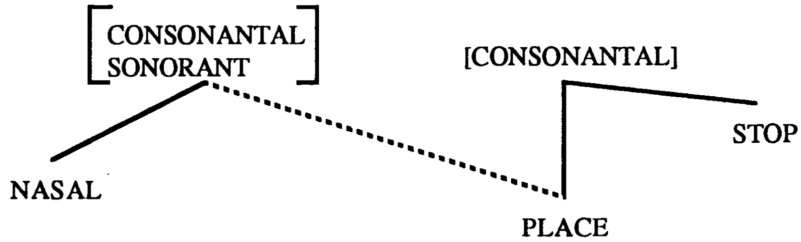
(1.4) <u>A linear account of nasal assimilation</u>

$$[+\text{nasal}] \rightarrow \begin{bmatrix} \alpha\text{anterior} \\ \beta\text{coronal} \\ \gamma\text{high} \\ \delta\text{back} \end{bmatrix} / \_\_ \begin{bmatrix} +\text{consonantal} \\ -\text{continuant} \\ -\text{sonorant} \\ \alpha\text{anterior} \\ \beta\text{coronal} \\ \gamma\text{high} \\ \delta\text{back} \end{bmatrix}$$

The problem is that the set of features immediately to the right of the arrow is essentially arbitrary. There is nothing in the theory to say that these are all the place features or that they form a set of features which behaves as a natural class, as exemplified in this commonly found process. Indeed, there is nothing to prevent any other arbitrary set of features being the basis of an assimilation process such as: [±continuant, ±coronal, ±high].

In feature geometry, however, this problem is overcome. The representation of the segment is such that groups of features are dominated by class nodes, which themselves may spread according to autosegmental principles. Thus, the nasal assimilation rule might be formalized as follows:

(1.5) <u>Formalization of the process of nasal assimilation utilizing feature geometry</u>



In this formalism the explanation of why the place features, and only they, are involved is given by the fact that these features are just those dominated by the place node which spreads, taking with it all those features it dominates.

1.2.3.1. <u>Basic formal assumptions behind feature geometry</u>

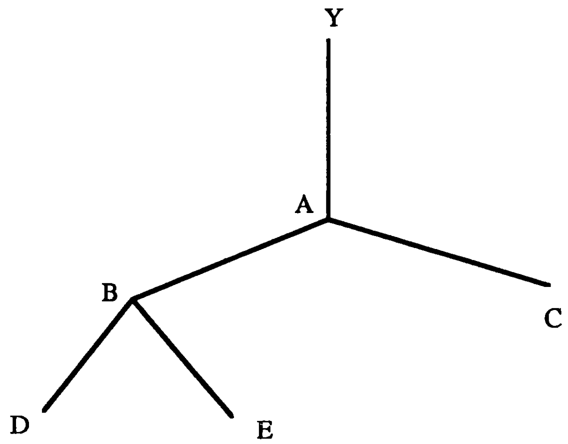
Details of the features and class nodes proposed in this thesis and the relations holding between them will be given in chapter 2. Here an exposition of the basic formal assumptions behind the feature geometric representation of segments will be given. The feature geometric representation is a representation of the melody of a segment and will be assumed to be a set of class nodes and features, arranged in a tree diagram. Each tree diagram is essentially a "slice" of a three dimensional structure as shown in (1.6) below. The diagram in (1.6a) is the view looking directly down the structure drawn in (1.6b). The structure represented in (1.6b) is a sequence of segments in a string, the direction Y to Y' being isomorphic with the passage of time. The lines AA', BB', etc. are referred to as tiers and it is these which, if present, are the nodes of the representation of a single segment labelled as A, B, etc. in diagram (1.6a).

Here we shall define a node as being the instantiation of a tier at a particular point in a phonological or phonetic string. A node, therefore, will always be regarded as an entity which, if present in a diagram, is actually existent. A tier, on the other hand, implies potential existence of a node at any particular point in a string. In other words, the tiers provide the possible shape of a melodic representation whereas nodes give the actual shape. A tier may exist in the phonology of a language but this does not mean that that tier is represented as a node in all melodic representations. In Somali, for example, we shall see that there is a tier for a feature which, when it surfaces, accounts for pharyngeals: the CONSTRICTED PHARYNX tier. This tier may potentially surface, as a node, in a segmental representation but when it is not present in a melodic representation then the tier is not actually present at that point. In English, on the other hand, this tier does not exist at all and the node, therefore, never surfaces.

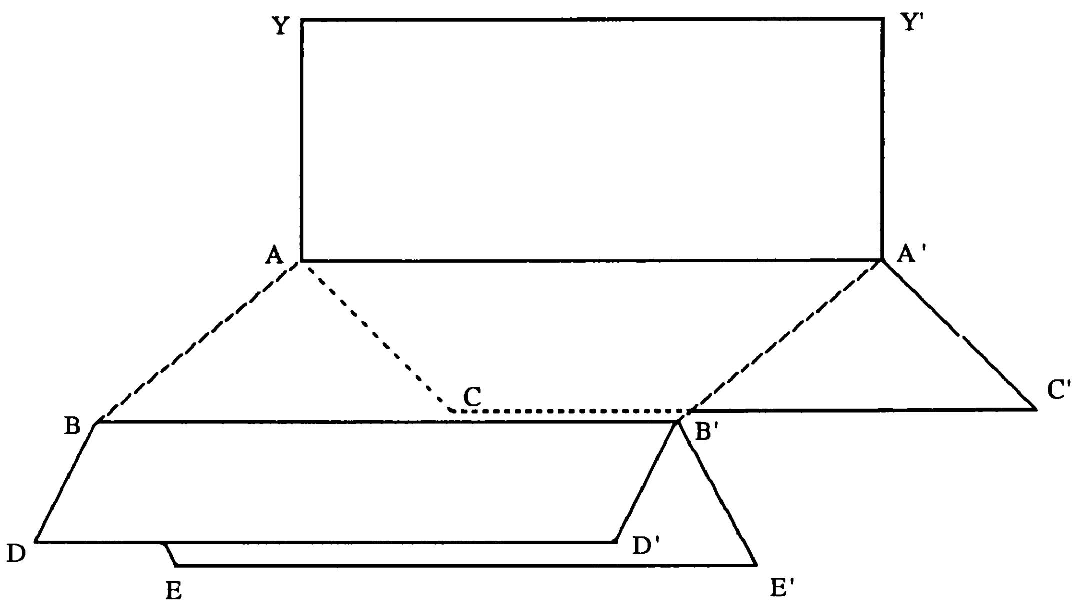
The label "plane" is given to the flat "area" bounded by two tiers. For example, the rectangle BB'DD' in diagram (1.6b) is a plane. Planes are not significant entities in feature geometry, being a product of the diagrammatic representation of the formal basis of the theory rather than theoretically significant entities in themselves. Despite this, it is sometimes convenient to refer to them in order for something to be more simply expressed.

(1.6) Feature geometry type representations

(a)



(b)



The actual distinctive features are the terminal elements in the tree (apart from the features which constitute the root node, see chapter 2 for details), all other nodes being referred to as class nodes. This terminology is similar to that of Sagey who refers to class features and terminal features, although the definition of the difference between the two sets is different, as will be pointed out in chapter 2.

1.2.3.2. Relations between nodes

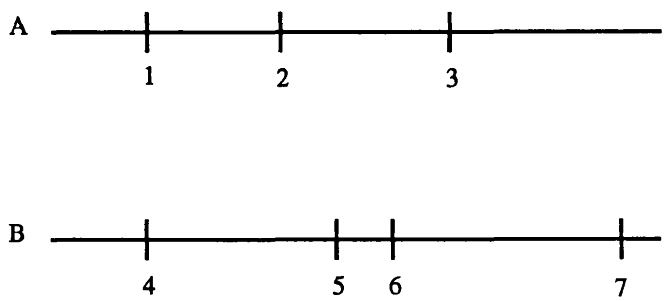
Two relations may hold between nodes in a melodic representation, dominance and precedence. All nodes are related to another node by the dominance relation. The root node (Y in (1.6a)) may be described as the node dominating all other nodes. In (1.6a), therefore, the root node (Y) dominates all nodes, node A dominates node C, and nodes D and E are dominated by node B. Immediate dominancy is said to hold between two nodes when no intermediate node occurs between them. Thus, node B immediately dominates both nodes D and E in (1.6a). The dominance relation between two nodes is expressed in diagrammatic form by a line linking those two nodes. This line is called an "association line".

The relation of precedence is expressed differently according to the particular diagrammatic representation of the string. In a diagrammatic representation of the type in (1.6b) above, the precedence relation holds between any two points on a particular tier. In the type of diagram, as in (1.6a), on the other hand, the precedence relation may only hold between two terminal nodes represented in a particular manner in the model proposed here (see section 2.3.1.3. for details). It is only those terminal nodes dominated by certain class nodes which may enter this relation.

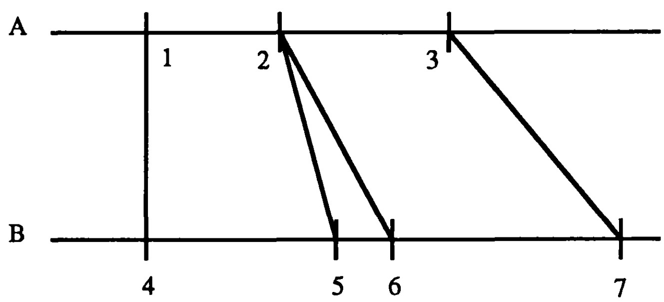
A further important point to make with regard to precedence and dominance is that the dominance relation, as expressed by association lines, provides the means for points on different tiers to be ordered in relation to each other. Points on one tier which is an order are not assumed to be ordered with respect to points on another ordered tier unless this ordering is made explicit by association lines. This is made clearer in the following diagram.

(1.7) Diagrams showing the role of association lines in expressing precedence in two strings

(a) Two tiers without association lines



(b) Two tiers with association lines



In diagram (1.7a) the tiers A and B have a number of points on them, labelled 1, 2 and 3. Each point is in a precedence relation with each of the other points on the same tier; thus point 1 precedes both point 2 and point 3. This precedence relation, however, may not be said to hold between any one of the points on tier A and any one of the points on tier B. That is to say, that the points on tier A and the points on tier B are separate independent orders. Precedence may only hold between points on the two tiers if it is made explicit by the presence of association lines as shown in (1.7b). Note also that the precedence relation must hold independently on one of the tiers for the points on the other tier to be ordered.

We see in (1.7b) that the association lines link certain of the points on the two tiers, thus implying that the dominance relation holds between these points: 1 dominates 4, 2 dominates 5 and 6, and 3 dominates 7. Given these dominance relations we can now say, for example, that node 1 precedes nodes 5, 6 and 7 as well as nodes 2 and 3.

A further point to mention is that the precedence relation in phonological representations is isomorphic with the passage of time. This is simply making explicit the notion that a string of nodes or segments which are in a precedence relation represent that sequence of nodes or segments as they occur in time in an utterance. A node or segment preceding another node or segment in a phonological string precedes that other node or segment in time when the nodes are phonetically implemented. Note, however, that no quantity is implied by this. Phonologically speaking a distance between two points in a tier does not represent any particular length of time[1]. The dominance relation, on the other hand, does not seem to be isomorphic with any external relation or referent.

The matter of what association lines represent in terms of the isomorphism of the passage of time has been discussed by Sagey, E.C. (1986). In her thesis Sagey points out that most phonologists assume association lines without making explicit what relation the lines represent. One phonologist she quotes as having made this matter

---

1 This statement is made with reference to phonology. This is not to suggest that it is not possible to propose a possible length of time which corresponds to some phonological entity, although it is felt here that such a proposal properly belongs to a theory of phonetics as opposed to a theory of phonology.

explicit is Goldsmith who states that association lines represent "simultaneity in time" (Goldsmith, J. (1976) p.42). Many phonologists would probably agree with this. Sagey, however, proposes that it is not simultaneity which is represented but what she terms "overlap in time". This may be described as follows: if two nodes, A and B, are associated by an association line, then some part of node A must be simultaneous with some part of node B. Which parts and how large those parts are is of no concern to us here. We shall not, therefore, discuss this matter but shall assume that the association lines represent simultaneity, following Goldsmith, J. (1976). Note that the choice of one or the other has no bearing on the explanations and arguments proposed in this thesis.

The well-formedness condition, known as the "line crossing prohibition" will be assumed to hold. It is stated as follows, after McCarthy, J.J. (1988) p.3: "No association lines between the same two autosegmental tiers may cross."

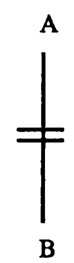
1.2.3.3. Operations

Operations which may involve nodes in a segmental representation are given in this section. There are a number of operations which may be performed on a melodic representation or on a string of two or more melodic representations. These are listed below with the diagrammatic representation denoting the operation. The definitions are in line with the generally accepted views of autosegmental phonology.

1.2.3.3.1. Delinking

This is a process in which a node B dominated by another node A is cut off from node A. That is to say, the dominance relation ceases to exist between node A and node B. Node B is said to have been delinked from node A. The delinked node B may remain as a "floating" node to be reassociated later or it may be deleted, in which case it ceases to exist in the representation altogether and thus is not phonetically realised. Note that a floating node may not surface on its own. If a floating node has not been reassociated by the end of a derivation, then it is deleted automatically. Delinking is marked diagrammatically by two parallel lines crossing the association line linking the two nodes in question.

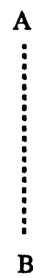
(1.8) Diagrammatic representation of delinking



1.2.3.3.2. Association

This is a process whereby a node B becomes immediately dominated by another node A. Association of one node with another is marked diagrammatically by a broken line.

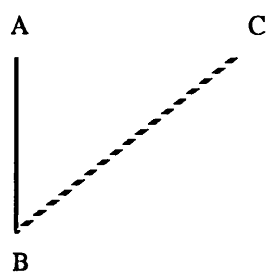
(1.9) <u>Diagrammatic representation of association</u>



1.2.3.3.3. <u>Spreading</u>

Spreading is not a basic operation but a particular instance of the association operation. Although not basic, it is used widely in autosegmental phonological literature and will be used here to represent the particular instance of association it represents. If a node B is immediately dominated by another node A, and B is then associated with another node C, then node B is said to have spread to node C. Having spread, node A may then remain associated with node B or may be delinked from node B. Spreading, as an instance of association, is marked diagrammatically in the same way as association, that is with a broken line.

(1.10) <u>Diagrammatic representation of spreading</u>



1.2.4. Feature types used in the thesis

Another aspect of phonological representation which must be mentioned is the nature of features themselves. The two types of features which will be discussed here are unary and binary features. Multivalent features are another possible feature type but will not concern us here.

Unary features have only one value, stated by the label of the feature, for example, [voice]. They may be either present or absent in a representation.

Binary features are the type most commonly used in generative phonology. A feature may have one of two values, plus or minus, "+" or "-", for example [+voice] or [-voice].

The debate on different feature types is not one which will be entered into in detail here. Suffice it to say that in this thesis unary features will be used and the major reasons for this are set out below. We shall see later, however, that the unary status of some features is not as clear as might be assumed from reading this section (see section 2.3.1.3.).

Firstly, the use of the feature geometry framework provides the impetus to look at the features in a unary way. The class nodes in a hierarchy are all equipollent, that is to say the presence of one does not imply the absence of another. Rather each is independently either present or absent which may be regarded as being generally the case for unary features. However, the use of binary features, the values of which are privative (ie. it is not possible to specify a segment for the positive and negative value of a feature simultaneously), is not analogous with the nature of class nodes. Although this is not necessarily undesirable, it is useful to investigate the difference and see whether more conformity amongst nodes is possible, hence this basic assumption of the unary nature of features.

Further justification may be found in the fact that a theory using unary features is more restrictive than one using binary features. One simple reason for this is because, for every feature in a unary system, there are two possible feature specifications in a binary system. This is the case, of course, if we simply assume that every feature in a unary system has an analogous feature in a binary system, which is a very simplified way of viewing the matter. The general view is still assumed to hold, however, that there will be more feature values in a binary system than there are features in a unary system.

A further factor is the matter of manipulation of a feature in a rule. In a system using binary features, it is possible for a rule to manipulate a feature which is negatively specified. This, in effect, manipulates the absence of a feature which does not seem desirable. One justification for this in the past has been that a certain natural class may be specified in terms of the absence of one feature. However, given the way in which feature geometry handles natural classes in a hierarchical way, it seems more desirable for natural classes to be handled in this way, rather than resorting to the negative values of binary features. Indeed, it is precisely cases of natural classes which could not be handled in linear models which is one of the major benefits of a feature geometric approach and this should be followed through as far as possible.

Before leaving this matter it must be pointed out that in Sagey's model the status of the negative values of binary features is said to be different to the status in a model such as that of Chomsky, N. and Halle, M. (1968). This is due to the fact that the terminal features in Sagey's model imply the use of an active articulator. Thus, Sagey states:

> Furthermore a terminal feature that occurs under an articulator node in the hierarchy may not be specified in a segment unless the corresponding articulator node is also specified. Even the minus values of these terminal features now imply involvement of a particular articulator.
>
> Sagey, E.C. (1986) p.277

Despite this, however, we shall adopt a unary approach to features, given the reasons above and those mentioned at other points in the thesis.

1.2.5. Underspecification

In this section we shall provide an outline of the theory of underspecification as it is assumed here. The basis of underspecification theory may be given in the feature minimization principle expounded by Archangeli, D. (1984):

> A grammar is most highly valued when underlying representations include the minimal number of features necessary to make different the phonemes of a language.
>
> Archangeli, D. (1984) p.50

The melodic representations which we shall assume for Somali segments will be underspecified in underlying representation in response to the above principle. The only matter which needs to be discussed in a little more depth is the implications of assuming a unary feature system as opposed to a binary one with which Archangeli worked.

In underspecification theory only one value for each distinctive feature may be present underlyingly. Thus, only [+high] or only [-high] may be present in all underlying segments specified for that feature in a particular language. In a unary system this stipulation of the grammar is not needed in the same way since the feature may only be present or not present. There are, however, certain pairs of features, discussed in the following chapter, which behave in a manner analogous to the way in which the two values of binary features behave, so that this stipulation of underspecification theory will not be abandoned totally (see section 2.3.1.3.).

A further matter which needs to be addressed, given our assumption of a unary feature system, is the status of redundancy rules. In Archangeli's model of underspecification theory there are two types of redundancy rules: complement rules and default rules. Complement rules are those which insert the opposite feature value to the underlying feature value of a particular feature in melodic representations not specified for that feature. Thus, if in a language the feature value [-high] is assumed to be present in underlying representations, a rule is automatically set up in the phonology which fills in the opposite feature value, [+high] in this example, in all of those segments lacking a specification for the feature [±high]. A default rule may be either universal or language specific and may be best described as all those rules which insert appropriate feature specifications in a phonological representation other than complement rules.

Since, in our model, we are working with a unary feature system, complement rules might be assumed not to exist. This is not quite as straightforward as we might first assume as we shall see in section 2.3.1.3. On the whole, however, as we shall see, the range of possible complement rules is much more restricted in the model assumed here. Default rules are assumed to exist in the same way as they do in Archangeli's theory of underspecification. Thus, in general, we shall assume underlying phonological representations to be minimally specified with the further features being inserted by redundancy rules.

1.3. Conclusion

This introductory section has provided some basic information on the Somali language and the people who speak the language. We have also set out the very basic assumptions underpinning the general model of phonology assumed in this thesis. In the following two chapters we shall look in much greater detail at two particular aspects of the model, namely the feature geometric representation of segments in Somali and the prosodic organization of those segments.

Chapter 2. The segmental inventory and feature geometric representation of segments in Somali

2.1. Introduction

In this chapter a model of feature geometric representation for the segments of Somali will be proposed. The feature geometry will be shown to be more restrictive than those models proposed by Clements, N. (1985), Sagey, E.C. (1986) and McCarthy, J.J. (1988). The ways in which this model is more restrictive will be detailed at various points throughout the discussion. The feature geometry, as explained above in chapter 1, will pertain primarily to Somali, since it is our purpose here to explain aspects of Somali phonology, and thus certain aspects of phonological representation which are not of primary interest with respect to Somali will not be dealt with in detail. One such matter is the initiation of segments. Since all segments in Somali are initiated in the pulmonic airstream we shall not look into the matter of the representation of segments initiated by any other mechanism such as ejectives or clicks.

Before looking at the segments individually and proposing a feature geometric representation for each segment, it is important to look at the overall underlying segmental inventory of Somali which is set out in the following sections. The description of the phonological characteristics of Somali segments is a prerequisite to ascertaining an adequate representation for those segments which may then be amended in light of the phonological behaviour of those segments.

Before continuing, we shall provide some details of the way in which the segments are to be written. In general, we shall use the Somali orthography when writing words in Somali. This will include the general writing of words as well as the writing of underlying representations between slashes (/ /). We shall only use the symbols of the International Phonetic Alphabet (the IPA) in cases where the phonetics of a form needs to be made explicit. In the thesis any string between slashes is to be understood as an underlying string. Any string between square brackets is to be understood as a derived string. This may not always coincide with a surface or even a post-lexical form but may represent the form derived by a particular process under discussion. Furthermore, although the majority of strings written between square brackets are written in the Somali orthography there are instances when the IPA symbols are used to make a particular phonetic point. Each instance should be clearly understandable as it arises. As for the general writing of words, referred to above, this will be done within the general text in bold. Note that we shall also write individual segments in bold when the reference to a particular segment is in general terms as will generally be seen to be the case in chapters 2 and 3. When referring to a segment in particular as an underlying segment we shall use the slashes as mentioned above. Thus in chapter 4 when we discuss the underlying representations of certain morphemes more use will be seen to be made of the slashes.

2.2. The segmental inventory of Somali

2.2.1. The consonants

In the list below the complete underlying segmental inventory of Somali is given. Details of the phonetic implementation of the sounds in various positions follows in the sections dealing with the individual segments themselves. Note that the segments are represented by the letters of the Somali orthography.

(2.1) <u>The consonants of Somali</u>

Stops:	b	d	dh		g	q		'
		t		j	k			
Fricatives:	f	s		sh		kh	x	h
							c	
Nasals:	m	n						
Liquids:		r						
		l						
Semivowels: w			y					

In the following section each consonant is briefly set out with any relevant remarks on its behaviour. The phonatory information for the stops is not very extensive here since this aspect is the subject of a more detailed examination later in section 2.3.2.6.1.

b This is a voiced bilabial stop which is unaspirated and little voiced in initial position. In intervocalic position it is often spirantized, particularly if it is preceded by an accented vowel (see Armstrong, L.E. (1934) p.119 and Cardona, G.R. (1981) p.11) as in the word **laba**, "two", which may be pronounced la[β]a. In pause position or followed by a voiceless consonant it is not released and often does not involve voice to any great extent.

d This is a voiced dental stop. Its phonetic realization shows parallels with that of **b**. Thus, for example, the word **hodan**, "wealthy", may often be pronounced ho[ð]an.

dh This is a voiced retroflex stop. In a way reminiscent of **b** and **d**, **dh** is weakened in intervocalic position to a retroflex flap. Thus, **tidhi**, "you said", is pronounced ti[ɽ]i. In certain dialects, particularly southern dialects, the distinction between **dh** and **r** has been neutralized in intervocalic and final position. Thus, what is pronounced as **dh** in the dialect under consideration here is pronounced as a simple alveolar tap or trill (ie. [ɾ] or [r]) in these other dialects. A further aspect of this sound is that it has been described as involving some activity in the pharynx and the larynx. This is described by Armstrong in the following way:

> The sound is produced with the same pharyngal contraction and the same raising of the larynx as is necessary in the articulation of ʕ and ħ. If this contraction is relaxed and the larynx moved down again at the same time as the tip of the tongue is removed from the back of the teeth ridge, there is a momentary rushing in of air giving the sound an implosive quality.
>
> Armstrong, L.E. (1934) p.7/120-8/121[1]

Similar observations are also made by von Tiling who discusses the matter in some detail (see von Tiling, M. (1925) pp.9-13 and 15-26), Cardona (Cardona, G.R. (1981) p.12) and Moreno (Moreno, M.M. (1955) p.8). As far as my own observations on this matter are concerned, I have noted an implosive-like quality in the speech of one Somali speaker, but have not investigated the matter any further as it is beyond the scope of the present work. Historically speaking, the origins of the Somali retroflex plosive are to be found in proto-East Cushitic glottalized coronals (see Sasse, H.-J. (1979) especially pp.25-31 for an account of this). The phonetic link between implosion and retroflex tongue configuration which is implied by this historical development has been investigated by Hardcastle, W.J. & Brasington, R.W.P. (1978). This matter will not be pursued here, although the phonetics of this sound in different speakers will hopefully form the material of further research involving experimental investigation not available to the pioneers of previous years. In particular, electropalatographic investigation may prove particularly useful.

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1 There are two versions of Armstrong, L.E. (1934). The original 1934 publication page number in this example is 120-121. The other numbers refer to the republication of 1964. Each reference will provide the two numberings in this manner.

g This is a voiced velar plosive which behaves in a similar way to **b** and **d**. Thus, **dhagar**, "Deceive!", may be pronounced dha[ɣ]ar. This spirantization, however, does not seem to be as common as it is in the cases of **b** and especially **d**. This is a personal impression which needs further, more objective, investigation.

q Despite the Somali orthography providing the same symbol as the IPA voiceless uvular plosive, this sound will be assumed to be a voiced uvular stop underlyingly, since it behaves in a way congruous to the other voiced stops, although it does occur with very little or no voice in certain positions, especially in word initial and word final positions. In intervocalic position the **q** may be weakened to a voiced uvular fricative [ʁ]. For example, **boqor**, "king", may be pronounced bo[ʁ]or.

' The glottal stop is an underlying segment of Somali and is found in both medial and final position. For example, **go'aan**, "decision", and **lo'**, "cattle". It is found in initial position also, but this will be assumed to be due to the fact that it is introduced by a rule in order that the constraint that all Somali syllables have onsets may be fulfilled. It is therefore not assumed to be present in initial position underlyingly. An interesting fact about this stop is that, phonologically, it patterns with the voiced stops. This apparent anomaly will be explained later in section 2.3.2.6.1.

t This sound is the voiceless counterpart of **d**, that is, it is a voiceless dental stop. There are, however, constraints on this consonant which also hold for the other underlying voiceless stops **k** and, to some extent, **j**. It does not occur syllable finally and as a consequence of that does not occur as a geminate. Also, it is not subject to any weakening process, such as the voiced stops may undergo in their phonetic realization. Thus, for example, the word **itaal**, "strength", is always pronounced i[t̪ʰ]aal. Another important characteristic of this consonant is that it is always pronounced with aspiration. This matter will be discussed later in section 2.3.2.6.1.

k This is the voiceless velar stop which behaves in a parallel manner to **t**, that is to say it does not occur at the end of a syllable and does not undergo any weakening process. As with **t** this consonant is also pronounced with aspiration.

j This segment is assumed here to be a voiceless palatal stop underlyingly. It surfaces phonetically as a voiced or a voiceless palato-alveolar affricate ([ʧ] or [ʤ]). This, as far as I am able to ascertain, is an arbitrary matter and not predictable. The major argument in favour of its underlying representation is that it is not found syllable finally, as is the case with **t** and **k**, except in some Arabic loans such as **xaj**, "the Muslim pilgrimage to Makkah", or **taaj**, "crown". Further details are given in section 3.3.2.4.1. It is interesting to note that the pronunciation of such words by certain speakers is xa[ʃ] and taa[ʃ]. From discussions with Somalis it seems that this may be due to these speakers having no knowledge of Arabic. Thus, these speakers substitute the ungrammatical (in their idiolects at least) syllable final **j** with the grammatical [ʃ]. There seems to be no phonological problem, however, in accepting that **j** is a possible word final segment in the marked set of Arabic loan words.

f This is a voiceless labiodental fricative.

s This is a voiceless alveolar grooved fricative.

sh Following Armstrong, L.E. (1934), we shall assume this fricative to be a palato-alveolar fricative. Judging by the sound, however, it may be suggested that this, at least in certain speakers, is more of a voiceless alveolo-palatal fricative (IPA: [ɕ]). We shall leave the precise classification of this sound to future research. Again, research in the phonetics laboratory, particularly with elecropalatography, should provide useful insights into the nature of this segment.

kh This is a voiceless uvular fricative. It may sometimes be heard as a velar fricative, [X], and is only found in Arabic loanwords. When this sound occurs in such a loanword it may sometimes be replaced by the sound **q**. For example **khaymad**, "tent", may also be pronounced **qaymad**. This again, as far as I am aware, is an arbitrary matter and may reflect the fact that **kh** is not, for some people at least, part of their phonological competence; thus, they substitute the sound **q**, which in their idiolect is grammatical, as indeed it is in the language as a whole.

x This is a voiceless pharyngeal fricative.

h This is a voiceless glottal fricative. In initial and final position it is always voiceless. In intervocalic position, however, it is often voiced. Thus, for example in **bahal**, "wild animal", the **h** may often be pronounced [ɦ]: ba[ɦ]al.

c This is a voiced pharyngeal fricative. In some speakers a little creaky voice may be heard when this sound is uttered. It is interesting to note that this sound, as well as the voiceless pharyngeal fricative, differs somewhat from the pharyngeal fricatives found in Arabic. This matter may be left to further work in the phonetics laboratory in order to ascertain precisely what this difference might consist of.

m This is a voiced bilabial nasal. It is not found in word-final position but may be found within a word in syllable-final position on the surface. This matter is explained in section3.3.2.4.2.

n This is a voiced alveolar nasal found in all positions. In her monograph on Somali phonology, Armstrong, L.E. (1934) points out that there are different realizations of word-final **n**. After a long vowel, a weak nasal is heard. After a short, accented vowel, the **n** is "long and strong" (Armstrong, L.E. (1934) p.12/125). There also occurs a nasal which Armstrong describes as a "voiced *n* followed by voiceless *n* (*n̥*) which appears to be significant" (Armstrong, L.E. (1934) p.12/125). After conducting a brief investigation of this myself, I have come to the provisional conclusion that the different phonetic realisations of **n** after a short vowel are linked with the placement of tonal accent. Although further work must be done before a detailed exposition can be given, it seems that, following an accented vowel, the nasal is fully voiced. After an unaccented vowel, however, there is a tendency for the nasal to be voiceless in the latter part of its pronunciation. Thus, it seems that this difference in nasal quality is not in itself significant but merely reflects a significant difference in the position of the tonal accent in the words ending in it. A particularly good example of a minimal pair in this respect is the pair of words **ínan** and **inán**, meaning "boy" and "girl" respectively. Although Armstrong denotes this realization of **n** as [n n̥]", (ie a geminate **n** with the second half pronounced without voice), it is not, strictly speaking, a geminate phonologically since, as we shall show later, there are no tautosyllabic geminate consonants in Somali. The segment **n** may occur as a geminate heterosyllabically.

r This is an alveolar trill which is accompanied in most positions by a heavy breathiness. Despite this breathiness and although it is sometimes pronounced voicelessly, we shall assume that underlyingly the segment is voiced. It is not breathy when it is an ungeminated intervocalic **r**, being only a tap (IPA [ɾ]) in this position. Armstrong mentions a "Very long *r* (nine or ten taps) after both long and short vowels. After short vowels the sound is voiceless during the latter half of its length. After long vowels it gives the impression of being entirely without voice" (Armstrong, L.E. (1934) p.15/128). The explanation for this is most likely to be along similar lines to the situation encountered with the final **n**.

l This is a voiced alveolar lateral approximant. This sound seems to behave in a similar way to **n** and **r** in word final position, although it is less readily apparent. Indeed, Cardona goes so far as to say: "Non c'è traccia della realizzazione finale [l̥] data dalla Armstrong" [There is no trace of the final realization [l̥] given by Armstrong], Cardona, G.R. (1981) p.13. Further experimental phonetic work should prove invaluable in ascertaining the details of the behaviour of this segment, as with **n** and **r**.

2.2.1.1. <u>Gemination</u>

In this section we shall look briefly at phonologically relevant consonant length in Somali. Whereas with vowels all may be long or short, only certain of the consonants may occur as geminates. These are:

b, d, dh, g, l, m, n, r

We can see from this list that the segments which do not occur as geminates may easily be stated in terms of the following natural classes of segments: the fricatives, the guttural consonants[1] and the voiceless consonants.

It is interesting to note that the literature on Somali differs with respect to the consonants which may occur as geminates. This may be due to the fact that certain consonants may occur as geminates in certain syntactic positions because of a process which seems to occur

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[1] That is to say, the uvulars, pharyngeals and glottals. See section 2.3.2.5.6. for further details on this matter.

in Somali similar to the process generally known as *raddopiamento sintatico* in Italian. No work has been published on this phenomenon in Somali and we shall not look into it here, leaving it to future research. Suffice it to say that the process seems to take place following particles which have accent on the final vowel. This confirms observations made by Armstrong, L.E. (1934) who says: "It appears to take place after a stressed syllable ending in a short vowel and pronounced usually with the high level tone. It is commonly heard, for example, after the particles *ka*, *u*, *ku*, *ma*, *ha*" (Armstrong, L.E. (1934) p.25/138). Given this, it may safely be assumed to be a post-lexical process. Thus it may produce geminate consonants which are not found in the lexicon due to the principle of structure preservation.

A further interesting point related to gemination is the status of geminate **m**. This matter is taken up in section 3.3.2.4.2.

Examples of minimal pairs in which consonant length is relevant are given below:

waran	"spear"	warran	"give news"
galay	"I entered"[1]	gallay	"we entered"
gaadhay	"I reached"	gaadhdhay	"she reached"

---

[1] Note that all indicative verbs, apart from the rarely used independent past, must occur with an appropriate mood classifier or a focus marker to form a grammatical sentence. This is omitted from examples in the thesis for clarity's sake and has no bearing on any of the phonological arguments made in the thesis.

2.2.2. The Vowels

The vowel system in Somali is not as straightforward as might be thought from looking at a piece of written Somali. It consists of two series of vowels which may be set out in the following way:

(2.2) Somali vowels

(a)	i		u	(b)	i̟		u̟
	e		o		e̟		o̟
		a				a̟	

The vowels in (2.2a) will be termed the "back series" and those in (2.2b) the "front series". The front series is marked by a plus mark, one of the International Phonetic Alphabet symbols for tongue advancedness. In the specialized Somali literature this frontness is often marked with a cedilla, following the usage in Andrzejewski, B.W. (1955).

As yet no satisfactory explanation of how the front and back series of vowels are phonologically distinct has been found. That is to say the precise phonological nature of the difference has not been satisfactorily accounted for. We shall not shed any further light on this subject here leaving it to future investigation. It is, however, felt that it is clearly a phonologically relevant distinction and, as such, must be represented somehow in the segmental representation. Reasons for assuming it to be phonologically relevant are to be found in the minimal pairs below. The two types of minimal pairs which show this phonological relevance are, firstly, the type in which a lexical difference is marked by nothing more than fronting and, secondly, the morphological role of fronting in the marking of the independent past[1]. These two types of minimal pairs are exemplified below, those examples marked with the diacritic being the fronted ones. The first group shows lexical differences marked by vowel quality. The second series of examples shows examples of the distinction between the imperative and the independent past 3rd person masculine singular. The independent past in these examples is marked, as always, by vowel fronting:

duul	"fly!"	du̟u̟l	"attack!"
diid	"faint!"	di̟i̟d	"refuse!"
keli	"singularity"	ke̟li̟	"kidney"

keen	"bring!"	ke̟e̟n	"he brought"
tus	"show!"	tu̟s	"he showed"

This matter of vowel fronting, although phonologically significant and interesting, will not form part of the investigation of this thesis. Works which deal with it in more detail are Andrzejewski, B.W. (1955), Armstrong, L.E. (1934) and Farnetani, E. (1981).

All vowels, of both the back and front series, may be phonologically long or short and, following Somali orthography, will be written here by doubling the letter of the vowel when long (for example, **aa**, **ii**). Some examples of minimal pairs with respect to vowel length are:

dhig	"put, teach"	dhiig	"blood"
ag	"nearness"	aag	"surroundings"
mas	"snake"	maas	"leather"

---

1 The independent past is a rarely used tense in Somali. Although it has the same meaning as the normally used general past, it has the distinction of being a tense with which it is not necessary to use a mood classifier or focus marker. See Saeed, J.I. (1987) p.89 for further details.

2.2.3. Suprasegmental aspects of Somali phonology

The suprasegmental aspects of the phonology of Somali centre around the system of tonal accent which has been the focus of much discussion since Somali phonology was first discussed linguistically. For some time discussion centred on whether or not Somali was a tone language or not. This was before the nature of the system was understood for what it is. We shall not look at this history as it does not concern us here. Suffice it to say, that the latest and most important works on the Somali tonal accent system are Hyman, L. (1981b) and Banti, G. (1988a). Despite the fact that the tonal accent system is better understood now, there are still interesting facets of the system, which are as yet uninvestigated, such as the influence of tonal accent on neighbouring consonants, which we have referred to above. Also, the wider domain of suprasegmental phenomena is something which should prove to be a productive field for future research. As far as this thesis is concerned, however, we shall have reason to look at the tonal accent system in section 3.3.1.1. and shall leave further comment until then.

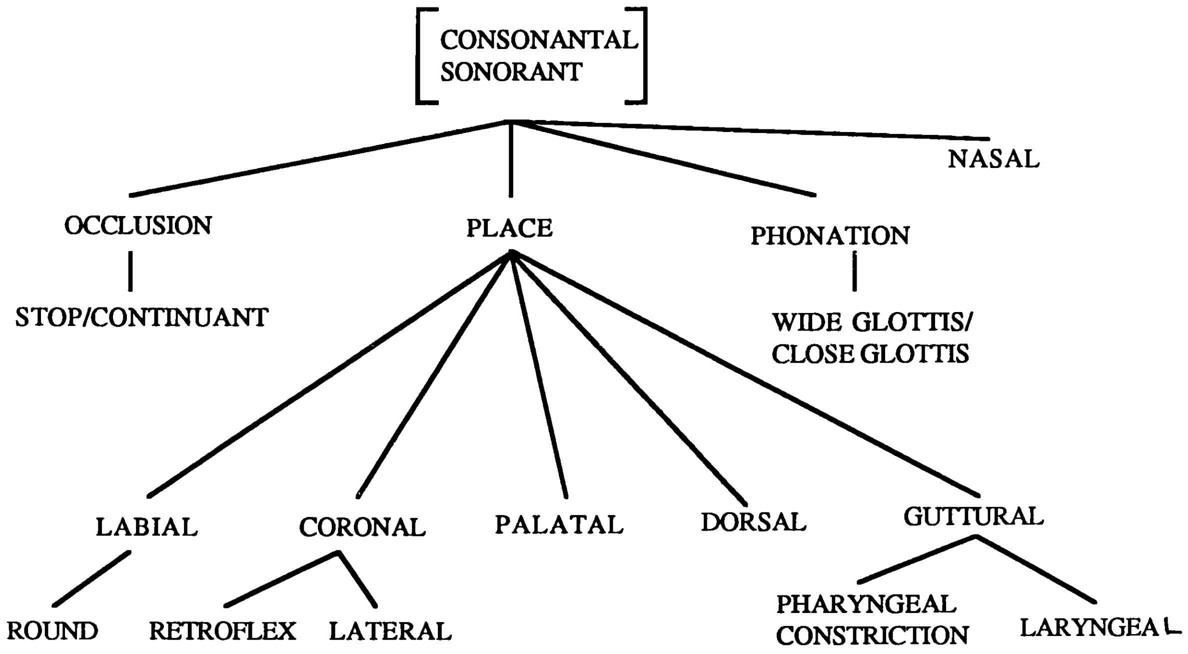
2.3. The model of feature geometry proposed for Somali

2.3.1. Basic assumptions pertaining to the model of feature geometry proposed here

In the previous chapter we looked at the basic assumptions behind the theory of feature geometry. In this section we shall turn our attention to the model of feature geometry proposed in this thesis as it pertains specifically to Somali. Certain basic principles will be proposed. These will restrict the behaviour of the model of feature geometry, making possible only a restricted set of segmental melodic representations. We shall compare the model of feature geometry proposed here with other models; specifically those of Clements, N. (1985), Sagey, E.C. (1986) and McCarthy, J.J. (1988).

The feature geometry being proposed here for Somali segments conforms to the template shown in the following diagram:

(2.3) <u>Template of the Somali feature geometry model</u>



This is not a representation of a particular segment but shows all the nodes which may occur in a Somali feature geometric representation. The diagram also represents the relationships holding between the various nodes. The sections below will discuss the nodes and the relations holding between them including the relation between STOP and CONTINUANT, and WIDE GLOTTIS and CLOSE GLOTTIS. In subsequent diagrams we shall often use abbreviations of the node labels which are more convenient. The abbreviations which will be used are given below.

(2.4) List of all of the nodes of the feature geometry proposed for Somali

CG	close glottis
CONS	consonantal
CONT	continuant
COR	coronal
DOR	dorsal
GUTT	guttural
LAB	labial
LAR	laryngeal
LAT	lateral
NAS	nasal
OCC	occlusion
PAL	palatal
PC	pharyngeal constriction
PHON	phonation
PL	place
RET	retroflex
RND	round
SON	sonorant
STOP	stop
WG	wide glottis

2.3.1.1. Node types

The first aspect of the feature geometric representation which we shall discuss is the distinction between the different types of nodes. A major distinction to be made amongst the nodes is that between feature nodes and class nodes. The class nodes are the following: ROOT[1], OCCLUSION, PHONATION and PLACE. All other nodes will be

[1] Note the ROOT node is not explicitly labelled ROOT in diagram (2.3). This is because the ROOT node is not a separate node in its own

called feature nodes. The essential difference between these two sets of nodes is that the class nodes must be present in all segmental representations; a matter formalized below in the class node requirement. The feature nodes, on the other hand, are not present in all representations, but only in those of the segments of which they form part of the specification. A further implication which follows from this is that class nodes play no role in themselves in distinguishing one segment from another, whereas feature nodes do. Essentially, the role of the class nodes may be regarded as being organizational. They constitute labels which mark particular sets of feature nodes and allow those sets of nodes to operate as a set[1]. This matter of operating as a set is an important factor to bear in mind, as it is a major factor in the assumption of a class node. As McCarthy points out: "any subset of the features that appears frequently in phonological rules should be dominated by a single class node of the geometry" (McCarthy, J.J. (1988) p.87).

The distinction between class nodes and feature nodes differs from that made by Sagey between her class features and terminal features, of which she writes:

> Class features differ from terminal features in that while the latter may be specified either plus or minus, the former are only either present or absent.
>
> Sagey, E.C. (1986) p.273

Thus, in Sagey's model the nodes labial, coronal and dorsal, also laryngeal and soft palate, are part of the set of class features. These particular nodes are active articulators, the definition of each being

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right but the node formed of the SONORANT and CONSONANTAL features (see section 2.3.2.3. for further details).

1 The idea that the class nodes are essentially labels has been discussed in Hayes, B. (1990). Hayes develops a theory based on coindexing to overcome the diphthongization paradox. His ideas are mentioned later with regard to contour segments in section 2.3.1.3. However, we shall not discuss details of his theory of representation further here.

analogous with the following definition for labial: "Involving the lips as an active articulator (distinctively)" Sagey, E.C. (1986) p.274. The articulators for each of the above class features are the lips, the tongue front, the tongue body, the glottis and the soft palate respectively (see Sagey, E.C. (1986) p.274). Active articulator nodes are also assumed in our model although their status within the overall model is a little different.

Clements, on the other hand, does not use active articulator nodes and his class nodes reflect more the type of classification of distinctive features made in earlier generative phonological frameworks of the type proposed in Chomsky, N. and Halle, M. (1968). This has been mentioned by McCarthy who implies that Clements' class nodes are based upon "familiar articulatory and functional classifications" (McCarthy, J.J. (1988) p.89).

A further difference between Sagey's model and the one proposed here lies in the fact, as has already been mentioned, that all feature nodes in our model are unary in nature, including the terminal feature nodes, whereas in Sagey's model, as well as those of McCarthy and Clements, the terminal features are binary.

As far as node types are concerned then, we are assuming two types: class nodes which are essentially organizational in their role and feature nodes (which are the features) which provide the phonological specification of segments.

2.3.1.2. Class node requirement

A major formal assumption we shall make in the theory of feature geometry proposed here is that all class nodes must be present in a segment's representation at the end of the lexical stage of a phonological derivation, that is, as a representation exits from the lexical component of the phonology. The class nodes in the model as it pertains to Somali are, as mentioned above, the ROOT node, the OCCLUSION node, the PLACE node and the PHONATION node.

This assumption is made on the basis of a requirement of phonetic implementation. We shall assume here that each and every phonological segment must, at the end of a derivation, possess all the information required for an unambiguous phonetic implementation of that segment in the particular language of which it forms a part. The precise nature of that phonetic implementation will vary according to the phonetic changes, ie. the various post-lexical processes which segments may undergo in any particular language. But all the essential information which is needed to transform a phonological entity into a phonetic entity is needed. We formalise this in the assumption that all the class nodes are required at the end of the lexical derivation. Furthermore, all must have an adequate specification; that is to say, a specification which does not violate any phonological principles, either universal or language specific, within the domain of the segment or any wider domain. We shall call this the class node requirement and formalise it as follows:

Class node requirement:

> Each and every class node must be present and fully specified as a phonological representation exits the lexical component of the phonology.

A class node which is not dealt with here but which may need to be present is an INITIATION or AIRSTREAM MECHANISM node which provides specifications for clicks, ejectives or implosives[1]. Since, however, all segments in Somali are articulated with an egressive

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1 It is, of course, possible that another explanation is more suitable for accounting for such initiation facts. For example, the idea that clicks are compound segments has been proposed by Sagey (see Sagey, E.C. (1986) pp.126-130).

pulmonic airstream, this matter will not be looked into any further. We shall assume that the pulmonic airstream is a default phonetic initiator of linguistic sounds. This matter may, however, form the basis of further research should this approach to feature geometry prove promising in the areas dealt with.

The class node requirement will be assumed to be universal. The reason for this is that it would be highly undesirable for such a requirement to be language specific. The only way in which it might be made language specific would be to state that it might be required in some languages and not in others. Given the fundamental nature of the requirement, this would be highly undesirable.

A major question we must ask of the class node requirement is: is it necessary, given the assumption of underspecification theory and default rules in the phonology? After all, redundancy rules provide default specifications of features in a phonological derivation. Although it may be controversial, we shall here support the class node requirement. The reason for this is that underspecification theory deals with the features which actually specify a segment, namely the feature nodes. We have said above that the class nodes play essentially an organizational role in the segments' representation, thus it cannot be said of a class node that it may be introduced by means of a redundancy rule without moving away from the real motivation for setting up such rules in the first place. This may be countered with the possibility that a feature node is introduced into a feature geometric representation by means of a redundancy rule, and that that feature, since it must be dominated by a class node, then causes the class node to be inserted into the feature geometry.

It seems that there is not a lot of difference between the last two possibilities, other than a difference in emphasis. The motivation for the class node requirement was given as the need for all the necessary phonological information to be available for the implementation of the phonetic realization, whereas the motivation behind assuming redundancy rules in underspecification theory is to assign correct values to all of the features which make up a phonological specification, whilst at the same time preventing redundant information from being present in the lexicon.

In a linear model involving binary features, such as the SPE model, all the features are generally present in the final representation of a string. In a feature geometric model of the type assumed here, however, not all of the features are present in any particular segment's representation, and the class node requirement helps towards making clear which features are needed in that it states that there needs to be an adequate place specification, etc. There is nothing in the standard underspecification theory which explicitly states this and so we assume the class node requirement as part of our model of phonology.

We may indeed go further and state that the class node requirement actually motivates redundancy rules. After all, the class node requirement states that an adequate specification must be present at the end of the phonology and it is the redundancy rules which provide these features. Thus, in our model, we may say that the class node requirement actually motivates the presence of the redundancy rules, explaining their existence in the phonology.

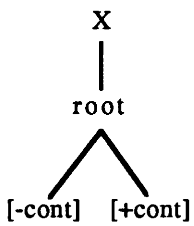
Part of the class node requirement formalization is that a class node must be fully specified. For the PHONATION and OCCLUSION class nodes this means one of the feature nodes it dominates must be present. For the PLACE node, and adequate PLACE node specification must be present, what constitutes such a specification is detailed in section 2.3.2.5. and its subsections. For the ROOT node one of the features, at least, must be present.

2.3.1.3. The relations between sister nodes: contour and complex segments

In chapter 1 we discussed briefly the matter of the relations which may hold between two nodes in a feature geometric representation. In this section we shall discuss a further aspect of the feature geometry which must be spelt out; namely, the way in which the daughters of the various class nodes are related in the model proposed here.

In this thesis, features are assumed to be unary in nature. This, however, means that the matter of how to represent segments, such as affricates and pre-nasalised stops, described by Sagey as "contour segments", must be addressed. Her convincing arguments on the nature of contour segments and complex segments constitute an important part of her thesis and are to a large extent based on the binary nature of the relevant features involved in contour segments. However, we cannot simply dismiss the arguments she puts forward because they are couched within a model of binary features whilst we are working with a model involving unary features. We must provide at least as equally explanatory an account as Sagey's model. Sagey explains that "a contour segment is represented as branching for some feature" (Sagey, E.C. (1986) p.49). By feature, here, she means specifically terminal feature as we noted above. Since all terminal features are binary in her model, a contour segment is a segment in which a particular terminal feature is specified as '+' and '-' within that one segment, the feature values being ordered within the segment. This type of branching is only possible on the terminal nodes which are also, in her theory, as in those of Clements and McCarthy, the only possible binary nodes, see Sagey E.C. (1986) p.273. Thus, for example, affricates are contour segments and are specified as [-continuant] and then [+continuant] (using Sagey's features) within the same segment (see diagram (2.5)).

(2.5) <u>Sagey's partial representation of an affricate</u>

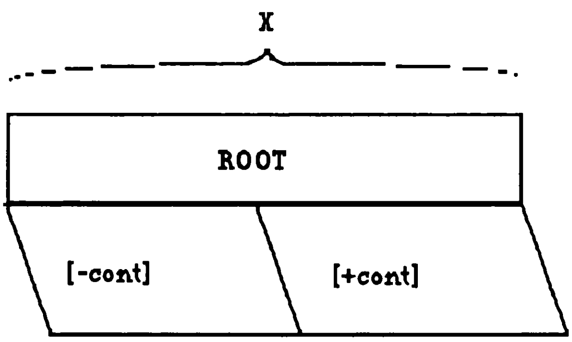


Sagey, E.C. (1986) p.96

This analysis is supported by the phonological behaviour of such segments which behave as stops with regard to rules which affect their left edge, but behave as fricatives with regard to rules which affect their right edge (see Sagey, E.C. (1986) pp.93-99).

Although this branching root node is shown with two association lines, the two value specifications for [±continuant] are on the same tier. Thus, we may represent the contour segment more lucidly as in (2.6).

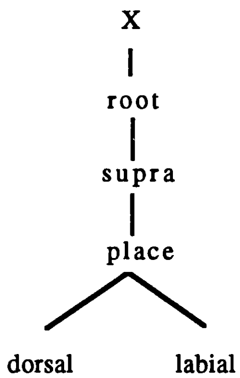
(2.6) <u>3-dimensional partial representation of an affricate in Sagey's model</u>



Another type of contour segment is the pre-nasalized stop (this will be dealt with separately below).

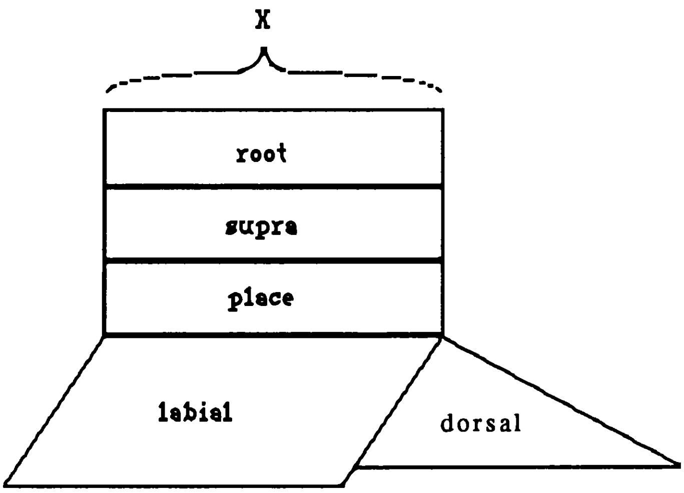
Complex segments are segments which incorporate a multiple articulation, but one which is unordered. An example of a complex segment is the well known labial-velar stop ([g͡b] or [k͡p] in the IPA), found in some West African languages such as Yoruba. Sagey demonstrates that such sounds are single segments and not segment clusters. Furthermore, she shows that these segments behave in phonological rules as would either individual segment whose place specification the complex segment incorporates, and this both to the right and left of the segment. Thus, a labial-velar, for example, would behave in a phonological rule as both a velar and a labial to the right and left of the segment. A partial representation of [g͡b] in Sagey's model is given below in (2.7).

(2.7) <u>Sagey's partial representation of the complex segment /g͡b/</u>



In the case of the contour segment in (2.5) in which the association lines associate two tiers only, namely the root and continuant tiers, the association lines from the place node in (2.7) do actually associate three separate tiers. Thus, the equivalent representation of the labial-velar to that of the affricate in (2.6) would be the representation in (2.8).

(2.8) 3-dimensional partial representation of the compound segment /g͡b/ in Sagey's model

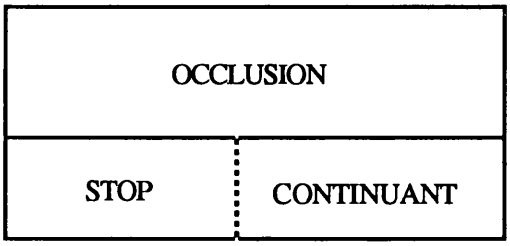


These arguments and conclusions of Sagey's are accepted here and, indeed, in the feature geometry proposed in this thesis such segments will be represented in a similar way. There is, however, a difference which significantly affects the representation of contour segments. Sagey assumes terminal features to be binary whereas the assumption made here is that all features (including terminal features) are unary. Thus, contour segments, as represented by a sequence of the '-' and '+' values of a binary feature in Sagey's model, must have some equally explanatory representation in terms of unary features.

The matter of contour segments reflects a further phonological difference between binary and unary features in terms of their status within a feature geometric representation. The branching feature in contour segments is, in Sagey's model, always a binary terminal feature, Sagey's hypothesis being that: "Contour segments may branch for terminal features only. No branching class nodes are allowed." (Sagey, E.C. (1986) p.50). An important factor in this matter is that the feature values in the branching node of a contour segment are mutually exclusive, since it is impossible to specify a binary feature for both values simultaneously within a segment. This fact of contour segments must still be explained using unary features here. In other words, the exclusivity of the two values of a binary feature, which is of great value in explaining contour segments and their behaviour, must have its counterpart in a theory of contour segments based on unary features.

This will be attempted here by assuming that certain pairs of unary features share one tier with only one feature being allowed to occupy the tier at any particular point. Thus, the features CONTINUANT and STOP, which occur together in affricates, share the tier dominated by the OCCLUSION class node as shown in diagram (2.9).

(2.9) <u>Representation of STOP and CONTINUANT sharing the tier dominated by the OCCLUSION node</u>



This assumption provides a formal representation which accounts for the fact that a segment may not be specified for both CONTINUANT and STOP simultaneously. If they were set up on separate tiers, then a convention would have to be assumed to be part of universal grammar, such as: "The features CONTINUANT and STOP may not occur simultaneously" - a convention which is arbitrary; why not also LABIAL and CONTINUANT? Such a convention, however, is not needed, given the representation assumed here which prohibits, by its very nature, the simultaneous co-ocurrence of CONTINUANT and STOP. The feature pairs which are represented in such a way in the feature geometric representation of Somali segments proposed here are the following: STOP / CONTINUANT and WIDE GLOTTIS / CLOSE GLOTTIS (see section 2.3.2.2. for the case of NASAL which will be assumed to be different). In order to show clearly in the diagrammatic representation that these features share a tier, they will not be represented diagramatically with separate association lines associating them with their mother node. They will be represented as shown in diagram (2.10).

(2.10) <u>Diagrammatic representation of the feature pairs STOP CONTINUANT and WIDE GLOTTIS CLOSE GLOTTIS in the model of feature geometry proposed here</u>

OCC | PHON
STOP / CONT | WG / CG

The slash in these diagrams may be said to represent the precedence relation which holds between the two features.

One matter which must be addressed with regard to this assumption is how it relates to what has been termed by Hayes the diphthongization paradox (in Hayes, B. (1990)). Hayes points out that given the feature geometric representation of segments, a paradox occurs when part of that representation is deleted from the melody of a doubly associated melodic representation. He uses the example of Icelandic pre-aspiration to help explain this. In Icelandic there is a rule which converts geminate voiceless aspirated stops into pre-aspirated voiceless stops. That is, /pp^h, tt^h, kk^h/ change to [hp, ht, hk]. Trying to explain this process within a feature geometric representational theory would involve delinking the place (or supralaryngeal) specification of the initial half of the geminate, thus leaving the laryngeal specification. This creates problems for feature geometry, mentioned by Hayes as follows. Note that in this respect Hayes is discussing the model of feature geometry proposed by Clements, N. (1985), but the general idea is applicable to other models, including the one proposed here:

> Since long segments are doubly linked, there is only one /p/ autosegment present on the Supralaryngeal tier. Deleting this autosegment, we obtain *[hh],..., and not the correct form [hp]
>
> Hayes, B. (1990) p.35

Hayes proposes a revised model of phonological representation which is based on the idea of coindexing autosegments with each other to overcome this problem. However, with regard to contour segments under discussion here there is no problem. Hayes himself agrees with the contour segment type of representation for affricates and pre-nasalized stops as proposed by Sagey and points out that the diphthongization paradox does not affect the status of contour segments. This is because these segments are represented as singly associated melody units with internal pairs of features, or feature values, which are ordered. Indeed, in Hayes' revised theory of representation the way such segments are represented is essentially the same as in the feature geometric model.

Returning to the matter of the representation of contour segments proposed here, it may be argued that the representation is no more adequate than an arrangement involving the two feature values of a binary feature, such as [-continuant] and [+continuant]. It may indeed be said that the features CONTINUANT and STOP are not unary at all, but simply the two values of a binary feature with different labels and that to argue that these are unary features is not valid. In other words, to all intents and purposes, CONTINUANT is the same as [+continuant] and STOP is the same as [-continuant]. Looking at the features in isolation from the rest of the phonological representation proposed here, this is certainly true. That is to say, the relationship between the pair of features CONTINUANT and STOP is analogous to the relationship between the pair of values of the binary feature [±continuant]. However, we are not interested only in this relationship but in the model as a whole, and it does not seem incongruous to allow certain pairs of unary features to be analogous with the two values of a binary feature. Furthermore, this one point certainly does not appear to be a justification for the assumption of binary features exclusively within the representation as a whole. We shall therefore accept that in the case of these pairs of features the relationship between them is the same relationship as holds between the two values of a binary feature and shall represent this as we have proposed above.

In terms of the comparison with Sagey's model, the implication of the above assumptions about the feature pairs listed is that contour segments are represented in essentially the same way in the model proposed here as in her model. The model proposed here, however, is more desirable since it is more restrictive than Sagey's model in which there is no constraint on which particular binary features may constitute contour segments. In the model proposed here such a constraint is part of the representation, since only those pairs of features set up in the configuration given in (2.10) may form contour segments. This, however, does lead on to a further question: namely, what factor determines which features are configured in this way?

One way in which we may address this is to say that all pairs of features which define complementary natural classes may be configured in this way in the feature geometric representation. This is not to say that pairs of features must be set up which are the equivalent of pairs of all binary feature values in binary feature models. Rather, where a language requires the assumption of a pair of features which define natural classes, then those features should be configured in the way shown if the sets defined by those features are complementary. It must be borne in mind that this only holds for phonologically relevant natural classes. That is to say, that what we mean by natural class in this context is strictly a class, the defining feature of which plays a positive role in the phonology of the particular language and not one which may simply be set up for no other reason than to define a particular set of segments as the set of all other segments to any other particular set of segments.

Thus, although laterals may be said to be a natural class in a particular language as a consequence of the role laterals play in the phonology of that language, the complement set of non-laterals may not necessarily be set up as a natural class unless it also plays a positive role in the phonology of the language. If such a set plays no such role in the language, then no unary feature analogous to [-lateral] may be set up and configured as outlined above. In other words, we set out with a set of features needed to account for the phonology of a language and, of those features, any pair which defines two complementary sets of the whole set of segments is set up in the configuration given above.

In the case of Somali, we can see that the two pairs of features we have assumed to be configured in this way conform to the definition. Furthermore, with regard to these pairs of features, it seems most likely that it will prove to be the case that they are both universally configured in this way.

Thus STOP and CONTINUANT are assumed to be represented in the "binary" configuration as also are WIDE GLOTTIS and CLOSE GLOTTIS.

Returning, then, to the model proposed here, we are providing a model of phonological representation which allows some of the explanatory power of the binary feature system to explain the matter of contour segments as demonstrated in Sagey, E.C. (1986). On the other hand, we are at the same time excluding the more undesirable facets of a binary feature system. Having assumed the "binary" nature of these pairs of features, we must provide them with a label. Since the label "binary" might be regarded as misleading in this context (hence the quotation marks in the above instances) we need to provide another term. We shall label these features "complementary features" because they are features which define complementary natural classes. It must be remembered that they are still feature nodes but constitute a subset within the set of feature nodes.

The approach made here to the status of the complementary nodes provides for a more restrictive theory than that proposed by Sagey. Sagey proposes the hypothesis: "Contour segments may branch for terminal features only. No branching class nodes are allowed" (Sagey, E.C. (1986) p.50). This restricts the features which are allowed to branch to form contour segments to those which are terminal features, such as [±continuant] or [±nasal], but there is no constraint in the theory which explains why other terminal binary features, such as [±lateral], etc. do not branch. Thus, for example, predicting as possible contour segments those involving the sequence of [-lateral] [+lateral]. The proposal made here is that there are certain tiers shared by two features; that is to say, tiers upon which two features, or one of either of those two features, may be present. If both features are present within a segment, then the precedence relation necessarily holds between the two features; that is to say, one feature precedes the other, thus explaining the fact that if both features occur within one segment it will necessarily be a contour segment. Since contour segments may only involve pairs of features found on the same tier, the representation restricts the possible contour segments to just those which are configured as complementary features.

One further point must be made with regard to these complementary features; namely the situation with regard to underspecification theory. As mentioned above, the theory of underspecification as expounded in Archangeli, D. (1984) is accepted here. One of the principles of that theory, which is couched within the theory of binary features, is that any feature may only be specified for one value at the underlying representation level. Since we are dealing here with pairs of features which are analogous to binary feature value pairs, we shall assume the same principle to hold for these pairs. That is to say, that for any pair of complementary features only one of the features may be present in phonological representations at the underlying level.

In this section, then, we have made clear the formal aspects of the model of feature geometry which we are proposing in this thesis for Somali. We shall now go on to discuss the nodes assumed to comprise the model of feature geometry here and compare them with the similar nodes proposed by the other works on feature geometry being looked at. This discussion will involve further general formal aspects of the model.

2.3.2. The individual nodes proposed for the Somali model of feature geometry

In this section we shall look at the individual nodes assumed in our feature geometry model for Somali. Nodes will be defined and their relations with other nodes will be discussed. We shall also look at nodes which occur in the other models of feature geometry but not in our model and discuss the implications of this.

2.3.2.1. <u>OCCLUSION</u>

We shall begin by defining the features dominated by the OCCLUSION class node. One of the arguments we put forward in favour of unary features is that they are positively involved in phonological processes. Thus, if we are to assume that the pair of features STOP/CONTINUANT is universal, we must be able to show some evidence that the features play an important role in the phonology of Somali. Furthermore, if we are to assume them to be configured as complementary features universally, then we also need to provide at least some evidence from other languages.

2.3.2.1.1. <u>STOP</u>

STOP will be defined along the lines of the description of stops in Chomsky, N. and Halle, M. (1968): "in stops the air flow through the mouth is effectively blocked". STOP, therefore, will be defined here as total occlusion within the oral tract.

In Somali STOP plays a role in a number of phonological phenomena which are detailed later. Particularly, we shall mention here the restriction on WIDE GLOTTIS stops in the language. Details are given in section 3.3.2.4. Suffice it to say here, that the feature STOP plays a role in the rule of WIDE GLOTTIS deletion and thus must be assumed to be present in the Somali model of feature geometry.

Phonological evidence in another language for the feature STOP may be found in Benç (a Northern Omotic language spoken in south-west Ethiopia). There is a process whereby STOP is spread from /n/ to a following /z/. This is described by Breeze, M. (1990) as follows:

> /z/ has three allophones: [ʒ], [dʒ] and [ʒʲ]. [dʒ] occurs in a consonant cluster following /n/...
>
> e.g....[gen^{4}dʒu^{4}bay^1] *dikdik*
>
> Breeze, M. (1990) p.6[1]

This behaviour may be explained in the framework proposed here as the spreading of the STOP node from the nasal to the following fricative, thus providing evidence for the phonological relevance of the feature STOP in another language.

2.3.2.1.2. CONTINUANT

The feature CONTINUANT will be defined as characterizing sounds in which: "the primary constriction in the vowel tract is not narrowed to the point where the air flow past the constriction is blocked" Chomsky, N. and Halle, M. (1968) p.317; that is to say, sounds in which there is not a total occlusion within the vocal tract. This lack of occlusion may be to a greater or a lesser extent. In vowels, for example, there is barely any resistance to the flow of air through the oral tract. In fricatives, on the other hand, there is a certain amount of restriction which causes the characteristic turbulence associated with fricatives.

We can see that these two definitions characterize complement sets of sounds, thus justifying setting the features up as complement features.

Having assumed the feature, we must show it to play a phonological role in the language. In Somali, CONTINUANT does not seem to play as prominent a role in phonological processes as does STOP. This is an interesting point, given the fact that, as we shall see, it is the default

1 Note the superscript numbers in this example refer to tones.

specification for the OCCLUSION class node. We do, however, need CONTINUANT if we are to provide an adequate specification for the affricate in which, although it is a STOP underlyingly, the feature CONTINUANT plays a role in providing an adequate specification for phonetic implementation.

In other languages we see examples of processes in which the feature CONTINUANT plays an important role. Examples of processes in which CONTINUANT spreads are given in McCarthy, J.J. (1988) who notes:

> The post-vocalic spirantization rules of Spanish, Tigrinya, and Biblical Hebrew (in which pbtdkg -> ɸ, β, θ, ð, x, ɣ) are possible examples of this process [ie. spreading of the CONTINUANT node], although they are open to an alternative interpretation.
>
> McCarthy, J.J. (1988) p.13

The class node which dominates these two feature nodes is the OCCLUSION node. Why, though, do we need to assume the OCCLUSION node when the feature nodes, CONTINUANT and STOP, share the same tier. Might they not simply be immediately dominated by the root node? An answer to this question stems from our assumption of the class node requirement. All segments are either stops or continuants[1]. This needs to be spelled out in the phonetic representation, something which is assured by the class node requirement. In order for the class node requirement to come into effect, however, a class node must be present and in the case of STOP and CONTINUANT the class node is OCCLUSION. It may prove, after further work, that this class node is superfluous and that an equivalent to the class node requirement may be assumed which does

1 Or, indeed, both, as in contour segments in which the segment is a stop for part of its duration and a continuant for the rest of its duration.

not require the node OCCLUSION. For the time being, however, the node OCCLUSION will be assumed.

2.3.2.2. NASAL

In this section we shall define the feature NASAL and look at the status of this feature within the feature geometric model. The definition of the feature is straightforward. NASAL will be defined as the presence of flow of air through the nasal cavity due to lowering of the soft palate.

It was mentioned above that another type of contour segment is the pre-nasalized stop. This is represented in Sagey's model by the presence of both the negative and positive values of the feature [±nasal] on the tier dominated by the soft palate node (see diagram (2.11)). As we have seen above in our theory, we are assuming that features are unary in nature, thus it is not possible to represent such segments in the way Sagey does, since NASAL does not have the two values, '+' and '-', as in a binary model.

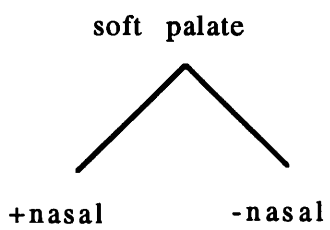
We are in a situation, therefore, where it seems that we need to set up a pair of complementary features. However, whereas in the case of CONTINUANT and STOP, we had reason to assume these two features aside from their complementarity, in the case of NASAL there is no other feature we have assumed which is complementary to the feature. That is to say, we cannot set up a pair of complementary features because we have only one feature, NASAL.

It is possible that we could set up a feature in the feature geometric representation to fulfill a complementary role: a feature, ORAL, for instance. With this, however, we would be guilty of a circular argument, not a desirable way of assuming the existence of features. After all, what positive role in the phonology does ORAL have to play? What we are doing, if we take this angle of approach, is to simply set up a unary feature equivalent of the feature value [-nasal]. A further consideration is the phonetic implementation or definition of a feature, such as ORAL, since there are nasal sounds which are also "oral": nasalized vowels or laterals, for example. In other words, the features ORAL and NASAL would define not complementary sets but sets which may have common members, which would mean allowing for the possibility of ORAL and NASAL being present simultaneously in a representation.

Given this interesting situation, a strong stance shall be taken here with regard to NASAL. No feature other than NASAL will be assumed to exist on the NASAL tier.

Again, however, given the explanatory value of the binary feature [±nasal] in Sagey's account of pre-nasalized stops, we must attempt to provide an equally explanatory account, given the assumptions made here. In her model Sagey represents pre-nasalized stops as contour segments with branching from the soft palate node to the two value specifications of the binary feature [±nasal] as shown in diagram (2.11).

(2.11) <u>Partial representation of a pre-nasalized stop in Sagey's model</u>



What Sagey provides in support of this representation is the fact that pre-nasalized stops behave as nasals with respect to rules sensitive to their left-hand side and as non-nasals with respect to rules sensitive to their right-hand side. One example she gives is that of Kaingang, as noted by Herbert, R.K. (1975) p.107, see Sagey, E.C. (1985) p.96. The behaviour is summarized as follows:

(2.12) Kaingang nasalization spreading

n	/	$\tilde{V}$ __ $\tilde{V}$
n d	/	$\tilde{V}$ __ V
d n	/	V __ $\tilde{V}$
d n d	/	V __ V

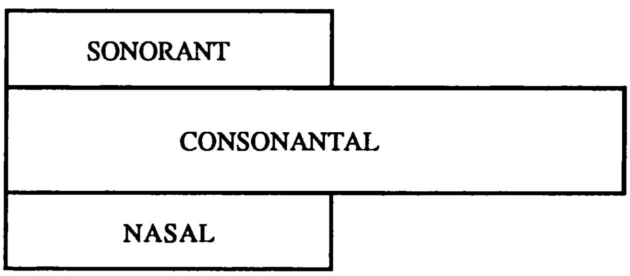
These data show the effect of pre-nasalized and post-nasalized consonants on surrounding vowels, nasalization only spreading to an adjacent vowel from the side which is specified as [+nasal] in Sagey's representation.

Sagey's contour segment representations capture this behaviour in a very explanatory way. In the representation proposed here, involving the feature NASAL, we propose capturing this by making full use of the formal characteristics of the feature geometric representation of individual segments in a string. Before going on to show this, however, it must be pointed out that Somali does not have pre-nasalized stops, so, in terms of the immediate value to the explanation of Somali, the representation of pre-nasalized stops is not of immediate concern. However, the way in which NASAL is represented is important, since nasality is part of the phonology of Somali, and this way of representing nasality has implications for the represention of pre-nasalized stops in other languages.

Feature geometric representations of segments are generally two-dimensional as in the diagram in (1.6a) in chapter 1. This is primarily because the full three-dimensional representation of a segment (the type of diagram in (1.6b) in chapter 1) involves a much more complicated diagram which is not always necessary in order to represent a particular process or segment. A way of implying the three-dimensional structure of a feature geometric representation in a two-dimensional diagram has been given above in the representation of the complementary feature pairs, CONTINUANT/STOP and WIDE GLOTTIS/CLOSE GLOTTIS, on the same tier (see (2.10) above). The slash in that representation shows that the two features are in a precedence relation, essentially allowing for a view *down* the feature geometric representation[1].

Thus, for the representation of pre-nasalized stops the feature node NASAL will be assumed to be present for only part of the segment's duration, the rest of the segment's duration being without the NASAL feature node tier. The relevant part of a pre-nasalized stop's representation will be assumed to be as in the following diagram:

(2.13) Partial representation of a pre-nasalized stop



The part of the segmental representation involving the feature node NASAL will be nasalized and the second part, where there is no NASAL feature node, will be solely oral in nature. Note that this lack of NASAL implies the lack of SONORANT also, as expressed in the diagram. It will be assumed that the presence of the feature SONORANT is dependent on the feature NASAL in this case[2].

---

1 This, of course, has implications for what precisely is represented by association lines, but we shall not discuss this matter here.

2 Since we do not need this configuration for Somali we shall not discuss representation in a two-dimensional diagram.

It may be argued that, since the absence of NASAL is assumed to be part of the representation of this particular type of segment, this is no different from the assumption of the existence of the negative value of the feature [±nasal], [-nasal]. A significant difference holds, however, between the representation proposed here and a representation involving [-nasal]. In the representation proposed here, the quality of non-nasality, exclusive orality, in a segment, or part of a segment is not something which may be manipulated as may the negatively specified feature [-nasal], since there is no feature to manipulate. In other words, the representation proposed here implies that only nasality in the form of the feature node NASAL will be involved in any autosegmental process, such as spreading or delinking or that only this feature may be referred to by a particular phonological constraint. As far as Somali is concerned, and the processes described in Sagey's thesis (see pp.96-105), this is true. Sagey does refer to a process in the language Guarani, however, involving the spreading of [-nasal] (see Sagey, E.C. (1985) p.51).

This process is discussed in van der Hulst, H. and Smith, N. (1982) along with other cases in which [-nasal] is assumed to spread. All of the cases discussed by van der Hulst and Smith, however, involve the spreading of [-nasal] which is set up in the representation as an *autosegmental* feature. That is to say, that it is not part of the melody of the segment as such but is set up on an autosegmental tier. It is also interesting to note that in their model van der Hulst and Smith, following Clements, G.N. and Sezer, E. (1982), assume five parameters in the analysis of autosegmental phenomena one of which is "the set of opaque segments" (see van der Hulst, H. and Smith N. (1982) p.311). It is these opaque segments which are assumed to be associated with [-nasal] in the accounts of blocking spreading which they discuss. It is felt here that, although it may not quite have the simplicity of their account, the model we are proposing will account for the facts they present; since, by listing the blocking segments associated with the autosegmental feature [-nasal] as part of the parametric information of the language, one can envisage other ways of accounting for the blocking which they discuss.

Given this, we shall not waver from the position assumed here, leaving the research of universal implications to later. Certainly, as far as Somali is concerned, the assumption made here is adequate. What is more, we can explain some more general aspects of the behaviour of nasality, given our assumption.

Hyman, L. (1975) has pointed out that, whereas nasalization of vowels in the environment of a nasal consonant is common, denasalization of a nasal in the environment of a non-nasal is not:

> The denasalization of a consonant before an oral vowel is a less natural rule. While /an/ quite naturally is realized phonetically as [ãn], it is a rare occurrence to find /na/ pronounced [da]
>
> Hyman, L. (1975) p.159

It is still the case that such a process is an assimilatory process, similar, formally, to nasalization. This may be shown by comparing the two rules given by Hyman:

(2.14) <u>Hyman's nasalization and denasalization rules</u>

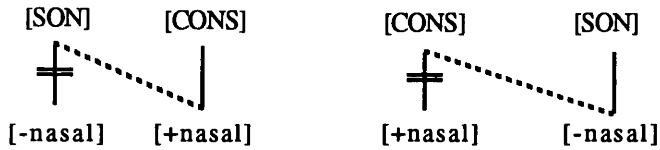
$$V \rightarrow [+\text{nasal}] \;/\; \_\_ \begin{matrix}[+\text{nasal}]\\ C\end{matrix}$$

$$C \rightarrow [-\text{nasal}] \;/\; \_\_ \begin{matrix}[-\text{nasal}]\\ V\end{matrix}$$

Hyman, L. (1975) p.159

There is nothing in the rules or the representations to show that one is more "natural" than the other. What is more, this is also the case with a feature geometric formalization of these rules involving binary features (see (2.15) below).

(2.15) Feature geometric representation of the rules in (2.14)



Given the formal similarity between the rules in (2.15), there must be a markedness convention stating that spreading or assimilation of [+nasal] is much more natural or, stated in another way, much less marked than spreading or assimilation of [-nasal]. Given the representation of nasality assumed in our model, there is no possible way in which [-nasal] or its equivalent can be manipulated in this way. Thus, the representation explains the lack of such processes or, in the case that such a process is shown to exist, the representation explains its highly marked status in terms of the fact that it would not be accounted for by the simple spreading of the feature [-nasal] as in a binary system.

A further matter which the representation helps to explain is the fact that there are no languages with a sound inventory consisting of nothing but nasals, whereas there are some, albeit very few, without nasals see Lass, R. (1984) p.156.

Lass, speaking of a survey of nasals in Nartey, J.N.A. (1979) states: "There are eight [languages] in his sample with none, [nasals] covering a fairly wide geographical and genetic range, including Quileute from North America, Rotokas from the South Pacific, and Apinayé from South America" (Lass, R. (1979) p.156). Lass also mentions two languages, Duwamish and Snoqualmie, mentioned by Hockett, C.F. (1955) but he says "Hockett remarks (p.119) that these languages once had nasals and have now lost them" (Lass, R. (1984) p.156). This causes Lass to ponder the possibility of nasals as being an "extinct universal"; in other words, that nasals were once universal but are no longer.

The fact of nasals not being present in certain languages may be easily explained by the representation assumed here in that those languages simply do not have the feature NASAL as part of their phonological representations. In a model involving the binary feature [±nasal], we would have certain complications, given that, in stating that [+nasal] is not part of a language's phonological distinctive feature matrix, we are also stating that [-nasal] is not part of it.

Referring briefly back to the way in which we defined complementary features, we see that there is a natural class of nasals which is generally regarded as such in languages. However, the complementary set of non-nasals is not regarded as a natural class in many languages, as far as the author is aware, and thus it is not possible for us, according to our own criteria, to set up a feature, such as ORAL, as a complementary feature with NASAL.

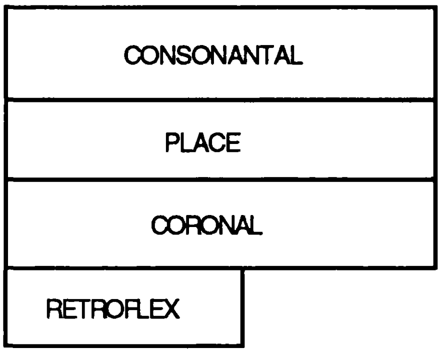
One matter must be clarified in respect to this representation of NASAL. Why is it that all segments which are not specified NASAL are produced orally? Furthermore, how do we account for segments which are both nasal and oral? We shall deal with the first question first. This may seem a trivial question but, given our assumption above of the class node requirement, the fact that we are allowing a matter of phonetic implementation, ie. orality, to be allowed to be manifested without providing an explicit statement to that effect in the form of a feature in the phonological representation could be regarded as undermining the class node requirement. We shall explain this matter by assuming it to follow from a most basic assumption of spoken human language, namely that the means of communicating by natural language is orally by default. It therefore follows that any segment is produced only orally unless the marked feature NASAL states otherwise. Note that we state *only* orally since all nasals require some oral component in their phonetic realization.

It is the opinion here that this need not be stated as part of any particular grammar or even as part of universal grammar, since it might be regarded as an axiom of natural language that it is communicated orally unless some outside incident causes this to be impossible. It is important to realize here that we are not suggesting that linguistic communication by any means other than orally is not language, but simply that it is a fact of human life that language is generally communicated orally unless this is simply impossible, and that this fact is not something which need be accounted for by linguistics but by a theory of, perhaps, biology. Further to this, it may be said that linguistic communication may be engaged in by writing, and this by choice, not because oral communication is impossible. Such events are also outside the scope of the type of linguistic investigation being undertaken here, probably falling within branches of psychology and sociology.

Let us now turn to the second question above, as to how we may account for segments which are both nasal and oral. This is no problem for the system of representation we are assuming here. All sounds are necessarily produced orally, that is to say, air flows through the oral tract, unless something prevents that flow from passing through. The feature STOP prevents the flow as we see from the definition we have assumed for it. Thus, all nasal segments will also be oral segments unless they are nasal stops.

One potential problem with this way of handling NASAL is the fact that we have no way of preventing other nodes from being represented in an analogous way to NASAL. In other words we need to explain the matter of why it is that there is no segment of the type which might be described as a "pre-retroflexed" stop for example. That is a retroflex stop which is specified for the feature RETROFLEX for part of its duration and not specified for the remainder of its duration as exemplified in (2.16).

(2.16) Diagrammatic representation of a "pre-retroflexed" stop



In other words, why is the type of representation assumed for pre-nasalized stops restricted to just these segments?

This is a question which will be answered here in terms of the idiosyncratic nature of the feature node NASAL. It will simply be assumed that the NASAL tier is the only tier which may be present for only part of a segment's duration. This may have something to do with the fact that the NASAL feature is one which involves some amount of continuity in its expression. That is to say, that the phonetic manifestation of the feature may be, so to speak, turned on and off during the production of any type of segment[1] due to the nature of the initiation of nasality, the soft palate being raised or lowered. This does not seem to be the most satisfactory of answers but will be assumed for the time being, pending further examination of the matter.

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[1] The only exception to this is the glottal stop. The lack of nasalized glottal stop may be explained simply by the physiology of the vocal tract. This does, however, need to be incorporated into the model of representation. We shall not discuss this further here as it does not have any particular bearing on the arguments proposed.

2.3.2.3. The ROOT node: CONSONANTAL and SONORANT

In the model proposed by McCarthy, J.J. (1988) these two feature nodes actually form the root node of the segment. This configuration was proposed by McCarthy on the grounds that "the major class features do not assimilate, reduce, or dissimilate except in conjunction with processes that affect the entire segment" (McCarthy, J.J. (1988) p.97). He points out that providing these features with separate tiers or having them dominated by a common tier implies their undergoing any possible autosegmental process independently of the other features of the segment. He states that this is not the case, and thus they themselves are assumed to constitute the root node itself, explaining the fact that any process in which they are involved also involves the whole of the segment. These features distinguish the Somali segment types in the following way:

SONORANT:	vowels[1]
CONSONANTAL:	stops, fricatives, (the affricate)
CONSONANTAL, SONORANT:	nasals, liquids, the y semivowel[2]

As to the definitions of these two features, CONSONANTAL will be defined as in Chomsky, N. and Halle, M. (1968) ie. involving "a radical obstruction in the midsagittal region of the vocal tract" (Chomsky, N. and Halle, M. (1968) p.302). As to SONORANT this will be defined as follows: "involving no sound source other than the larynx"[3]

1 The difference between vowels and semivowels is manifested in the prosodic structure except for one case in Somali. Details are given in section 3.3.2.2.1.

2 See section 3.3.2.2.1. for details.

3 I am grateful to Dr Katrina Hayward for this suggestion.

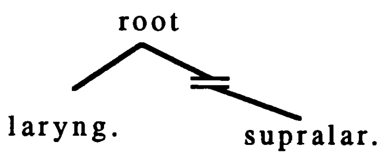
Before going on to look at the next class node in our model of feature geometry, we shall discuss the supralaryngeal and laryngeal nodes assumed by both Clements and Sagey, but not McCarthy, whom we follow here in also not assuming these nodes. Although we are not assuming these nodes in our model, it is important to discuss them here, since they explain certain phonological phenomena in Clements' and Sagey's models which we must be able to explain also in our model.

2.3.2.4. Supralaryngeal and laryngeal nodes

Clements and Sagey include a supralaryngeal and laryngeal node in their feature geometries, albeit dominating different nodes: Clements' supralaryngeal node dominates a place node and a manner node, Sagey's supralaryngeal node, on the other hand, dominates a soft palate node and a place node. McCarthy, by contrast, argues against the supralaryngeal node in response to the argument involving debuccalization (see immediately below). He points out that, where this is explained as delinking of the supralaryngeal node in Clements and Sagey, there is no corresponding general phonological process which involves delinking of the place node. Further, he proposes that "debuccalization could as well be regarded as delinking of the Place node" (McCarthy, J.J. (1988) p.93). We shall follow McCarthy's lead in the model proposed here in assuming this to be the explanation of this process although, since our model is different to McCarthy's, we must spell out the details of the process as pertaining to our model, showing them to be at least as explanatorily adequate as Sagey's proposal.

The arguments used to justify the supralaryngeal and laryngeal nodes in both Clements and Sagey are similar (and in some cases the same). We shall therefore only refer to Sagey's work in this matter. To show how Sagey justifies the supralaryngeal node we shall give two examples of phonological processes in which she shows it to play an explanatory role (see Sagey, E.C. (1986) pp.32-35). Firstly, she states that the historical process which has reduced consonants in English to [ʔ] and [h] may be explained by a delinking of the supralaryngeal node, leaving only the laryngeal specification thus:

(2.17) <u>Diagram of supralaryngeal delinking in Sagey's model of representation</u>



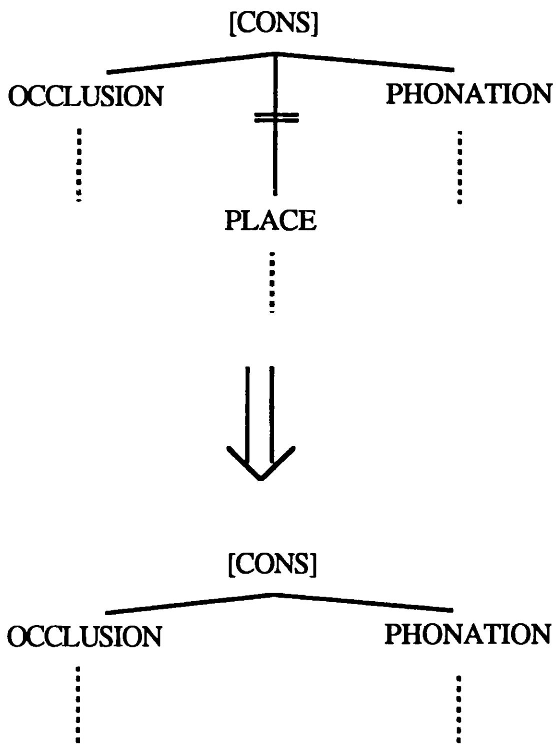
Sagey, E.C. (1986) p.32

This process highlights the fact that in Sagey's model the roles of the larynx as active articulator in terms of the place specification for laryngeal consonants and as phonation specifier for all segments are determined by the same node. After the delinking of the supralaryngeal node, the laryngeal node, and whatever it might dominate, becomes the place specification of the laryngeal segment resulting from the delinking. In other words, what remains is what had been the phonation specification which then characterises the segment on its own.

In the model proposed here, there is a distinction between the laryngeal specifications which account for the phonation of a particular segment and the place specification of laryngeal segments. That is to say, the phonation specification of a segment, being dominated by the class node PHONATION, is separate from the place specification of laryngeal segments which is dominated by the class node PLACE, unlike Sagey whose laryngeal node handles these aspects together.

We must show, however, that the proposed model is capable of accounting for the phonological process mentioned above in at least an equally explanatory and simple manner as that given by Sagey. To show this, the equivalent process to that given in (2.17) above would be as in the following diagram:

(2.18) <u>PLACE node deletion in the model assumed here</u>



This process shows that the remaining segment would have an occlusion specification and a phonation specification[1]. Its LARYNGEAL place specification, however, would only be present after the introduction of the place specification, since it is the PLACE node which has been deleted. The introduction of the PLACE node

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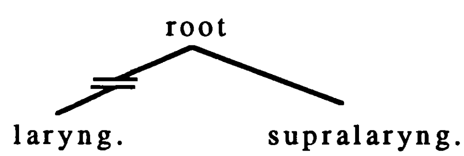
[1] That is, of course, assuming that at that particular stage in the phonology those nodes were already present in the representation. Whether they are or not does not have any bearing on the details of the particular argument under discussion here.

later follows from the class node requirement that all class nodes must be present in order for a segment to surface phonetically. Furthermore, the PLACE node must have an adequate specification according to the class node requirement. We shall assume that in this case the default specification is GUTTURAL. We shall see later that a further node is required due to GUTTURAL being a zone of articulation feature, this further node will be assumed to be LARYNGEAL (further details are given in sections 2.3.2.5.1.2. and subsections of 2.4.1.). Thus, a glottal stop or fricative, according to the OCCLUSION node specification, would surface. The specification dominated by the PHONATION node would be determined by the type of laryngeal consonant and the redundancy rules of the particular language. See 4.2.2.1. for how this works in a particular instance in Somali.

Another example which is used by Sagey to illustrate the explanatory power of assuming a supralaryngeal and laryngeal node is the synchronic process found in Thai, where there is a neutralization of the laryngeal features (which produce voiced, voiceless aspirated and voiceless unaspirated stops) in syllable final position where only unreleased voiced stops appear. Sagey explains this as being a simple delinking of the laryngeal node and thus all the features dominated by it (see (2.19)).

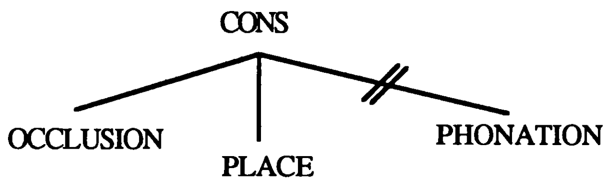
(2.19) Thai neutralization in Sagey's model



Sagey, E.C. (1986) p.32

This, again, may be explained using the model proposed here in that the delinking of the PHONATION node produces precisely the same effect as the delinking of the laryngeal node in Sagey's model, although in this model the PHONATION node must appear again at the end of the derivation to provide a phonation specification. In this case, it would be the unmarked, default, unreleased, voiced specification. Diagram (2.20) shows the delinking in our model.

(2.20) Thai neutralization in our model



Given these arguments, it can be seen that the proposals made by McCarthy and by us in this thesis are as adequate as the assumption of the supralaryngeal and laryngeal nodes.

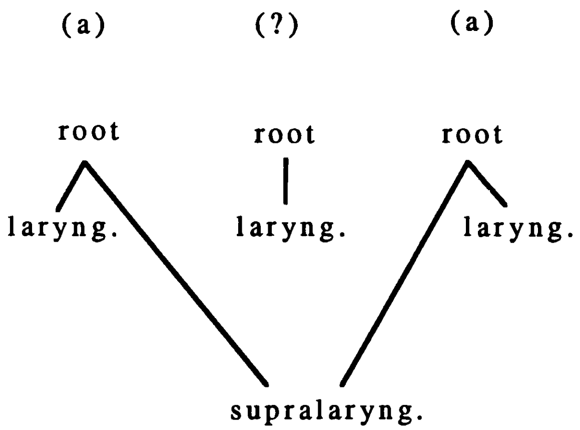
A further argument against the laryngeal, supralaryngeal node dichotomy is motivated by an aspect of phonological behaviour displayed in Somali, as well as in other Afroasiatic languages. This is the fact that uvulars and pharyngeals form a natural class with laryngeals, the whole group being described as "gutturals", following Hayward, K.M. & Hayward, R.J. (1989).

In her thesis, Sagey provides details of a phonological phenomenon exemplified by a North American language, Acoma. She writes:

> for example, when separated only by glottal stop, two vowels are normally identical..., for example, yaʔaana 'skunk brush', huuʔuuka 'dove' etc.
>
> Sagey, E.C. (1986) p.34

This is explained by the "sharing of supralaryngeal features... possible because /ʔ/ has no supralaryngeal node to block spreading of the vowel's supralaryngeal node" (Sagey, E.C. (1986) p.34), see (2.21) below:

(2.21) <u>Diagram showing lack of supralaryngeal node not blocking spreading of a vowel's supralaryngeal node</u>



Sagey, E.C. (1986) p.34

This is certainly a good explanation of this particular phenomenon which is quite widespread amongst the world's languages (other examples of similar processes are listed in Steriade, D. (1987). See particularly p.603). However, it is not only laryngeal consonants which are subject to these types of processes. The same process occurs in a number of Afroasiatic languages but not just with regard to laryngeal consonants but uvular and pharyngeal consonants also. See section 2.4.1.1. for an example of this in Somali. In Sagey's model the processes involving pharyngeals and uvulars, as well as laryngeals, would call for more complex formalisms which would detract from the simplicity of the type of process given in (2.21). This is particularly so because the features specifying the uvulars and pharyngeals would be supralaryngeal features in Sagey's model which would necessitate a radically different approach to explaining such processes to the one given above for the translaryngeal process in Acoma.

In the model proposed here, however, which involves the use of the feature GUTTURAL, what has been called "trans-laryngeal harmony" (see Steriade, D. (1987) p.603) may more universally be called "trans-guttural harmony" and may be more adequately explained in these terms.

The phonetic support Sagey gives for assuming the laryngeal node is that it "corresponds to an independent articulator in the vocal tract" (Sagey, E.C. (1986) p.36). She then goes on to say, "The grouping of features executed by the larynx into a single phonological constituent is thus motivated by the anatomy of the vocal tract" (Sagey, E.C. (1986) p.36). This is an appealing argument, given the active articulator basis of her feature geometry. However, the phonological facts regarding the natural class of guttural segments outlined above are also important. What is more, the larynx is involved in various aspects of a segment's phonological representation, such as phonation, place and tone. The model proposed here acknowledges these differences and realises this in the feature geometry.

Thus, we can see that the supralaryngeal and laryngeal nodes are not necessary in the model of feature geometry and those arguments put forward for these nodes can also be explained in our model.

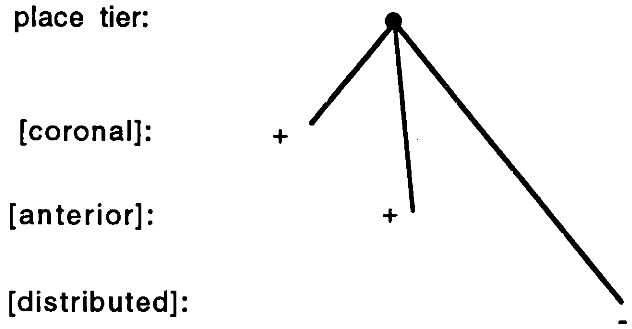
2.3.2.5. PLACE

Let us now return to looking at the nodes in the model of feature geometry we are assuming. We shall turn our attention here to the PLACE node and those nodes dominated by it.

We shall begin by giving a brief overview of the actual place dominated nodes proposed by Clements, Sagey and McCarthy in the works referred to above. As we have seen, the various different approaches to feature geometry have assumed various different features to be dominated by the place tier. Clements has a place tier dominating the same place features generally used in linear frameworks (for example that of Chomsky, N. and Halle, M. (1968)). In other words, Clements deals with place in what may be termed a place of articulation theoretical way which, as McCarthy points out, "expresses places of articulation primarily in terms of values of the features [coronal] and [anterior]" (McCarthy, J.J. (1988) p.99). The other major features are the tongue body features [high], [back] and [low].

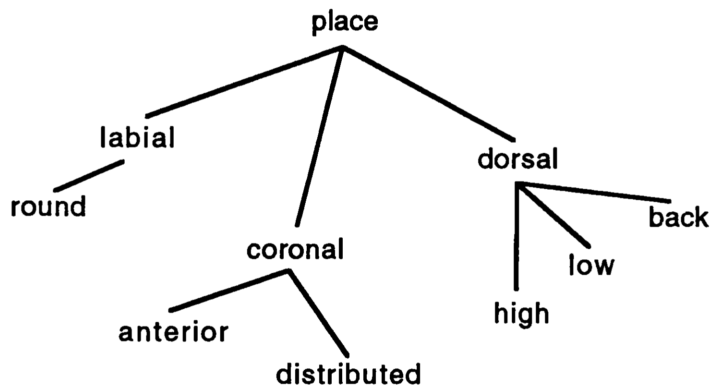
Clements' place node and the nodes dominated by it are exemplified in the following partial representation of [s]:

(2.22) <u>Partial representation of [s] taken from the diagram in Clements, N. (1988) p.248</u>



Sagey, on the other hand, defines the place tier in the following way: "Affecting formant structures in a manner resulting from changes in the shape of the resonator" (Sagey, E.C. (1986) p.275). In her model, she proposes three class features dominated by the place node: labial, coronal and dorsal. Of these she says: "The specification of one of these class features in a segment means that the articulator the class feature represents is present as an active articulator in the segment" (Sagey, E.C. (1986) p.274). Thus Sagey proposes an active articulator based theory with dependent terminal features dominated by the class features according to the following diagram:

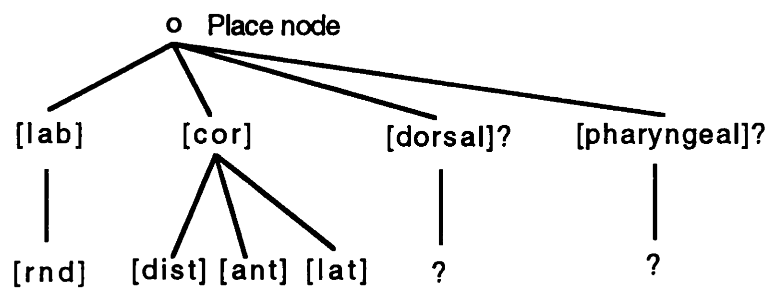
(2.23) <u>Sagey's place node</u>



Sagey, E.C. (1986) p.2

As to McCarthy, he also proposes an active articulator theory and, like Sagey, proposes various terminal features dominated by the class feature nodes although, as may be seen from the following diagram (2.24), these differ from those of Sagey.

(2.24) <u>McCarthy's place node</u>



McCarthy, J.J. (1988) p.105

The question marks are as given in McCarthy's own diagram.

A further contribution to the discussion on place in a phonological representation has been made by Hayward, K.M. and Hayward, R.J. (1989). In this paper they propose a new distinctive feature [guttural], citing arguments based on data from a number of Semitic and Cushitic languages to support this. The feature is proposed to capture the natural class of laryngeals, pharyngeals and uvulars. The class specified by this feature is provisionally defined in the following way:

> the 'guttural' class should provisionally be defined as including those sounds having a constriction in the pharyngeo-laryngeal zone, i.e., in that part of the vocal tract which extends from the end of the oral cavity (i.e. the uvula) to the larynx
>
> Hayward, K.M. & Hayward, R.J. (1989) pp.187-188

In their article they introduce the idea of a feature denoting a zone of constriction in a phonological representation. They suggest that zone of constriction features must be given "recognition in Feature Theory as a distinct and necessary category" (Hayward, K.M. and Hayward, R.J. (1989) p.190), although they do not spell out in detail how such features might be incorporated into any particular theory of phonological representation, leaving this to further work.

One point which needs to be made with regard to Hayward, K.M. and Hayward, R.J. (1989) is that they mention the feature [anterior] as a zone of constriction feature. This implies to some extent that they are assuming their zone of constriction features, [labial], [palatal] and [guttural] to be somewhat similar, formally, to the feature [anterior][1]. Although this matter is not pursued in the article, there are significant differences between the features they propose as zone of constriction features and [anterior]. One major reservation of McCarthy's is that the feature [anterior] does not refer to a "class of segments referred to consistently by phonological processes" (McCarthy, J.J. (1988) p.100).

---

1 It has been mentioned to me in a private communication by Prof. R.J. Hayward that in the article the authors did not wish to support the feature [anterior]. The arguments here provide further evidence for the idea that [anterior] does not play an adequate enough role in phonology to support its assumption.

This criticism cannot be aimed at the features [labial], [palatal] or [guttural], since they are all motivated by the fact that groups of segments may be defined by these zone of constriction features which undergo phonological processes. In other words, these features define natural classes of segments which are phonologically significant, unlike [anterior].

A further argument against [anterior] is that it may not be defined in terms of articulatory or acoustic terms (see McCarthy, J.J. (1988) p.100). This argument, again, does not apply to the three features being discussed. [Labial] may clearly be defined as involving the lips[1]. The feature [palatal] has been described as follows: "the [palatal] class would comprise those sounds having a constriction in the palatal zone" (Hayward, K.M. & Hayward, R.J. (1989) p.189). Thus, a positive definition of the zone of constriction is given. As for the feature [guttural], it describes any sound involving "constriction in the pharyngeo-laryngeal zone" (Hayward, K.M. & Hayward, R.J. (1989) p.187). See above quotation for a definition of the pharyngeo-laryngeal zone). Thus, it implies active articulation of the vocal folds, pharyngeal muscles or root of the tongue towards the back of the pharynx. That is, use of any active articulator in the pharyngeo-laryngeal zone.

A further difference becomes apparent if the binary nature of distinctive features is lost and features are assumed to be unary, as is the case in this thesis. The feature [anterior] in a unary system loses half of the possible specifications it may contribute to phonological representations. This is a great loss and one which weakens the already weak position of [anterior] even further. The three other features, on the other hand, do not lose any of their motivation if

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[1] A factor which will be considered in arguing for labial to be an active articulator in this model rather than a zone of constriction (see section 2.3.2.5.1.1.).

handled in a unary theory, since it is their positive specifications which define the natural classes involved.

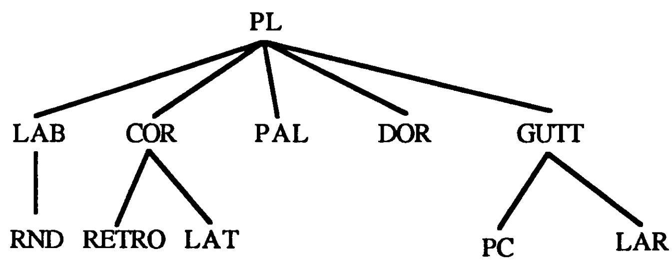
The zone of constriction features, indeed, may be said to be more sound within a unary system, since the complement set of segments to the sets defined by these features are not natural classes which undergo phonological processes in the same way as the defined classes themselves. In other words, the class of segments defined by [-guttural] does not behave as a natural class as does the natural class defined by [+guttural] or, in our system, a unary system, simply GUTTURAL. So we see that, although they have been likened to the feature [anterior], the arguments against that feature may not be made with respect to the zone of constriction features [guttural], [labial] and [palatal].

We have, then, three different ideas as regards place features. Two of these are couched within feature geometric representations; namely, place of articulation and active articulator theories. The other, although not specifically discussed within the feature geometric framework, may be incorporated into it without any problems as we shall see below.

In this thesis we shall propose a set of place features for the model of feature geometric representation for Somali which includes active articulator features and zone of constriction features along with a further group which we shall term configuration features. There will be strict principles, however, with regard to their co-occurrence, these being formally incorporated into the feature geometric model. The place of articulation features will not be pursued, given the problems associated with them which have been outlined above and in McCarthy, J.J. (1988).

The structure of the PLACE node in our model is given in the following diagram.

(2.25) <u>Our place node</u>



2.3.2.5.1. <u>The different types of nodes</u>

We shall now discuss the different types of nodes assumed under the PLACE node of our model of phonological representation.

Following discussion of the node types, we shall look at each of the nodes in question individually.

2.3.2.5.1.1. <u>The active articulator nodes</u>

The active articulator nodes are defined in the same way as Sagey defines them in her work; that is to say, the presence of an active articulator node implies the distinctive use of the articulator in question.

These nodes are: LABIAL, CORONAL, DORSAL, PHARYNGEAL CONSTRICTION and LARYNGEAL. Thus, the definition of each of these nodes is analogous to the following definition of LABIAL:

The presence of the node LABIAL implies the distinctive use of one or both of the lips.

The active articulators associated with each node are:
CORONAL: the blade of the tongue
DORSAL: the dorsum of the tongue
PHARYNGEAL CONSTRICTION: the tongue root and pharyngeal muscles
LARYNGEAL: the vocal folds

2.3.2.5.1.2. The zone of constriction nodes

As in Hayward, K.M. and Hayward, R.J. (1989), the following nodes are classified as zone of constriction nodes: GUTTURAL and PALATAL.

A departure from their proposal is the assumption of the LABIAL node as an active articulator node. This is also necessitated by the model we are assuming here, given a co-occurrence convention we shall set out later.

2.3.2.5.1.3. Configuration nodes

ROUND, LATERAL and RETROFLEX in our model will be labelled as configuration nodes. A configuration node will be defined as a node which specifies a particular configuration of an active articulator other than what may be referred to as the default configuration. It follows from this that configuration nodes must co-occur with an active articulator. What is more, certain configuration nodes may only co-occur with one particular active articulator, details are given in the forthcoming discussion.

2.3.2.5.1.4. The co-occurrence restrictions on place dominated nodes

Having outlined the three types of nodes assumed here, we shall show how they are restricted in their co-occurrence. Let us begin by referring to the class node requirement which we have already assumed to be part of universal grammar. It follows from the class node requirement that the PLACE class node must have an adequate specification, although this adequate specification was not formalized in terms of the PLACE node. We shall now make the assumption that, as far as the PLACE node is concerned, an adequate specification is defined as the specification of an active articulator node. That is to say, each and every segment must include in its specification an active articulator node dominated by the PLACE node. It must be remembered that this requirement must be fulfilled at the end of the lexical stage of the phonological derivation. In underlying representation and at earlier stages of the phonology the PLACE node may be present without any active articulator node or may even be absent from the representation, as, for example, when it is deleted in a process such as that of "debuccalization" mentioned above.

It follows from this assumption that, when a segment's specification involves a zone of constriction node and/or a configuration node, these must co-occur with an active articulator node. In addition to this, however, the matter of which particular nodes occur with which other nodes is also restricted. The configuration nodes may only co-occur with their respective active articulator nodes. Thus, in Somali the language specific constraints on the configuration nodes are: the node ROUND must co-occur with LABIAL; the nodes RETROFLEX and LATERAL with CORONAL[1].

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[1] It would, of course, be desirable if these constraints were found to be universal, but we shall leave discussion of this matter to future work.

As for the zone of constriction features, they may only co-occur with the active articulators which produce a constriction within the specific zone. For Somali this means that at least one of either the LARYNGEAL or PHARYNGEAL CONSTRICTION active articulator nodes must co-occur with the feature GUTTURAL, and the DORSAL or CORONAL active articulator node must occur with the PALATAL node. Further details are given below in the sections on individual features.

We shall now look at all the individual nodes dominated by the PLACE node in the Somali feature geometry proposed here.

2.3.2.5.2. LABIAL and ROUND

The LABIAL node implies the active articulation of one or both lips in a segment. It dominates one configuration feature, ROUND. ROUND implies the distinctive rounding configuration of the lips.

Referring back now to the matter of LABIAL being assumed to be an active articulator node rather than a zone of constriction node, as it is in Hayward, K.M. and Hayward, R.J. (1989), we can see that given, the principles of co-occurrence assumed here, it is impossible for the node LABIAL to be a zone of constriction feature, since according to our principles it would have to occur with an active articulator node. We would then have to assume an extra active articulator node LABIAL, which is obviously highly undesirable, or the LABIAL node would have to be an exception, also highly undesirable. Hence, the assumption, as in Sagey's model, that LABIAL is an active articulator node, following Sagey.

2.3.2.5.3. CORONAL, RETROFLEX and LATERAL

The CORONAL node implies the active articulation of the blade of the tongue. It has two dependent configuration nodes: RETROFLEX and LATERAL.

The definition of the node RETROFLEX is quite straightforward; it implies the distinctive curling back of the tongue.

The status of LATERAL, on the other hand, is not quite as straightforward, given the existence in some languages of what have been described as velar laterals.

In a paper entitled "A place for lateral in the feature geometry" Levin, J. (1988) has demonstrated convincingly that, although velar laterals do involve a velar component, it is clear that as far as their phonological behaviour is concerned the lateral component is dominated by the coronal node in the feature geometry. This conclusion is also accepted by McCarthy, J.J. (1988) in his feature geometry and we shall accept it here, assuming LATERAL to be dominated by the CORONAL node. Furthermore, we shall assume LATERAL to be a configuration feature; that is to say, it is defined by the configuration of the tongue blade, the active articulator. The precise definition, which we shall take from Levin, J. (1988), is: "Lateral sounds involve lowering or raising one or both sides of the tongue margins" (Levin, J. (1988) p.41).

2.3.2.5.4. DORSAL

The active articulator associated with the DORSAL node is the tongue body or dorsum. Of the two active articulator models given above, only Sagey proposes any features dominated by the dorsal node. McCarthy, J.J. (1988) suggests that this dominates certain features but does not give the actual features, only a question mark. See diagram (2.24) above. Sagey's features are the binary tongue body features familiar in generative phonology, since they are those proposed in Chomsky, N. and Halle, M. (1968) (see particularly pp.304-309). These are [±high], [±back] and [±low]. These features, however, are not assumed here. There are two main reasons for this: the unary feature system and the GUTTURAL node.

In previous models using the features [±high], [±back] and [±low], the segments we are classifying as guttural were distinguished by these features. This is shown in the following table which is extracted from Hyman's SPE Distinctive Feature Matrix for Consonants (see Hyman, L. (1975) p.244). It shows the features which distinguish uvulars, pharyngeals and laryngeals (there are, of course, further differentiations in voice, continuance, etc. but these have been disregarded since they are not relevant to the present discussion).

(2.26) Partial distinctive feature matrices for gutturals taken from Hyman, L. (1975)

	q	ɢ	χ	ʁ	ʀ	ħ	ʕ	ʔ	h	ɦ
high	-	-	-	-	-	-	-	-	-	-
back	+	+	+	+	+	+	+	-	-	-
low	-	-	-	-	-	+	+	+	+	+
ant	-	-	-	-	-	-	-	-	-	-
cor	-	-	-	-	-	-	-	-	-	-

Hyman, L. (1975) p.244

Since the zone of constriction feature GUTTURAL has been assumed in our model, the contribution of these binary features is greatly diminished, even without taking into account the fact that a unary feature system is being proposed. This is because their relevance in classifying the guttural consonants has been taken away. The tongue body features, then, are not assumed to be a part of the model proposed here at all.

2.3.2.5.5. PALATAL

Following Hayward, K.M. and Hayward, R.J. (1989), this node is assumed to be a zone of constriction node. It may be defined, therefore, in the following terms: a segment specified for this feature is one which involves constriction at the hard palate. The status of this node within the feature geometry, however, is not a simple matter since there are two active articulators with which this zone of constriction node may co-occur: namely CORONAL and DORSAL. This is evident from the anatomy of the vocal tract. The part of the tongue which causes the constriction with the hard palate may be the dorsum or the blade. It is impossible for any other articulator, such as the lips, to form a constriction with the hard palate.

We shall assume here that the feature PALATAL will co-occur with the DORSAL active articulator when the segment is specified SONORANT and that the active articulator when the segment is specified CONSONANTAL is CORONAL. This assumption is based on the Somali facts in which the palatal consonants, the underlying stop (which surfaces as an affricate) and the fricative, involve use of the CORONAL active articulator node. Whereas, the PALATAL specified vowel involves the DORSAL active articulator node. Further investigation may prove that in universal terms this is the correct assumption but we shall not undertake such investigation here.

2.3.2.5.6. GUTTURAL

Following Hayward, K.M. & Hayward, R.J. (1989) this feature node will be assumed to be a zone of constriction feature, the zone of constriction being the area from the uvular to the larynx.

Only LARYNGEAL and PHARYNGEAL CONSTRICTION features may occur with GUTTURAL. The GUTTURAL node, however, may co-occur with other active articulator nodes, as in the example of **q** discussed below in section 2.4.1.1.

2.3.2.5.7. PHARYNGEAL CONSTRICTION

This is one of the two active articulator nodes dominated by the zone of constriction feature GUTTURAL. Its specification implies the distinctive active articulation of the tongue root back towards the back wall of the pharynx and accompanying constriction of the pharyngeal muscles. These muscles are not regarded as separate active articulators, since they do not specify separate segments. There is no language, as far as I am aware, which distinguishes pharyngeal segments formed solely by constriction in the pharynx caused by the tongue root from pharyngeal segments formed solely by the constriction of the pharynx through action of the pharyngeal muscles.

2.3.2.5.8. LARYNGEAL

As the name of this node implies, a segment specified for this feature involves the distinctive active articulation of the larynx. This does not include the articulation of the larynx in its role as phonation producer. Thus, only laryngeal fricatives and the glottal stop are specified for this feature.

Having now looked at the PLACE node and those nodes dominated by it, we shall go on to look at the PHONATION node.

2.3.2.6. PHONATION

This node is a class node and, as such, must be present as a string exits the lexicon because of the class node requirement. The feature nodes dominated by this node specify the phonation characteristics of segments. Such features in Sagey's model are dominated by the laryngeal node as we have seen above. Here, however, the model distinguishes the role of the larynx as a phonation effect producer and as an active articulator dominated by the PLACE node. The details of the phonation specification of segments is not necessarily as simple as might be assumed from our model and it is accepted here that the relationship between the phonation and "place" roles of the larynx may be closer than is implied in this model. However, we shall leave these implications to further work, should the approach here prove insightful.

Given what we have said about the class node requirement, however, a theory internal argument for the assumption of LARYNGEAL as being dominated by PLACE may certainly be made. Since we have assumed above that an adequate specification of the PLACE node involves the specification of an active articulator node dominated by PLACE, we need to state what the PLACE specification is for laryngeal consonants. In the case of these segments, the active articulator is obviously the larynx, more specifically the vocal folds, which in such consonants act in a comparable way to the lips in labial consonants. Thus, the active articulator node LARYNGEAL is required, dominated by the PLACE node via the GUTTURAL node.

Another argument in favour of LARYNGEAL has to do with the fact that what has been termed trans-laryngeal harmony may, in fact, be more adequately described as trans-guttural harmony. Since laryngeals form part of the natural class of gutturals along with the pharyngeals and uvulars, it seems appropriate to assume a node, LARYNGEAL, dominated by the GUTTURAL zone of constriction node, thus providing a more adequate specification of this natural class.

2.3.2.6.1. WIDE GLOTTIS and CLOSE GLOTTIS

In the models of feature geometry which we are critically discussing in relation to the model proposed here, the features which are proposed for the phonatory aspects of segments are as follows:

Clements uses: [±spread] [±constricted] [±voiced]

Sagey and McCarthy use: [±constricted glottis] [±spread glottis]
[±stiff vocal cords] [±slack vocal cords]

Only two phonation features are required for Somali, since there are only two phonation types in the language. These features are assumed to be complementary features which are set up in the feature geometric representation in the appropriate manner, see diagram (2.10). This is because all segments have one phonation characteristic or the other, and so both features characterize natural classes which are complementary sets of which all segments are members of one or the other. The two features are: CLOSE GLOTTIS and WIDE GLOTTIS.

The reasons for assuming these two features, as opposed to some other possibilities such as VOICE and VOICELESSNESS as well as how they are defined, are given in this section. Furthermore, as we have mentioned above, for any pair of complementary features only one of the pair may be present in underlying representations. In Somali this feature will be assumed to be WIDE GLOTTIS for the reasons given below[1].

In Somali the only phonation distinction which might be termed a voiced versus voiceless distinction is found between the following pairs of consonants: **t** and **d**, **k** and **g**, and **x** and **c**. In order to ascertain the feature which is needed to provide for this phonation distinction, the stops will be discussed in some detail and the adequacy of the resulting feature discussed in relation to the pharyngeal fricatives. In the initial stages of this discussion we shall use the terms voiced and voiceless to characterize the phonation difference since the discussion moves towards justification for the features WIDE GLOTTIS and CLOSE GLOTTIS.

The Somali stop inventory is as follows:

b	d	dh		g	q[2]	'
	t		j	k		

Note that, as we have mentioned above, the orthographic symbol **j** represents an underlying palatal stop. From this inventory it is apparent that six voiced stops are present and three voiceless stops. This immediately suggests that the voiceless stops are the marked set. This assumption is confirmed when the behaviour of these stops is observed. There is a restriction on the position the voiceless stops may hold within a syllable; no voiceless stop may occur at the end of a syllable. If an underlying voiceless stop finds itself in this position, then it becomes a voiced stop via a rule to be discussed in section 3.3.2.4. For example, the verb with the imperative form **bug**, "to be ill", in Somali is underlyingly represented as /buk/. This is apparent from the 3rd person masculine singular form of the verb

1 See also Orwin, M. (1993).

2 The reader is reminded that the segment **q** is a voiced stop in underlying representation see section 2.2.1.

bukay, "he was ill", in which the underlying /k/ surfaces because it is in a position in which it is able to surface, namely as the onset of the syllable[1]. In the imperative, on the other hand, the underlying **k** is at the end of a syllable and thus surfaces as **g**.

It is quite clear, then, that the marked set of stops are the voiceless ones. We shall now turn to the question of what might be an appropriate feature with which to specify these stops. A first suggestion might be a unary feature equivalent of [-voice], something such as SURD, perhaps defined as 'distinctive lack of vibration of the vocal folds'. However, given the phonetic implementation of the voiced stops, this does not seem to be an adequate feature.

It is generally recognized that the voiced stops in Somali exhibit very little voicing in certain prosodic positions. For example, Armstrong, L.E. (1934) says the following about the segment **g**:

> *g* has not much voice initially. In a number of kymograph tracings made by Haji Farah no voice at all is recorded initially:
>
> *gæ̀æd* reach *gœd* hole
>
> *gall* pool *gœg* one side of camel skin
>
> *gal* enter *gʉ̀ʉrr* marriage
>
> The following subsidiary members of the phoneme occur and may all be represented by *g*:
>
> 1) A weak kind of *k* with no release before *t*:
>
> *náagta* the woman *'œ́œgta* the beacon
>
> *dœ́œgta* the pain *ɖégta* the ear
>
> 2) Voiceless (or with slight voicing) and with no release; or *k* with glottal closure and release, finally:
>
> *tæ̀æg* raise *tʉ̀ʉg* robber

---

1 Note that the syllable structure of Somali has not yet been addressed. However, the terms used in this discussion are used in a way that is generally understood and the discussion on syllable structure in the next chapter has no bearing on the arguments presented in this section.

tag go *naag* woman
dœ̀œg green grass

3) Sometimes *ɣ* when single between vowels, especially after a stressed syllable....

Armstrong, L.E. (1934) p.9/122

This detailed description of the behaviour of **g** is representative of the remaining voiced stops (see Armstrong, L.E. (1934) pp.6/119-11/124 for further details and examples as well as the descriptions given in section 2.2.1.). From this description it is clear why a feature such as SURD would be inappropriate. If SURD is defined as being the lack of vocal fold vibration during the articulation of a segment, ie. a standard definition of voicelessness, then the fact that the voiced sounds also very often manifest this characteristic is an anomaly.

To provide a hint as to what the distinguishing characteristic might be we shall turn to the voiceless stops. An aspect of these sounds which is readily apparent when they are heard in initial position is the heavy aspiration. This is also mentioned by Armstrong who, of the sound **k**, says: "Aspirated rather strongly" (Armstrong, L.E. (1934) p.9/122). It is this aspiration which will be assumed to be the indicator of the distinguishing characteristic marking the "voiceless" stops. But how can we formalize this in a pair of unary features?

If aspiration itself were to be assumed to be the marked feature, attention must be turned to the pair of fricatives **x** and **c**. If aspiration is to be the phonation feature, then it must be assumed that **x** is also marked for this feature. Since this is a fricative, aspiration itself may not seem a very suitable feature because aspiration is a phonatory aspect normally associated with stops. It is possible for aspiration to be associated with consonants other than stops but it is still highly inappropriate, given the nature of the fricative in question here. The pharyngeal fricative is so breathy in its sound that aspiration does not seem suitable as far as its phonetic realization is concerned. In other words, the breathiness associated with aspiration is not audible, given the already very breathy nature of the "voiceless" pharyngeal fricative, x.

In order to ascertain a more suitable feature the way aspiration is produced must be examined. In the earlier, general phonetic literature aspiration was generally regarded as being a function of voice onset time. For example, Abercrombie, D. (1967) states: "Aspiration, in other words, is a period of voicelessness that follows the voiceless closure phase of a stop" (Abercrombie, D. (1967) p.148). This matter has been discussed by Chin-Wu Kim in an article entitled "A Theory of Aspiration" (Kim, C.-W. (1970)). In this article Kim reviews traditional ideas of aspiration, including the idea that it is a function of voice onset time, also that the breathiness is the result of glottal friction. He then goes on to provide a new definition of aspiration. The two major points of this definition are as follows. Firstly, aspiration is a function of the width of glottal opening. Thus, "if a stop is *n* degree aspirated, it must have an *n* degree glottal opening at the time of release of the oral closure" (Kim, C.-W. (1970) p.111). The second point is that turbulence in the vocal tract which provides the breathiness of the aspirated consonant "is created not at the glottis but at the point of constriction for the following vowel whose configuration is formed, through coarticulation, during /h/" (Kim, C.-W. (1970) p.111).

Given this definition of aspiration, it is possible to propose a feature which is manifested by aspiration, namely wide glottal opening. Such a feature has been proposed by Halle, M. and Stevens, K.N. (1971) who propose a set of laryngeal features. The appropriate feature specification in their system for the aspirated consonants in Somali would be: [+spread glottis, -constricted glottis, +stiff vocal chords, -slack vocal chords]. Such a specification is not appropriate, though, given the assumption of unary features made here. Thus, what we shall assume is a feature WIDE GLOTTIS which corresponds with the [+spread glottis] specification of Halle and Stevens, and CLOSE GLOTTIS which corresponds to their [-spread glottis]. We shall not discuss the possible equivalents of their other features, since this is not relevant to the discussion of Somali.

Underlyingly then, the stops **t** and **k** and the fricatives **f, s, sh, kh** and **x** will be marked WIDE GLOTTIS. It must be pointed out here that the fact that all fricatives in Somali, apart from **c** as mentioned above, are marked for this feature seems a little anomalous since, if only the fricative inventory were examined, one would think that a feature for "voice" would be more appropriate. The fact is, however, that the fricatives all behave in the same way. There are no restrictions on the position the different fricatives may hold, as is the case with stops. Consequently, it is the feature specifying the marked stops which must be assumed as the underlying feature. That is to say that, since WIDE GLOTTIS and CLOSE GLOTTIS are a pair of complementary features the only feature found in underlying representation is WIDE GLOTTIS.

The assumptions made here also explain a further anomaly of the Somali stop inventory, if the feature [±voice] or a pair of unary feature equivalents were to be used. The glottal stop patterns together with the "voiced" stops, despite the fact that it itself is "voiceless" par excellence. It is, after all, impossible for the vocal cords to vibrate at the same time that they are held tightly together for the articulation of the glottal stop. Given the features assumed here, however, this patterning is not a problem since the glottal stop is a CLOSE GLOTTIS stop par excellence, and thus its patterning with the other such specified stops is not only not anomalous but is actually explained.

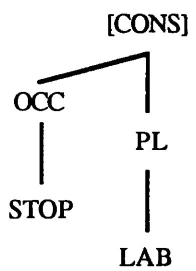
2.4. <u>The feature geometric representations of individual segments underlyingly and on the surface</u>

This section sets out the feature geometric phonological representations of each individual segment as it is represented in underlying representation and following the operation of default rules and other phonological rules, that is to say, as it is represented on the surface.

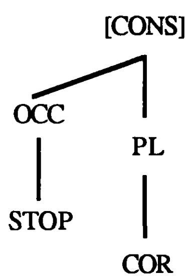
2.4.1. <u>The consonants</u>

2.4.1.1. <u>The stops</u>

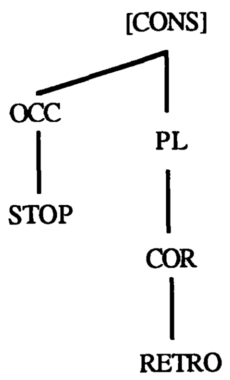
(2.27) <u>Underlying representation of **b**</u>



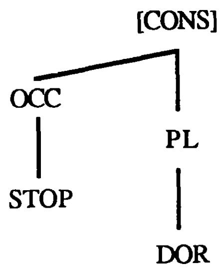
(2.28) <u>Underlying representation of **d**</u>



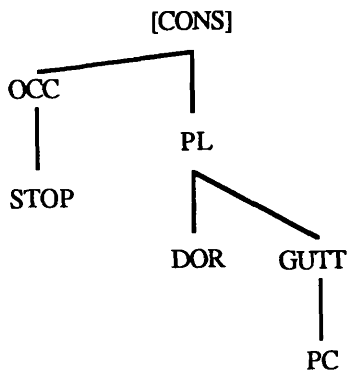
(2.29) Underlying representation of **d h**



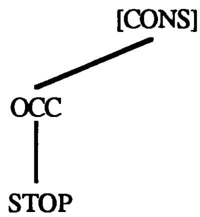
(2.30) Underlying representation of **g**



(2.31) Underlying representation of **q**

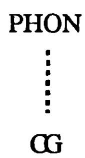


(2.32) Underlying representation of '



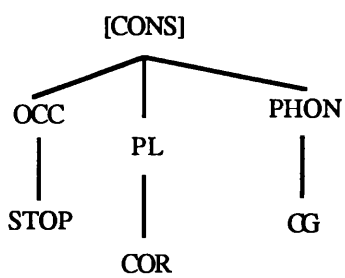
As we can see there is one class node which is missing from all of these underlying representations, namely the PHONATION class node. This is introduced because of the class node requirement and the default specification is assigned. The default specification is CLOSE GLOTTIS and the rule assigning it a complement rule, as was discussed above in section 2.3.2.6.1. The rule is formalized as follows:

(2.33) PHONATION specification complement rule



Following this rule, therefore, the surface representations of the above segments are analogous to the following representation of **d**.

(2.34) Surface representation of **d**



Other matters are self explanatory in the above segments except for the PLACE specifications of the uvular **q** and the glottal stop **'**.

The PLACE node of the uvular stop will be assumed to dominate DORSAL and GUTTURAL (diagram (2.35) later). Arguments for assuming the PLACE specification of **q** to be this way are found when we look at the behaviour of this segment in Somali phonology. When we look at various phonological processes in Somali phonology we see that the uvular may pattern either with the GUTTURAL consonants, that is with the pharyngeals and laryngeals, or it may pattern with the DORSAL consonants **g** and **k**.

An example of the former process is the assimilation of vowels across GUTTURAL consonants, as exemplified below by the suffixation of the infinitive suffix:-i[1]. This process regressively assimilates the vowel of the infinitive suffix across GUTTURAL consonants to the short vowel **a**, as shown in the following examples.

base form	infinitive	
keen	keeni	"bring"
qor	qori	"write"
tag	tagi (also tegi)[2]	"go"
dhal	dhali	"give birth"
rab	rabi	"want, desire"
bax	bixi	"leave"
baq	biqi	"be afraid"
kac	kici	"rise, get up"
da'	di'i	"rain"

1 This is the instance of trans-guttural assimilation referred to above in section 2.3.2.4.

2 This is due to a late process which also affects other monosyllabic verbs ending in a consonant.

We can clearly see from these examples that the uvular patterns with the GUTTURAL consonants, and thus we shall assume that it is specified as such by the feature GUTTURAL.

To show that the uvular patterns with the DORSAL consonants we shall look at another process which suffixes **i** to the base form of the verb, namely the causative/transitivizing suffix: **-i**. We see that, when the causative/transitivizing suffix is added to monosyllabic verbs with the short vowel **a** ending in a guttural consonant other than **q**, the process of vowel assimilation takes place. On the other hand, with all verbs which end in a segment involving the feature DORSAL a process of palatalization occurs.

base form		causative	
kar	"boil"	kari	"cook"
toos	"awake (intr.)"	toosi	"wake up (tr.)"
dhal	"give birth"	dhali	"beget"
ba'	"be destroyed"	bi'i	"destroy (tr.)"
kac	"rise"	kici	"cause to rise"
bax	"leave"	bixi	"make leave"
baq	"be afraid"	baji	"frighten"
daaq	"graze"	daaji	"take to pasture"
engeg	"be dry"	engeji	"dry (tr.)"
joog	"be somewhere"	jooji	"stop(tr.)"

We see, therefore, from this process that the uvular patterns with the stops specified DORSAL, thus we shall assume that **q** also includes the feature DORSAL.

Further arguments in favour of this representation come from the Somali dialect Jiddu, described by Lamberti, in which there are the following correspondences:

Jiddu	Somali	
eskel-	qosol	to laugh (p.19)
ba?al	boqol	hundred (p.20)

Lamberti, M. (1981)

Without going into the details of the historical processes involved it is clear that in this case there is a definite correspondence between the uvular **q** in Somali and both the velar **k** and the glottal stop **?**[1] in Jiddu. This provides us with further evidence that, in Somali at least, the uvular involves both the features DORSAL and GUTTURAL.

Aside from the evidence in Somali, there is evidence in Arabic dialects that the uvular stop is represented in this way. Bateson, M.C. presents this data in the following way:

> all sedentary dialects have voiceless versions of the Classical phoneme noted as /q/: [?] in most cities of Syria and Egypt, [k] for some rural Palestinian dialects, [q] in Iraq and most of North Africa; whereas nomadic dialects have a voiced consonant typically [g]
>
> Bateson, M.C. (1967) p.101

Although the matter of the type of dialects does not concern us, the fact is that the uvular stop in Classical Arabic has the glottal stop and velar stops as reflexes in other Arabic dialects. This is further evidence for the representation of the uvular stop given here.

A matter which we need to address, having made these assumptions, is the status of the GUTTURAL node with the DORSAL active articulator node. We have assumed above that all zone of constriction nodes must co-occur with an active articulator node. However, the

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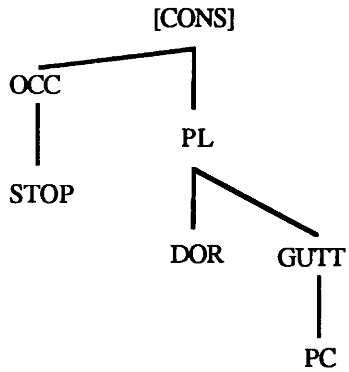
1 Note that we are using this symbol here for Jiddu, since it is the one used by Lamberti, and so as not to confuse it with the Somali '.

active articulator nodes which we have assumed to occur with the GUTTURAL node are LARYNGEAL and PHARYNGEAL CONSTRICTION. If we allow GUTTURAL to be present without either of these active articulator nodes, it jeopardizes the ideas about a zone of constriction needing an active ariculator within the zone. In other words, if we allow GUTTURAL to co-occur with any active articulator, then that opens the door to other such representations. We shall overcome this problem by stating that the GUTTURAL zone of constriction node must co-occur with an active articulator node which functions within its zone but it may co-occur with other features as a compound segment.

This prompts the question which active articulator node dominated by the GUTTURAL node is the one which is present in the representation of **q** in Somali? We can answer this question by looking at the possibilities in a wider context than just Somali.

Taking the two features, LARYNGEAL and PHARYNGEAL CONSTRICTION, we can suggest the types of segments which include these features in their specifications. Pharyngealized consonants may be assumed to include the GUTTURAL node dominating the feature PHARYNGEAL CONSTRICTION. As to the segments with the GUTTURAL node and LARYNGEAL, these might be ejective and implosive consonants. We mentioned above that we are not assuming a class node, such as INITIATION, and equally our PHONATION node is less rich than Sagey's. Ejectives are handled in Sagey's model by the features dominated by her laryngeal node, namely the same features proposed by Halle, M. and Stevens, K.N. (1971). Given our different model, the nodes dominated by GUTTURAL may account for these different segments as we are suggesting. This is, however, a field of investigation beyond the scope of this thesis. We shall assume here that GUTTURAL may co-occur with other PLACE nodes, but that it must also co-occur with one of the active articulator nodes dominated by it. In the case of **q**, this is PHARYNGEAL CONSTRICTION. Thus, the feature geometric representation of **q** underlyingly is:

(2.35) Underlying representation of **q**



Another default rule which is needed is the provision of the active articulator node for the PLACE specification of the glottal stop, which underlyingly only has the zone of constriction node GUTTURAL. The default active articulator which goes with the zone of constriction node GUTTURAL is LARYNGEAL.

It is interesting to note that, within the domain of the zone of constriction feature GUTTURAL, the two active articulator nodes are in a relationship analogous to that of complementary features. Furthermore, we are assuming that one, namely PHARYNGEAL CONSTRICTION, is present in underlying representation whereas the other, LARYNGEAL, is only found following its insertion by default rule, thus fulfilling a further requirement of complementary features in terms of underspecification theory. It may be that the relationship of complementarity, as we have discussed it above, is more widespread within the feature geometric representation than might be thought, given the discussion of the STOP/CONTINUANT and WIDE GLOTTIS/CLOSE GLOTTIS pairs.

Returning to the glottal stop, we see that this is the minimally specified consonant. In order for the glottal stop to surface, therefore, the class node requirement motivates the introduction of the PLACE node and the PLACE node default rule then inserts the default PLACE specification, GUTTURAL, see (2.36a). Since the GUTTURAL is a zone of constriction node, it requires an active articulator which in the default case is LARYNGEAL. These two rules are formalized below.

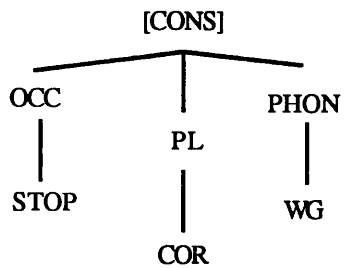
(2.36) GUTTURAL specification complement rule

(a)	(b)
PL	GUTT
⋮	⋮
GUTT	LAR

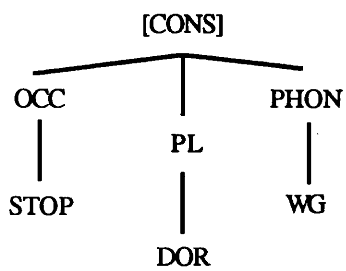
It must be noted that in this we are saying that the feature GUTTURAL is found in underlying representation and, also, is introduced, in the appropriate circumstance, via the default rule in (2.36a). This is not a problem for us. GUTTURAL is not a complementary feature and therefore is not bound by the constraint on complementary features that only one may be found in underlying representation and the other is introduced by a complemement rule.

We shall now return to the consonant specifications with the specifications of the WIDE GLOTTIS consonants.

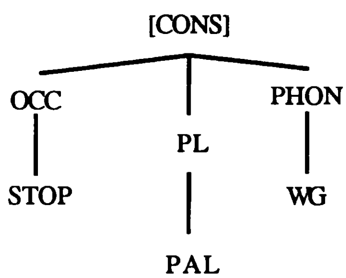
(2.37) Underlying representation of t



(2.38) Underlying representation of k



(2.39) Underlying representation of j

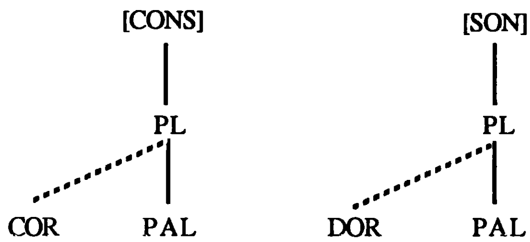


These three consonants are, judging by their phonological behaviour, the three most marked consonants in Somali. This is reflected in the representations of the consonants by the fact that they are specified for all the class nodes. Two features must be added to the representation of the palatal stop to give the correct surface representation. The first is the active articulator feature which needs to be specified with the PALATAL zone of constriction feature.

We have discussed this matter in detail above and shall assume that the DORSAL node is introduced into the representation by a default rule, motivated by the requirement for an active articulator node, along the following lines:

(2.40) Default rules of CORONAL and DORSAL introduction in PALATAL consonants and vowels respectively

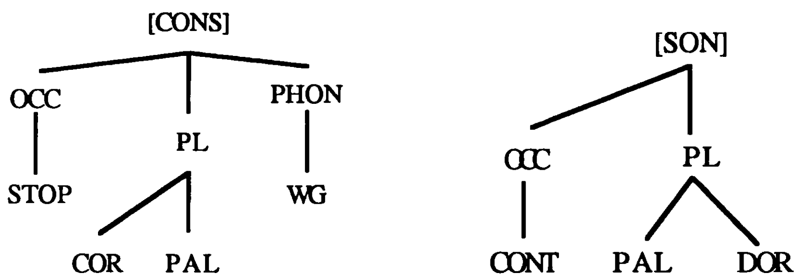
(a) (b)



Following the application of these rules the following representations result:

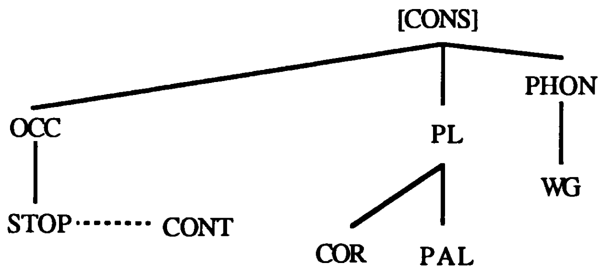
(2.41) Representations of j and i following application of the CORONAL and DORSAL introduction rules in (2.40)

j i



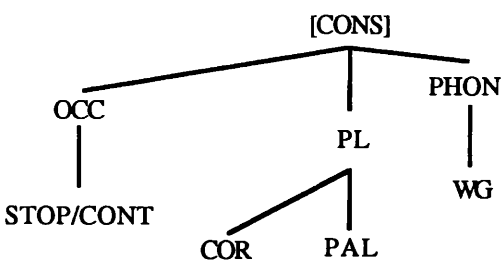
The second default rule which needs to be formalized for this segment is the rule which changes what is underlyingly a stop into a surface affricate. The precise reasons why this process should take place are unclear. Thus, there is no principle which may be referred to as motivating this rule. However, the evidence in favour of assuming the segment to be a stop underlyingly in Somali is very strong. The rule will be formalized as follows:

(2.42) <u>Default rule of palatal affrication</u>



The formalization of this rule shows the CONTINUANT feature node being associated with the STOP feature node or, more precisely, with the tier on which the STOP node is present. The representation then surfaces automatically as the pair of complementary features. It is important to note that in this rule the direction of association is part of the rule formalism, allowing for the final representation to surface as an affricate with the surface representation given below:

(2.43) <u>Surface representation of j</u>[1]



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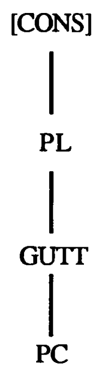
1 The precise phonetic implementation of this sound may also involve some ordering of the CORONAL and PALATAL implementations. This, however, is regarded very much as a phonetic effect of the phonological representation of the ordered pair of complementary features STOP and CONTINUANT. This matter will not be discussed further here.

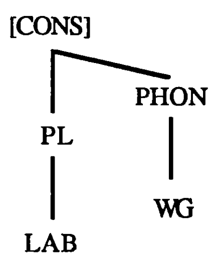
A further point to make with regard to this rule is that it is most likely a late level rule since it seems to be more a rule of phonetic implementation. We shall therefore assume the rule to apply in the post-lexical component.

2.4.1.2. <u>The fricatives</u>

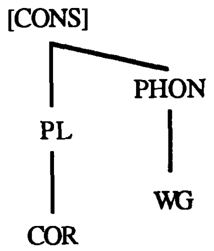
(2.44) <u>Underlying representation of c</u>



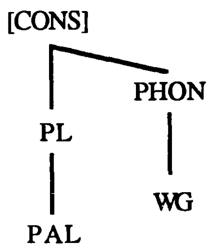
(2.45) <u>Underlying representation of f</u>



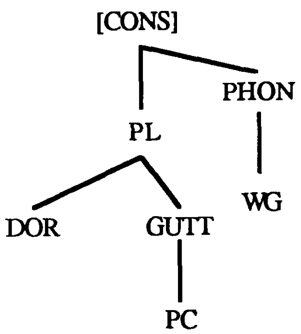
(2.46) Underlying representation of s



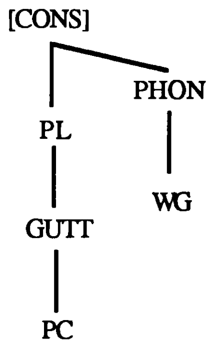
(2.47) Underlying representation of s h



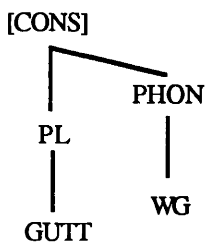
(2.48) Underlying representation of k h



(2.49) Underlying representation of x



(2.50) Underlying representation of h



As we see above, the only fricative which does not surface with the phonation feature WIDE GLOTTIS is the pharyngeal fricative c. Thus, this is the only fricative which does not have the class node PHONATION in underlying representation. As we mentioned above, it might be thought that, in the case of fricatives, the PHONATION feature WIDE GLOTTIS is unmarked and that this should rightly be the feature which is missing in underlying representations, with the feature CLOSE GLOTTIS introduced via a default rule ordered after the introduction of the node CONTINUANT. Such an account is, however, contrary to the theory of underspecification. If the feature WIDE GLOTTIS were to be absent, the feature CLOSE GLOTTIS would then necessarily have to be present in underlying representation in order to distinguish between the two pharyngeal fricatives. This, as we have seen, is impossible for complementary features of which only one may be present in any underlying representation, the other being introduced by complement rule.

Thus, as far as fricatives are concerned, two redundancy rules which are needed are the PHONATION specification complement rule which introduces the CLOSE GLOTTIS feature node (this is formalized in (2.33)) and the OCCLUSION specification complement rule which introduces the feature node CONTINUANT. This is formalized below:

(2.51) <u>OCCLUSION specification complement rule</u>

OCC
⋮
CONT

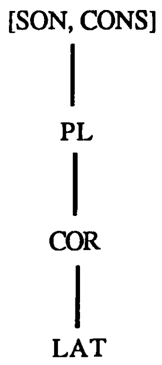
Again, this rule is motivated by the class node requirement as well as underspecification theory. The class node is introduced and needs to be fully specified, hence the complement rule.

Two of the fricatives also undergo default rules for PLACE specifications: **sh** is only specified underlyingly as PALATAL which as a zone of constriction feature must co-occur with an active articulator feature, which in this case is CORONAL given that the root node specification in CONSONANTAL. Thus, this undergoes the PALATAL CORONAL introduction default rule formalized above (2.40a). The other fricative is the laryngeal fricative which is specified underlyingly only by the zone of constriction feature GUTTURAL. It therefore undergoes the GUTTURAL specification complement rule introducing the active articulator node LARYNGEAL formalized above in (2.36b).

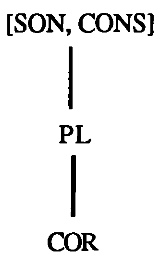
Note that the PLACE specification of the uvular fricative, **kh**, is the same as that for the uvular stop, **q**. This is assumed on the basis of analogy.

2.4.1.3. The consonants specified [SONORANT, CONSONANTAL]

(2.52) Underlying representation of l

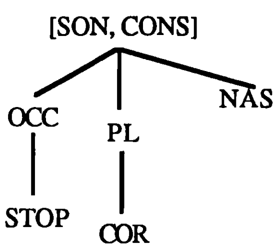


(2.53) Underlying representation of r

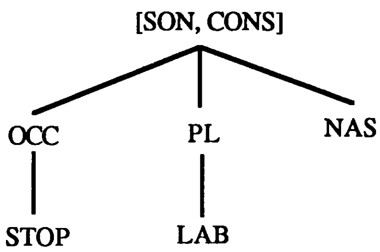


In both of these segments the complement rules for the PHONATION and the OCCLUSION specification take place. Both of these have been formalized above in (2.33) and (2.51) respectively.

(2.54) Underlying representation of n



(2.55) <u>Underlying representation of m</u>



For the nasals the PHONATION specification complement rule in (2.33) introduces the CLOSE GLOTTIS specification.

2.4.2. <u>The vowels</u>

One of the most important aspects of the model of phonological representation we are assuming here is that both consonants and vowels share the same features. As we have seen above in the discussion on the root node features, vowels are specified by the feature SONORANT. The only other features which are present in underlying representation in vowels are the PLACE features. Thus, before any vowel may surface it must undergo the PHONATION and OCCLUSION complement rules given above in (2.33) and (2.51). It is to be noted that, given the model of representation we are assuming here, the minimally specified segment in Somali is the vowel **a** which, underlyingly, is simply [SON].

We shall give the underlying representations for vowels and then discuss the PLACE specifications in more detail.

(2.56) <u>Underlying representation of a</u>

[SON]

(2.57) <u>Underlying representation of i</u>

```
[SON]
  |
  PL
  |
 PAL
```

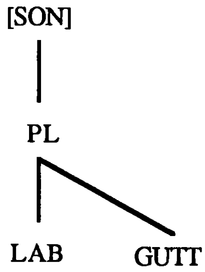
(2.58) <u>Underlying representation of e</u>

```
      [SON]
        |
        PL
      /    \
  PAL      GUTT
```

(2.59) <u>Underlying representation of u</u>

```
[SON]
  |
  PL
  |
 LAB
```

(2.60) Underlying representation of o



Let us take firstly the representation of the vowel **a**. This is the minimally specified vowel, as the glottal stop is the minimally specified consonant. Note that this is the case in Somali and this is not to suggest that these particular segments are the minimally specified segments in all languages.

Let us now look a little closer at the representations of vowels. The reasoning behind assuming the same features for both consonants and vowels is to allow for a more economical model and to account more readily for processes between consonants and vowels. There are, however, differences between consonants and vowels. These are manifested in the influence they have on the building of prosodic structure as we shall see in the next chapter, as well as in their general phonetic properties. In our model this difference is reflected in the difference in ROOT node specification described in the section above.

However, given the major difference between vowels and consonants, there may be further differences. One such possible difference has to do with the role of the active articulator in a representation. We assumed above that an active articulator node must be present with both a zone of articulation node and a configuration node. When we come to look at this requirement in terms of vowels there seem to be some problems. Let us take a basic definition of vowels as a starting point. Crystal, D. (1985) defines vowels in the following way:

> Vowels can be defined in terms of both PHONETICS and PHONOLOGY. Phonetically, they are sounds articulated without a complete CLOSURE in the mouth or a degree of narrowing which would produce audible FRICTION; the air escapes evenly over the centre of the TONGUE.
>
> ...
>
> From a phonological point of view, vowels are those units which function at the CENTRE of syllables.
>
> Crystal, D. (1985) p.330

Looking elsewhere we find definitions which are similar. Sommerstein, A.H. (1977), for example, provides a definition which incorporates the definitions of Jones, D. (1960) and Hockett, C.F. (1955):

> a vowel is any phoneme such that
>
> *all* of its allophones are so produced that 'the air issues in a continuous stream through the pharynx and mouth, there being no obstruction and no narrowing such as would cause audible friction' (Jones); and in addition it is *capable* of occurring as the nucleus of a syllable peak, though it may (or may not) also occur in other positions (Hockett).
>
> Sommerstein, A.H. (1977) p.26

In phonetic terms what occurs in both definitions is the lack of constriction in the vocal tract. We have assumed, following Sagey, that the active articulators, when present in a phonological representation, imply the distinctive presence of that articulator in a segment's specification. However, in vowels, although the active articulators play a role it is less emphasized. The articulation of a vowel is not, as we can see in the definitions, the formation of a specific constriction but more the formation of a particular shape of the vocal tract. This shape determines the shape of the "resonator" which determines the acoustic properties of the vowel sound produced. This is consistent with the definition of the feature SONORANT we have proposed above in section 2.3.2.3.

In our model we shall reflect this difference by stating that in vowels the presence of an active articulator node is not necessary. Thus, we shall assume that a zone of constriction feature may be adequate place specification for a vowel. Thus we specify the Somali vowels as above using the features LABIAL, PALATAL and GUTTURAL.

It might be said that this way of representing the place specification of vowels is no less explanatory than using the features [±high], [±low] and [±back]. However, firstly, these are binary features which we are not utilizing here. Thus, we need to assume a set of unary features. Furthermore, the features assumed here adequate in terms of Somali. Discussion of the universal implications of these assumptions will be left to further work should the approach prove successful in explaining aspects of the behaviour of Somali phonology.

2.4.2.1. Fronting

In section 2.2.2. we mentioned the matter of the fronting in Somali vowels. Although this is undoubtedly important, the behaviour of the fronted quality is very much along the lines of the quality being autosegmentalized. This shall be assumed to be the case here and we shall not include whatever autosegment is required in the vowel representation. This will not have any detrimental effect on the arguments proposed in this thesis, and it is hoped that further work may be eventually undertaken to investigate the fronting phenomenon in more detail.

2.5. Conclusion

This then concludes our discussion of the model of segmental representation of Somali. We have proposed a model which is a set of unary features and class nodes arranged within a feature geometric framework. We have stated how the various features and class nodes relate to each other and have thereby produced a more restrictive model than those proposed by Clements, Sagey and McCarthy. The particular relations are the complementarity of the complementary features, WIDE GLOTTIS, CLOSE GLOTTIS, STOP and CONTINUANT; and the co-occurrence restrictions between the different types of features dominated by the PLACE node. We have shown how this model is adequate for Somali and shall show this further in the following chapters particularly chapter 4.

Chapter 3. The prosodic structure of Somali.

3.1. Introduction to prosodic structure

In the previous chapter we looked in detail at the model of feature geometric representation which we are assuming for Somali. The feature geometric representation, however, is only part of the overall model of phonological representation of any language. The melodic representations need to be organized into strings. A model of prosodic organization is a way of organizing these melodic representations into strings in a principled and meaningful manner. The type of organization of prosodic structure which will be discussed here in relation to Somali is that referred to as weight-unit or moraic phonology. Here, the term moraic phonology will be used. The essential aspect of this approach is that it is not the number of segments which are counted prosodically, as in a theory based on a segmental timing slot tier or CV tier, but the number of weight units or moras.

In the following discussion, the term segment will be defined as a root node, all those nodes dominated by that root node and the set of relations holding between all of those nodes. In other words, a feature geometric melodic representation as discussed in the previous chapter. It does not imply an entity which may be counted[1].

In SPE type generative phonological theory segments were simply arranged in a linear string. The only attempt to organize them into larger units was through the use of boundaries. These boundaries

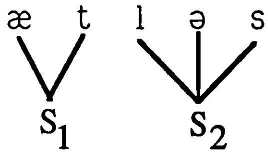
---

1 When we occasionally specifically refer to a model of representation involving a timing slot tier, however, the term segment will refer to an entity which may be counted. The meaning of the term should be clear each time it is used.

consisted of distinctive features, in the same way as segments, the features being [±segment] (this feature distinguished the boundaries from segments), [±formative boundary] and [±word boundary] (for more details see Chomsky, N. and Halle, M. (1968) pp.364-371). Furthermore, in phonological rules it was not the segment strings defined by the boundaries which were important, but the boundaries themselves (see Chomsky, N. and Halle, M. (1968) pp.238-241 for examples of rules involving these boundaries). A further important fact concerning prosodic matters in the SPE theory is that it did not accept the syllable as a phonological entity. No syllable boundary was posited and the only concession to the existence of the syllable as a unit was in the adoption of the major class feature [±syllabic] "which would characterize all segments constituting a syllabic peak" (Chomsky, N. and Halle, M. (1968) p.354).

This lack of syllable in SPE was soon regarded as a failing in the theory and one of the first works to introduce the syllable into generative phonological theory was Kahn's "Syllable-based generalizations in English phonology" (Kahn, D. (1976)). His view of the syllable was basically flat in so far as it did not consist of any internal constituents. As Selkirk, E. (1982) p.355 points out, "Kahn conceives of his as an "autosegmental" theory of the syllable which is quite analogous to the "autosegmental" theory of tone elaborated by Goldsmith (1976) and others". This flat structure is shown in diagram (3.1) taken from Kahn, D. (1976) p.36:

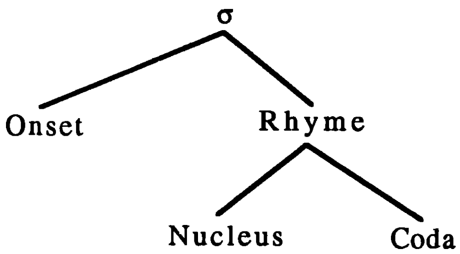
(3.1) Kahn's flat syllable structure



Where S stands for syllable
Kahn, D. (1976) p.36

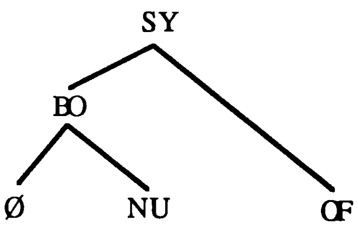
Following on from Kahn's work, the syllable was generally accepted as part of generative phonological theory. Furthermore, although the details differed amongst authors, it was accepted by many that the syllable was not the flat entity assumed by Kahn. Rather, it had a hierarchical constituent structure. One argument which has generally been put forward in favour of this view (see, for example, Selkirk, E. (1982)) is that co-occurrence restrictions on segments are often found to hold between members of constituents internal to the syllable; for example, between pre-nuclear consonants (forming the onset) and between the post-nuclear consonants (the coda) but not, for example, between the onset and the nucleus. This argument also holds for the other often cited constituent, the rhyme, for which it has been claimed "co-occurrence restrictions between peak and coda are always more likely to exist (and indeed are quite common) than are restrictions between either peak or coda and the onset." (Selkirk, E. (1982) p.339 commenting on Kuriłowicz, J. (1948)). Such assumptions have resulted in the following type of syllable structure:

(3.2) Hierarchical syllable structure



According to Vennemann, T. (1988), however, this structure is essentially arbitrary. In his work Vennemann cites evidence for further syllabic constituents including, for example (from Davis, S. (1982)), the body, made up of onset and nucleus. The argument for the constituent, the body, is that stress assignment in Aranda (Central Australia) is dependent on the presence or absence of an onset, thus providing evidence for the body of the syllable formed of the onset and nucleus and providing a structure of the type in (3.3) which he labels a naked syllable.

(3.3) Diagram of Vennemann's naked syllable



Where	SY: syllable	NU: nucleus
	BO: body	OF: offset

Vennemann, T. (1988) p.265

In his article Vennemann concludes that, instead of assuming one particular syllable structure to be the universal model, what is needed is "a more general theory of phonological structure, one which permits the definition of all the sorts of syllabic structure considered above not as arbitrary groupings but on the basis of phonological properties that characterize the grouped constituents as intrinsically different" (Vennemann, T. (1988) p.273). Ideas based on what he terms phonological cohesion are then outlined.

The matter of stress assignment being dependent on the presence or absence of a syllable onset has important implications for moraic phonology which implies, as we shall see, that onsets play absolutely no such role in such matters. We shall show, however, that moras are more explanatory than other units of prosodic organization for Somali and thus shall leave the discussion of the implications of onset influenced stress assignment to further work.

Vennemann's work constitutes one development of the approach to syllable structure within generative phonology and has been mentioned here to exemplify such development. To mention all such developments is beyond the scope of this thesis and we shall only discuss the development of direct relevance to the discussion in hand; that is, the development which, following Hayes, B. (1989), we shall term moraic phonology. The works upon which arguments here will be based are Hyman, L. (1985) and Hayes, B. (1989). McCarthy, J.J. and Prince, A.S. (1986) will later become important in discussions on reduplication.

3.2. Introduction to moraic phonology

One of the prime motivations for the moraic view of phonological prosodic structure is the heavy versus light syllable distinction found in some languages. It is a well-known fact that among those languages which recognize the heavy versus light distinction there are two types. Firstly, there are those in which syllables of the pattern CVC are considered light, only the CVV type syllable being considered heavy. Secondly, there are those in which such CVC syllables are considered heavy along with the CVV type syllable. The two groups are shown in the following table:

(3.4) <u>The two types of languages with a heavy versus light syllable distinction</u>

	group A languages	group B languages
light:	CV,CVC	CV
heavy:	CVV	CVV,CVC

Examples of the group A type include Huasteco and Khalka Mongolian (see Hyman, L. (1985) p.6 for references to these languages). Languages of the group B type include Latin and most dialects of Arabic. For further discussion on the heavy versus light syllable distinction see Newman, P. (1972). In a prosodic theory based on a timing slot tier and a hierarchical syllable structure, such as that which is exemplified in (3.2), this syllable weight distinction needs to be stated in terms such as projections of branching rhyme nodes. Such an approach involves various complications. For example, there seems to be no principled way in which the onset of a syllable is said *not* to contribute weight to the syllable other than if we assume some type of constraint saying that the rhyme, and the rhyme only, determines syllable weight. This, though, is an arbitrary statement. What is it about the rhyme which gives it this property? We shall see that this matter is handled in a principled way in moraic phonology, details being given when we discuss individual prosodic aspects of Somali phonology. The ideas of Hyman and Hayes will now be set out and the main points compared. Further comparison will also be made when looking at the details of Somali prosodic structure and syllabification.

3.2.1. Hyman, L. (1985)

In his work, *A Theory of Phonological Weight*, Hyman, L. (1985) proposes a theory of prosodic organization which handles the matter of syllable weight in a simple and explanatory manner. His theory hinges on a tier of weight units. Each segment is associated with one weight unit in underlying representation. Weight units are then deleted by two major rules: onset creation (a universal rule) and margin creation (language specific). Thus, for the Somali word **tag**, "go", the underlying representation in his model would be:

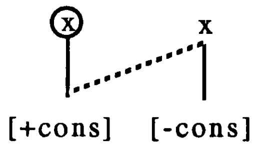
(3.5) Underlying representation of **tag**

$$\begin{array}{ccc} x & x & x \\ | & | & | \\ t & a & g \end{array}$$

In the diagram the 'x's are the weight units and the tier upon which the weight units rest is known as the weight unit tier. Although these weight units resemble, diagramatically, segmental timing slots in underlying representation, they must not be confused with such entities. Since Hyman uses these symbols they will be used in this discussion of his work. Later, however, following Hayes and Pillinger, S. (1989), the symbol μ (for mora) will be used for these weight units.

The onset creation rule applies universally at level I in the lexicon, application at later levels being language specific (see Hyman, L. (1985) p.16). This universal rule explains why onsets never contribute to syllable weight in any language. Hyman's formulation of this rule is:

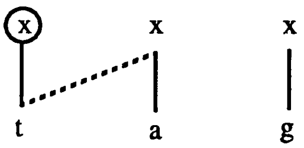
(3.6) <u>Hyman's onset creation rule</u>



Hyman, L. (1985) p.15

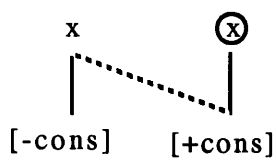
The small circle surrounding the first weight unit indicates its deletion. The representation of **tag** in (3.5) will therefore undergo the onset creation rule resulting in the representation given in (3.7).

(3.7) <u>tag having undergone the onset creation rule</u>



The margin creation rule is the rule which accounts for the different types of languages mentioned in (3.4). It is formulated as follows by Hyman:

(3.8) <u>Hyman's margin creation rule</u>



Hyman, L. (1985) p.18

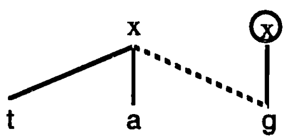
With respect to the languages of type A in (3.4) the margin creation rule applies, deleting the weight unit of [+consonantal] segments following [-consonantal] segments. In languages of type B, on the other hand, the margin creation rule does not apply; thus

[+consonantal] segments following [-consonantal] segments in such languages retain their weight unit. Thus, as we can see, the weight of a syllable is simply a function of the number of weight units a particular syllable node dominates at any particular stage in the phonological derivation of a string[1], the number of weight units being determined by the application of the onset creation rule and the margin creation rule.

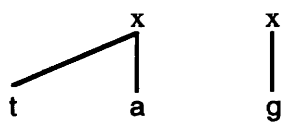
Referring back to the example of the word **tag**, the two logical possibilities are exemplified in (3.9). In the representations in this diagram the onset creation rule has already applied:

(3.9) <u>The two derivational possibilities for **tag**</u>

(a)



(b)



In the diagram in (3.9a) the margin creation rule has applied and the weight unit been deleted. In (3.9b), on the other hand, the margin creation rule has not applied and the weight unit associated with the segment **g** remains.

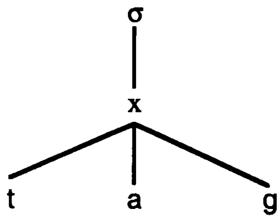
As to syllables, Hyman states that syllables are not universal. There are languages in which they are not necessary. The example he discusses in detail is Gokana. When syllables are required, however, it is the weight tier which provides the basis for the construction of syllables. Introducing a syllable tier to the representations given in (3.9) above results in the following:

---

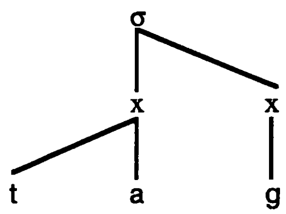
1 Details of the projection of syllable nodes is given below.

(3.10) Introduction of the syllable tier for **tag**

(a)



(b)



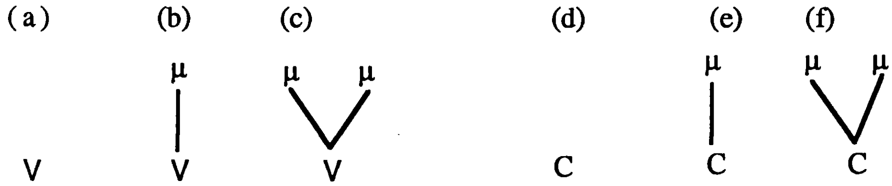
The representation in (3.10a) shows a light syllable whereas the representation in (3.10b) shows a heavy syllable. As may be seen, the weight of a syllable depends directly on the number of weight units it dominates. It can also be noted here that there are no intermediate units between syllable node and mora node. The matter of levels of prosodic organization higher than the syllable will not be dealt with here.

This outline is not an exhaustive account of Hyman's theory. Further issues will be discussed in more detail as they become relevant in the discussion on Somali.

3.2.2. Hayes, B. (1989)

In this work Hayes proposes a theory of prosodic organization which in essence is very similar to Hyman's but in certain details differs significantly. The fundamental notion remains that melodic segments are associated with weight units, although Hayes does not use this term, referring instead to moras. The underlying representation of strings is different in Hayes' model. Whereas Hyman proposes the pre-association of a weight unit with each melodic segment in underlying representation, Hayes proposes a system of representation which involves the following types of representation for vowels and consonants:

(3.11) <u>Hayes' underlying representations</u>



See Hayes, B. (1989) pp.256-257.

Here C stands, informally, for a consonantal melody and V, informally, for a vocalic melody.

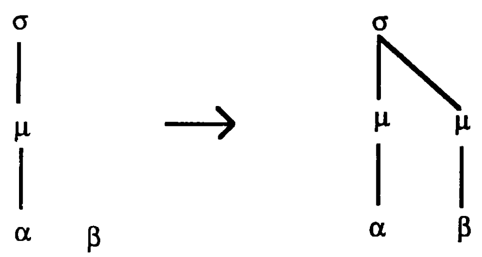
For both vowels and consonants there are three possible underlying prosodic representations. Taking the vowels, the representation under A is that of an underlying glide, that under B is a short vowel and that under C is a long vowel. As to the consonants, the representation under D is a single consonant, that under E is a geminate consonant whereas that under F is a long syllabic consonant. This final type of consonant is rare but assumed to exist in Kimatuumbi and Gokana (see Hayes, B. (1989) p.257). Hayes' main argument for proposing these representations is that only distinctive information is present in underlying representation and that "segments receive the same number of moras underlyingly that, in the absence of additional rules, they will bear on the surface" (Hayes, B. (1989) p.256).

One fundamental difference in Hayes' theory, when compared with Hyman's theory, is that there is a specific syllabification algorithm which organizes all underlying strings of segments in all languages; that is to say, syllabification is universal. This, in turn, implies the theoretically necessary existence of syllables, something which Hyman's theory does not do. The process of syllabification is given by Hayes as follows:

> (a) selection of certain sonorous moraic segments, on a language-specific basis, for domination by a syllable node; (b) adjunction of onset consonants to the syllable node, and of coda consonants to the preceding mora. Adjunction is subject to language-specific conditions on syllable well-formedness and the division of intervocalic clusters.
>
> Hayes, B. (1989) p.257

This algorithm of syllabification, as it stands, results in CVC syllables being light. In order for CVC syllables to be heavy, those languages which involve such syllables are assumed to have a rule termed a 'weight-by-position' rule. This is formalized by Hayes as follows:

(3.12) <u>Hayes' weight-by-position rule</u>



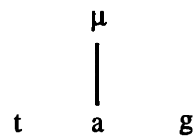
where σ dominates only μ

Hayes, B. (1989) p.258.

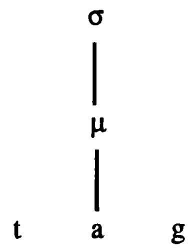
Thus, the two possible results of Hayes' syllabification process on the example word **tag** would be as follows:

(3.13) The two possible syllabifications of tag in Hayes' theory

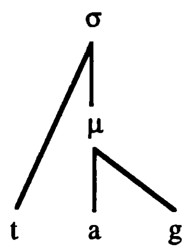
UR:



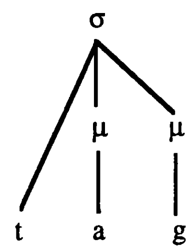
part (a) of syllabification process:



part (b) of syllabification process:



part (b) of syllabification process with weight by position rule:



3.2.3. Major differences between the theories of Hyman and Hayes

We shall now consider, briefly, some of the main differences between the theories of Hyman and Hayes. These differences and others will be taken up in the discussion involving Somali where arguments in favour of one analysis or another will be proposed.

The first main difference is the matter of underlying representations. In Hyman's theory all melodies are pre-associated with weight units whereas in Hayes' theory they are not. One interesting matter which arises from this is the implication it holds for which is the marked case in terms of syllable weight. In Hyman's theory the language specific rule which accounts for the difference between heavy and light syllables deletes a weight unit (the margin creation rule). In Hayes' theory, on the other hand, the language specific rule adds a mora (the equivalent of a weight unit in Hyman's theory) through the weight by position rule. In other words, an underlying representation of a monosyllabic word of the pattern CVC which undergoes only universal rules will result in a heavy syllable in Hyman's theory and a light syllable in Hayes' theory. This can be regarded as implying that, in those languages in which vowel length is phonologically significant, Hyman's theory regards heavy CVC syllables as unmarked whereas Hayes' theory regards light CVC syllables as unmarked.

A further major difference already hinted at above is the fact that Hayes' theory implies the existence of syllables universally. This contrasts with Hyman's arguments for assuming that not all languages necessarily involve syllables. The arguments he provides are based on data from the language Gokana (see Hyman, L. (1985) pp.19-32) and seem convincing as far as that language is concerned. Despite the fact that there is a significant difference in the theories in this respect, we shall not discuss this difference here as it does not have any significance for Somali which, as we shall show, does require syllables as part of its system of prosodic organization.

There is also a third difference in terms of the linking of the onsets of syllables. In Hyman's model onsets are associated with a mora node which dominates a vocalic segment. This is the direct result of the onset creation rule given above in (3.6). In Hayes' model, on the other hand, the onset of a syllable is associated directly with the syllable node. This is also a direct result of the syllabification algorithm he proposes. We shall not discuss this difference here since a much lengthier discussion would be needed in order to ascertain which of the two positions is the most adequate. The position we shall adopt for Somali will be made clear later.

3.3. The prosodic organization of Somali

This section deals with the prosodic aspects of the phonology of Somali. The general matters which need to be discussed here are:

-the reasons for favouring a mora based prosodic structure for Somali;

-the nature of underlying prosodic representations in Somali;

-the reasons for assuming that Somali phonology involves syllables;

-the nature of the syllabification process in Somali;

-whether or not CVC type syllables are heavy or light.

The ideas of Hyman, L. (1985) and Hayes, B. (1988) will, as we have mentioned above, form the basis of the discussion. They will be compared and the most explanatorily adequate approach assumed for Somali. Various Somali phonological phenomena will figure in the discussion, including tonal accent assignment, the scansion of Somali poetry, the nature and behaviour of semivowels and diphthongs, reduplication, vowel deletion and prosodic restrictions on WIDE GLOTTIS specified plosives.

3.3.1. Moras as the basis of prosodic organization in Somali

In this section we shall look at the tonal accent system in Somali and also the scansion system of Somali poetry, showing how they provide arguments in favour of the assumption of moras as the basis of prosodic organization in Somali.

3.3.1.1. The tonal accent system in Somali

Although the tonal accent system of Somali is not of primary concern in this thesis, it does provide some important arguments in favour of assuming a moraic prosodic system in the language.

The description and explanation of the suprasegmental aspects of Somali has had a chequered history, especially prior to Armstrong's work on Somali phonetics (Armstrong, L.E. (1934)). In Armstrong's work, the nature of the suprasegmental system of Somali was beginning to be understood. Subsequent work by others (see especially Andrzejewski, B.W. (1956)) continued to provide more insight into the workings of the suprasegmental aspects of the language's phonology and the way this interacted with the morphology and syntax. It was the work of Hyman (Hyman, L. (1981) and (1981a)), however, which revealed the fundamental nature of the Somali system as a tonal accent system.

Hyman demonstrated that neither tone nor accent is marked underlyingly for most forms. Accent is assigned via morphological rewrite rules which assign the feature [+accent], represented in his work by an asterisk, "*", to the appropriate vowel. Following accent assignment there are a number of accent shift and accent deletion rules. These are, in turn, followed by the process of pitch assignment to accented and unaccented vowels. Hyman assigns the pitch level 1 (highest pitch level) to accented vowels and the pitch level 2 to unaccented vowels. These unaccented vowels are marked by the diacritic, ° ,which represents the feature [-accent] (see Hyman, L. (1981) p.177). Although it is not explicitly stated, the implicit assumption in Hyman's argument is that all vowels must be specified for the feature [±accent]. Following the accent shift and deletion rules, all vowels which remain without a specification for [±accent] are assigned the feature value [-accent] by default.

As far as the accent bearing units are concerned, Hyman does not go into any detail as to what these units are specifically. In his rule formalisms accent asterixes are assigned to "V"s, representing vowel units; that is to say, a single vowel is represented as V whereas a long vowel is represented as VV, (see the example given in (3.14)).

(3.14) <u>Example of accent asterix assignment in Hyman's model</u>

$$\circ \; \text{->} \; * \, / \, \bar{V} \, C_0 \, (V(C))_{\#} \,]_{\left\{ \begin{matrix} D1 \; m. \\ D2 \end{matrix} \right\}}$$

Hyman, L. (1981) p.181

D1 and D2 are labels for declensions

From the rule formalism in (3.14) we see that all vowels are underlyingly marked [-accent], this initial value being altered to [+accent] by the accent assignment rules.

Given the assumptions of underspecification theory which are now widely accepted in generative phonology, this aspect of Hyman's account can be restated in a different manner. One might assume that in predictable cases no underlying value for the [±accent] feature would be given. The accent assignment rules would then assign the feature value [+accent] while all vowels remaining which lacked the positive value for that feature, [+accent], would gain the feature value [-accent] via a default rule[1]. Hyman's rule given in (3.14) states that [+accent] is assigned to the penultimate vowel or the only vowel in masculine nouns of his declension D1 (such as the examples in (3.15) below) and all nouns in his declension D2. Despite this use of vowels in the rules, he does also mention moras as accent bearing units. One instance is in relation to the difference between accent assignment in a language such as English and that in a language such as Somali. "Accent in Somali is clearly a property of the vowel (or mora), while it is a property of syllables in English" (Hyman, L. (1981) p.177).

---

1 This default rule would necessarily be a complement rule, since the only value which is allowed underlyingly would be [+accent]. Although in the majority of cases accent is predictable, there are a number of words in which accent is not predictable. For example, the focus marker **báa** always has the accent assigned to the penultimate mora.

Others have indicated their assumption that it is the mora which is the accent bearing unit in Somali. Biber, D. (n.d.), for example, writing on Central Somali, states that "the accent assignment rules count moras rather than syllables" (Biber, D. (n.d.) p.1). Banti, G. (1988a) also mentions "that the units that bear tones in Somali are not the syllables but rather the moras" (Banti, G. (1988a), p.13). Linguists working on other Cushitic languages have also pointed out the importance of moras in their prosodic organization; for example, Hudson, R.A. (1973), working on Beja and, more recently, Pillinger, S. (1990) on Rendille, a language very closely related to Somali.

This point of accent assignment being to the mora can clearly be demonstrated by the following set of masculine nouns where the tonal accent is represented by an acute accent. The words here are written in the Somali script in which long vowels, comprising two moras, are written as digraphs. Note that, when tonal accent is assigned, only vowels are associated with moras. We shall return to this matter later. Accent is marked by an orthographic acute accent over the relevant mora's associated vowel melody.

(3.15) <u>Examples of masculine nouns showing accent assignment to the penultimate mora</u>

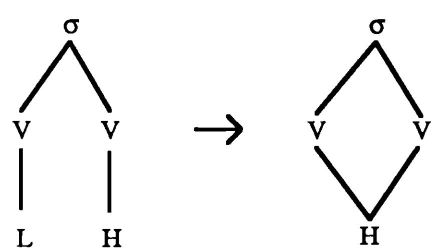
[']éy[1]	"dog"
túug	"thief"
ínan	"boy"
libáax	"lion"

The phonetic realization of the tonal accent requires mentioning here. The primary realization is high tone accompanied by a certain amount of stress. On a single vowel the realization of tone is steady.

1 Note the glottal stop at the beginning of this word is on the surface only.

On long vowels, however, the realization of tone involves the formation of phonetic contour tones. This results from the fact that these long vowels are made up of two moras. If the tonal accent falls on the first mora, then that part of the long vowel is realized at a higher pitch than the following mora, resulting in a falling tone realization. Equally, if the tonal accent falls on the second mora, that part of the long vowel is realized at a pitch higher than the first part, resulting in a slightly rising realization. In this latter case, however, the difference in pitch is not as great and the long vowel may sometimes be realized at a steady pitch. Note that Banti, G. (1988a) attributes this latter realization to the following rule of "rising tone simplification". Note in this diagram H stands for high tone and L for low tone.

(3.16) Banti's rule of rising tone simplification



Banti, G. (1988a) p.13

Thus, in the case of the minimal pair, **béer** "liver" and **beér** "garden"[1], the phonetic realization of these is as shown in the following diagram by the line drawn above the word.

---

1 Note that the difference in the accent assignment in these two words is not lexical but is the result of the gender of the two nouns. **Béer**, meaning "liver", is masculine and **beér**, meaning "garden", is feminine. Compare the masculine noun with the examples in the list (3.15) above.

(3.17) <u>The phonetic realization of **béer** and **beér**</u>

beer   beer or beer

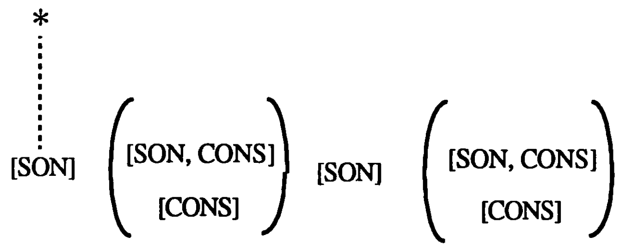
In the list of masculine nouns in (3.15) the generalization may be stated that the accent is present on the penultimate mora, something which needs to be accounted for by rule. Since we are assuming that the mora is the accent bearing unit, the rule must therefore associate the accent with the entities on the mora tier - the moras themselves. Thus, in terms of tonal accent assignment moras provide the most explanatory account.

We shall briefly look here at the inadequacies of accent assignment couched within a model involving a segmental timing slot tier, thereby showing that the mora tier is the only reasonable possibility in the case of Somali.

One possibility might be that the vowel melody is the entity which is accent bearing and rules may be formulated on that basis. However, this would be to assume that accent is assigned to the melodic tier; that is to say, in the case of these nouns, the tonal accent is assigned to the penultimate vocalic root node, ie. the penultimate in the set of root nodes specified SONORANT and SONORANT only, without any reference to any other tier of representation. Such an approach faces problems in an autosegmental analysis.

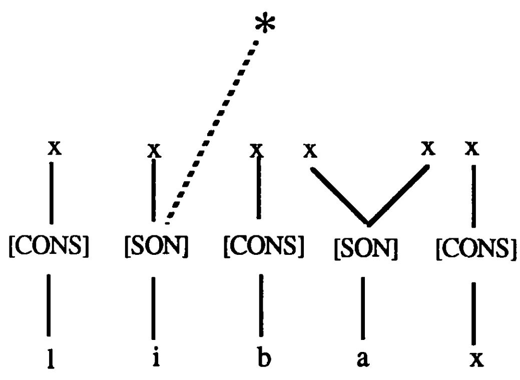
Let us assume the rule to be formulated as in (3.18) which states that in nouns of the group to which the examples in (3.15) belong the accent is assigned to the penultimate root node, specified in our model as SONORANT and SONORANT only. A further root node, *not* specified SONORANT and SONORANT only, may be present between the two SONORANT root nodes and one may be present at the end of the word.

(3.18) A formalism for accent assignment to the root node of vowel melodies[1]



In cases where an intermediate root node does exist and in cases of diphthongs, the accent will be assigned correctly. In the case of long vowels, however, accent will not be assigned correctly, since on the melodic tier there is only one root node associated with two timing slot nodes. Thus, the rule would make a false prediction as exemplified in (3.19) which shows the accent being incorrectly assigned to the noun **libaax**, "lion".

(3.19) Incorrect accent assignment to **libaax**



In this example we see the accent would be assigned to the vowel **i** in the word when it actually occurs on the initial part of the long **aa**.

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1 The parentheses in the rule formalism here indicate optionality; that is to say, a segment with either of the given ROOT nodes may be present or there may be no such segment present.

In order for a correct assignment to be made in this example, we must make a reference to the segmental timing slot tier. This, in addition to the existing formalism, is undesirable as it would involve a complicated statement such as: if the final [SON] melodic root node is associated with two timing slots, the accent is assigned to the leftmost of these.

A further important point with regard to this is that all the objections to this particular approach may equally be made of a rule involving mora nodes. This is because, in both models, the segments specified for SONORANT are associated with the higher prosodic tier nodes, long vowels being represented by a melodic node associated with two higher prosodic nodes (moraic nodes or segmental timing slot nodes). This, then, rules out this possibility in both a segmental timing slot and a mora based account.

Taking a look at possibilities of assignment to higher prosodic entities in the segmental timing slot model, we might assume accent to be assigned to the syllable node. This again involves complications which rule it out for Somali. If accent were assigned to syllables in Somali, then in the example [']éy in (3.15) above it would have to be assigned to the only syllable with a stipulation that the accent is then realized on the first nuclear timing slot. For the example **ínan** in (3.15), the accent must be assigned to the penultimate syllable and realized on the nuclear timing slot. As with the melodic tier account this approach fails to capture the obvious relation between the accent assignment in the nouns in (3.15), namely that accent is assigned to the penultimate mora.

A further possibility, if hierarchical syllable structures such as that in (3.2) were to be assumed, would be to assign accent to the nucleus of the syllable. This, however, involves the same problems as assigning the accent to the root node on the melodic tier, since in the case of the long vowels there are two segmental timing slots associated with the one nucleus node. Thus, the stipulation would have to be made that the accent is assigned to only the initial timing slot of the pair of slots associated with the particular nucleus node. Again, these arguments may also be levelled against a moraic approach, thus we need to look at other possibilities.

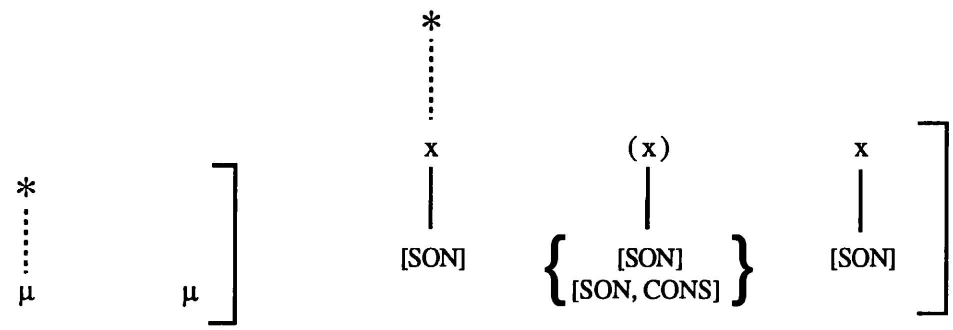
It seems that the only viable possibility in a segmental timing slot approach is to assign accent to the timing slot tier, making reference to the melodic tier as shown in the rule formalism below in (3.20B).

Yet another possibility would be assigning the accent to the syllable node. For Somali, however, this is not a possible account. In the case of assignment to long vowels, an additional rule would be needed saying that the accent be phonetically realized on the penultimate or final mor or segmental timing slot in the representation.

We shall now look at this possibility, comparing it with the assignment of accent to the mora tier in a moraic approach (3.20a). The representation given in (3.20a) assumes aspects of the underlying representation of prosodic structure and also a process of syllabification, which will be discussed later with specific reference to Somali.

(3.20) <u>Accent assignment to a mora and to a timing slot associated with a [SON] root node</u>

(a) (b)



The rule in (3.20a) shows the accent being assigned to the penultimate mora which, given the prior application of the onset creation rule and the margin creation rule, is at this stage in the derivation only associated with SONORANT segments (details are given later). The rule in (3.20b), on the other hand, shows the accent being assigned to the penultimate segmental timing slot which is associated with a melody whose root node is specified SONORANT.

The segmental timing slot rule crucially involves reference to the root node on the melodic tier in order for the correct timing slot to be assigned the accent. This reference to the root node on the melodic tier is to prohibit the accent being assigned to any timing slot nodes other than those associated with vowel melodies. This reference to the melodic tier does not seem unsatisfactory at first sight but it does involve a certain redundancy.

In order for a hierarchical syllable structure to be built upon an underlying representation involving segmental timing slots, reference must be made to the melodic tier, since the nucleus node must, in general, dominate the most sonorous segments in a string. If it is such segments which bear the accent, as would be the case in Somali, then referring again to the melodic tier in order to assign this accent, once syllabification has already taken place, may be regarded as undesirable, especially when this is not necessary in the moraic approach, as we shall see below.

In a prosodic representation which is mora based, as in a segmental timing slot based theory, the melodic tier is influential in the construction of prosodic structure. However, when it comes to the assignment of accent, the melodic tier need not be involved in a moraic approach as it is in the timing slot approach. All that is counted is the number of moras, whether they dominate only vowels, as is the case for Somali, or vowels and consonants, as has been demonstrated to be the case for Rendille (see Pillinger, S. (1989) p.41).

Thus, in a segmental timing slot based theory the melodic structure determines prosodic structure construction but then needs to be referred to again for accent assignment. In a mora based theory, on the other hand, the melodic structure is also a factor in prosodic structure construction, but then, when it comes to accent assignment, it is only this prosodic structure which need be referred to. Thus, the mora tier model is more economical in its formalism and, perhaps more importantly, allows for more autonomy between the prosodic and melodic domains.

Thus, we shall assume that the accent assignment rule for nouns, such as those in (3.15), is as given in (3.20A) above.

In the following diagram we have two examples of accent assignment, namely in the words **ínan** and **libáax** (see (3.15))

(3.21) <u>Accent assignment in **inan** and **libaax**</u>

(a) (b)

As far as accent assignment is concerned, the most economical and explanatory account is one involving moras, since it is these entities and these entities alone which need to be referred to in the rule. Thus, we have strong evidence in the tonal accent assignment system in favour of assuming a moraic approach to Somali phonology.

Having ascertained that accent is assigned to moras, we lead on to a further matter which must be addressed, namely, which melodies are associated with moras at this stage in the phonology. It is clear from what has been said about tonal accent that SONORANT and only SONORANT segments are associated with mora nodes when this process takes place. We shall assume this to be correct and provide further motivation for this assumption in the scansion system of Somali poetry.

Before looking at the scansion system, however, we shall discuss the level at which tonal accent assignment applies in the phonology. There are three matters we need to take into account when thinking about this. Firstly, there are certain words in Somali which require accent to be assigned underlyingly. One such example is the focus marker **báa**, which always has accent assigned to the penultimate mora. There seems to be no other way of accounting for this other than to state it in the lexicon. The second group of words are those in which the accent is assigned by rule in the lexicon. This is the case primarily for nouns in which the assignment of accent is dependent on the gender and/or the declension of the noun in question. Examples of such nouns are those in (3.21) in which the accent is assigned to the penultimate more on account of the nouns being masculine and members of Saeed's declension 2 (see Saeed, J.I. (1987) p.121). Thirdly we come to instances of accent assignment which is dependent on the syntax. One example of this is the accent on the verb type known as reduced verb form. This is a form of the verb which is used in main clauses when the subject of the main clause is focussed by a focus marker. It is also used in relative clauses when the subject of the relative clause is also the head noun of the relative clause. The characteristic of this verb type of interest to us here is the fact that it has an accent assigned to the final mora. This assignment is clearly dependent on the syntax of the clause, thus we must assume that assignment in this case is post-lexical.

There is, of course, much more which may be said on the levels at which accent is assigned, however, we shall leave this to further work. We can see from the overview given above, however, that accent is present in underlying representation as well as being assigned by rule both at the lexical level and at the post-lexical level.

3.3.1.2. Scansion of Somali poetry

The scansion of Somali poetry provides further arguments that the prosodic organization of Somali is based on moras and that moras at the appropriate stage of phonological derivation for scansion are associated with SONORANT and SONORANT only segments.

The formal prosodic structure of Somali poetry is a field which occupied Somalist scholars, both Somali and non-Somali for some time but to little avail (see, for example, Andrzejewski, B.W. & Lewis, I.M. (1964) pp.46-47). It was Maxamed Xaashi Dhamac "Gaarriye" and Cabdullaahi Diiriye Guuleed who made the breakthrough in the study of Somali scansion. Apart from an article by Cabdullaahi Diiriye Guuleed (1980), most of their work was published in a series of articles in the Somali national newspaper *Xiddigta Oktoobar*, "The October Star" (see the bibliography in Johnson, J.W. (1979) for a full set of references), and has been made available to scholars, who have no access to these articles, primarily through the work of John W. Johnson who has worked closely with Cabdullaahi Diiriye Guuleed in particular.

Full details of the scansion system will not be given here as it is beyond the scope of this thesis. What we wish to show is the importance of moras in the scansion system. A summary of the scansion rules applicable to the *gabay* genre of poetry is quoted from Andrzejewski, B.W. (1982):

> A. Each line consists of two hemistichs divided by a caesura.
> B. The first hemistich normally has 12 morae, with an optional but rare possibility of anacrusis, consisting of one additional mora at the beginning of the line.
> C. The second hemistich always has eight morae and contains two long syllables.
> D. Foot boundaries do not occur in the middle of a long syllable.
> E. The caesura coincides with a word boundary.
> F. Line boundaries do not cut across major syntactic components of a sentence.
>
> Andrzejewski, B.W. (1982) p.72

In order to demonstrate the ideas outlined above, two lines from a *gabay* poem[1] by Ismaciil Mire are given below with the symbol we

[1] The label *gabay* is given to a particular prestigious genre of poem which is used for composing poems on serious matters.

are using to denote mora, "μ", above each mora in the line. Each half line is written on a new line here.

```
μ μ    μμ   μ  μ μ    μ  μ    μ  μ μ
O o g g i i   h o r a y   n a g u   k e c e e n

μ  μ   μ   μ μ    μμ  μ
a r i   d i l l a a l k i i y e

  μ   μ   μ μ    μ    μ  μ    μ μ  μ(μ)1  μ μ
D a r   i m a a n k a   l a g a   q a a d a y   ba a

 μ μ  μ  μ μ    μ   μ   μ
n o o   a l o o g s a d a y e
```

Translation:
With the glow of dawn they came upon us, the brokers of the sheep and goats,
People whose good faith had been taken away, gathered conspiratorially against us

Orwin, M. (1992) p.33

The details above are not an exhaustive rendering of the prosodic structure of *gabay* poems but do show the importance of moras (morae as Andrzejewski writes) in the scansion system. Furthermore, moras in the poetic scansion system are always associated with vowel melodies. This coincides with the conclusion made above that in Somali the relevant moras for accent assignment are also moras associated with vowel melodies. This contrasts with other languages in which, as we have seen, syllable final consonants have phonological weight which plays a role in poetic scansion. One such language is Classical Arabic which also has a quantitative scansion system and in which CVC syllables are heavy.

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[1] This mora is written in parentheses because it does not count towards the metre as it is a diphthong in an open syllable. This does not have any bearing on the specific argument given here of the importance of moras in Somali but will be of great interest when we shortly come to look at semi-vowels and diphthongs in section 3.3.2.2.2.

Such a syllable would therefore count as two moras in Arabic in contrast to the one mora in Somali[1].

The details of the scansion system given above also show that syllables are important, particularly in the matter which is given under C in the quotation from Andrzejewski above which states that two long syllables are needed in the second hemistich of a *gabay* poem. The matter of the role of syllables in the scansion system is something which has been set out in detail by Johnson in terms of what he calls "moro-syllabic relationships" (see Johnson, J.W. (1988) pp.124-128). The difference in syllables which lies behind the moro-syllabic relationships is the difference between syllables with a short vowel and those with a long vowel; in other words, a difference in syllable weight, a concept which, as we have seen, lies at the heart of the motivation of moraic phonology. It has been made clear by all those who have worked on Somali prosody that moras are the units which are primarily organized in the scansion system although syllables do also play an important role. Thus, we shall take the scansion system of Somali poetry to be further evidence in favour of assuming both moras and syllables to be part of the system of prosodic representation in Somali.

We can see from the above outlines that the tonal accent system in Somali and the Somali poetic scansion system provide evidence for a mora-based phonological prosodic structure. This, along of course with the ample further arguments in support of moras in Hyman, L. (1985) and Hayes, B. (1989) as well as other references cited in those works, will be regarded as sufficient for us to assume here the explanatory adequacy of a mora based approach to Somali phonology.

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[1] See Bateson, M. C. (1970) pp.29-32, Prince, A. (1989) pp.68-79 and Wright, W. (1859) Vol. 2 pp.358-368 for further details of the scansion system in Classical Arabic.

Having now argued for and assumed the moraic approach to Somali phonology, we shall look at details of prosodic organization, specifically the nature of underlying representations and the process of syllabification. In order to come to some understanding of this in Somali, we shall discuss the process of prefixal reduplication. Providing an explanation for this process will lead us to assume certain explanatory aspects of prosodic organization. These will then be discussed and further motivated in light of further prosodic phonological phenomena in Somali. The further phenomena to be discussed will be prosodic restrictions on certain consonants, the process of vowel deletion and the explanation of the behaviour of diphthongs.

3.3.2. Syllabification in Somali

Before looking at the matter of syllabification it is necessary for us to recall that in Hyman's theory syllables are not regarded as being necessary or present in certain languages. In the following discussion we shall see more evidence in favour of the assumption of syllables. Since we have now assumed syllables to be part of the prosodic organization of Somali this section will be concerned with looking at the details of the type of syllabification process and underlying representations we are to assume for Somali through the discussion of various Somali prosodic phenomena.

3.3.2.1. Prefixal reduplication

Reduplication is a process found in adjectives[1], nouns and verbs in Somali. Reduplication takes two forms in Somali: prefixing

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[1] The category of adjective is one which is not accepted as straightforwardly as might be suggested here. It is not within the

reduplication and suffixing reduplication. Prefixing reduplication is found in verbs and adjectives essentially to form a plural although, as has been pointed out, there is more to the semantics of the process than mere plural formation on its own (see particularly Ajello, R. (1981) and Andrzejewski, B.W. (1969) for further details). Suffixal reduplication is a process which forms the plural of nouns of Saeed's declension 4 (see Saeed, J.I. (1987) p.123). This will not be discussed here. Since the process in adjectives and verbs is, phonologically speaking, the same, we shall only refer to adjectives in this discussion. The basic data for reduplication has, of course, been described in various works, in fact most extensive works on Somali. In particular, one might refer to Saeed, J.I. (1987) (see pp.178-179), also Lamberti, M. (1988) (see pp.133-134) and Banti, G. (1988) (pp.212-213). This latter work provides some more specific observations on the reduplicative process in adjectives which we shall return to shortly.

Initially we shall set out the data, following which we shall point out how the data has been described and then look towards an account of the data which is able to explain the behaviour of the prefixal reduplication process. We shall see that, by using a moraic account and ideas on reduplication proposed by McCarthy, J.J. and Prince, A.S. (1986), we are able to account for the reduplication processes in an explanatory manner. Furthermore, we shall see further evidence that syllables are required for Somali. The reduplication process also sheds light on the syllabification process of Somali, providing arguments for assuming certain aspects of this process. Thus, following discussion of reduplication, we shall have a clearer picture of the workings of syllabification in general.

The data for adjective reduplication may be conveniently divided into three groups. Aside from providing data, Banti, G. (1988) also

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scope of this thesis to discuss this matter. The interested reader is referred to Saeed, J.I. (1988) and references cited therein.

provides a convenient description of each of these groups which is given below (note that G stands for glide):

(3.22) Banti's grouping of adjective reduplication

Caa- reduplication			
dhaadheer	from	dheer	'long'
waaweyn	"	weyn	'big'
CV(V/G)C- reduplication			
ad'adag	from	adag	'hard'
xirxiran	"	xiran	'tied up'[1]
dildillaacsan	"	dillaacsan	'burst open'
taagtaagan	"	taagan	'stand'
qaybqaybsan	"	qaybsan	'divided'
CV(V/G)- reduplication			
gugguban	from	guban	'burnt'
duudduuban	"	duuban	'rolled up'
jajaban	"	jaban	'broken'

"the subsequent consonant is geminated whenever phonologically possible"[2]

Banti, G. (1988) p.213

Let us now look at the description of the process of reduplication in various works. The description of reduplication in adjectives in Saeed, J.I. (1987) pp.178-179 is slightly misleading, if one attempts to extend it to an explanatory phonological analysis of these forms. He states: "The reduplicated form is created by prefixing to the adjective

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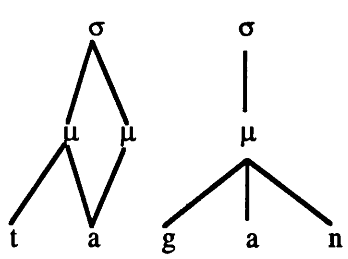
1 Note that, in the dialect being described in this thesis, this particular word would be pronounced and written **xidhxidhan** < **xidhan**. Banti's spelling, **xirxiran, xiran,** reflects the southern type dialects (see the reference to **dh** in section 2.2.1.). This difference has no implications for the arguments put forward in this section.

2 The qualification "whenever phonologically possible" is to account for examples such as **jajaban** in which the second **j** is not a geminate consonant because geminate **jj** is not allowed in Somali (see section 3.3.2.4.1.). See also later **ref** for details on prosodic restrictions.

a copy of the first syllable" (Saeed, J.I. (1987) p.178). Lamberti makes the following, also slightly misleading statement: "Diese [the plural form] wird durch Reduplikation der anlautenden Silbe gebildet". (This [the plural form] is formed by reduplication of the initial syllable) (Lamberti, M. (1988) p.133). These statements are misleading because, assuming the singular form to have been syllabified according to general assumptions on syllable structure, it is not only the first syllable which is reduplicated. Looking at the data in (3.22) above, we can see this in the example of the reduplicated plural form **taagtaagan**, derived from the singular form **taagan**. In the following diagram we show **taagan** syllabified according to basic principles (the details of Somali specific syllabification are given below) in moraic phonology, and one can see that the first syllable does not correspond to the syllable which is affixed to the beginning of the simple form in the reduplicated form.

(3.23) Diagram of taagan syllabified in moraic phonology



This matter is also unsatisfactory in a theory based on a segmental timing slot tier and a hierarchical syllable formed of constituents such as in diagram (3.2) above. From this it is clear that what is reduplicated is not the first syllable, but the first syllable plus the following onset consonant of the fully syllabified simple form.

Looking at the other examples of reduplication in Banti's table in (3.22), we see that these also do not conform to the description of the intial syllable being reduplicated. The type exemplified by **gugguban** and **duudduuban**, for example, do not copy the first syllable followed by the following onset consonant, rather they copy the first syllable and then the initial consonant of the reduplicated form which is geminated if phonologically possible.

We can see then that the description "the first syllable" is not adequate as the basis for a phonological explanation. Thus, we need to ascertain what is reduplicated, if it is not a syllable. Two works have analysed the reduplicated sequence as sequences of segments. Andrzejewski, B.W. (1969) calls the reduplicated string of segments the "preradical" and provides a description of the various shapes of the preradical in terms of the simple form of the adjective, stating that "when the s. mld. [simple form] begins with or consists of the following sequences, such sequences are identical in shape with the preradical of the corresponding r. mld. [reduplicative form]" (Andrzejewski, B.W. (1969) p.65; note r. mld stands for reduplicative mould and s. mld for simple mould). Those sequences are:

> *(a)* a consonant + a vowel + a consonant...
> *(b)* a consonant + a vowel + the semivowel y + a consonant...
> *(c)* a consonant + a vowel + the semivowel w...[1]
>
> Andrzejewski, B.W. (1969) p.65

Andrzejewski also points out that, if a singular form begins with a vowel, then the preradical is the same vowel (long or short), followed by the same consonant, followed by the glottal stop (Andrzejewski, B. W. (1969) p.65). (This is as in the case of examples such as **ad'adag** given above). He mentions further that, despite these observations, there are a number of exceptions. These formulations, along with the exceptions, have been further analysed by Banti, G. (1988). Banti reduces adjective reduplication to

---

1 Note that the example given by Andrzejewski under *(c)* is **gawgawracan**. Banti states of this that it may be a misspelling of **gawggawracan** and therefore an instance of reduplication of the third group in Banti's table (3.22).

essentially three types which he describes as follows (see also (3.22)):

> at least three different types have to be distinguished, all of them involving a reduplicative syllable joined to the left of the stem. In the first type the reduplicative segment is distinctly **Caa-**, i.e. the first consonant of the stem followed by long **aa**; it occurs only with **dheer** 'long' and **weyn** 'big'. In the other two types of reduplication, whose distribution with respect to each other has not been cleared yet, what is repeated is the first CV(V/G)C and, respectively, the first CV(V/G) segment of the stem; in this second type the subsequent consonant is geminated whenever phonologically possible...
>
> Banti, G. (1988) pp.212-213.

Let us refer to Banti's groupings as follows: the Caa reduplication as group (a), the CV(V/G)C reduplication as group (b) and the CV(V/G) + gemination reduplication as group (c). The reduplication type (a) may be treated as a marked exception to a more general process, since the examples of this process are very limited and it is an unproductive process. This assumption may be confirmed when looking at the matter from a comparative and ultimately diachronic perspective. Banti, G. (1988) has demonstrated the marked nature of type (a) reduplication in Somali. Furthermore, he has provided convincing arguments for the assumption that this form is very old within Cushitic (see Banti, G. (1988) p.241 and footnote 3, p.248). We shall return later to type (a) after looking at the other two types first. The other two types exhibit certain common properties which we might try to capture in the phonology and show to be not two separate processes but two manifestations of the same prosodic phonological process.

Given the assumption of moraic phonology which we are making here, there are a number of ways in which we can approach the problem in hand. Firstly, let us assume that reduplication is a process of the copying of melodic material which is then associated with a prosodic template that has been affixed on the appropriate tier. This is in preference to the idea that reduplication is explained by some sort of transformational rule or by the extraction of a specific string of segments, however described, from the simple form. This assumption is uncontroversial in light of work such as that of Marantz, A. (1982) and others which have been conveniently summed up in Spencer, A. (1991) (see the section on reduplication, pp.150-156). The essential basis of Marantz's approach is that reduplication is a process whereby a skeletal template is affixed to the simple form on the skeletal tier. The melodic material of the simple form is then copied and association of the melodic material with the affixed skeleton takes place according to principles of association which he sets out (Marantz, A. (1982) pp.446-447). In Marantz's case the template comprises CV slots and is either a pattern built up of these slots or is a syllable template or a morpheme template.

The ideas of Marantz are taken up and developed in McCarthy, J.J. & Prince, A.S. (1986). In this work they account for reduplication in a similar way to Marantz but with one fundamental difference. The template which is affixed to the simple form is not made up of CV slots nor any other type of segmental timing slots. Rather, they assume a prosodic organization based on moras and set out to show that the shape invariant which is affixed is a prosodic constituent. The possible constituents are listed here:

(3.24) Possible prosodic constituent affixes in McCarthy, J.J. and Prince, A.S. (1986)

Wd	'prosodic word'
F	'foot'
σ	'syllable'
σ_{μ}	'light (monomoraic) syllable'
$\sigma_{\mu\mu}$	'heavy (bimoraic) syllable'
σ_{c}	'core syllable'

Most of these are self explanatory. A core syllable is a syllable of the pattern CV which is assumed to be of particular importance and central to syllabification. The syllable V is also assumed to be a core syllable in languages in which a syllable onset is optional (Somali is not such a language). What is important is that for McCarthy and Prince there is no segmental timing slot tier; in other words, segments are never counted in any phonological or morphological process, let alone in reduplication. "It is a commonplace of phonology that rules count moras (μ), syllables (σ), or feet (F) but never segments" (McCarthy, J.J. and Prince, A.S. (1986) p.2).

Let us look at the salient facts of Somali reduplication in order to establish some idea of the formal nature of this process.

a) The reduplicative affix is always a full syllable with an onset and a syllable final consonant.

The fact that the reduplicative affix has an onset is easily explained by the fact that all syllables in Somali have onsets. This leads on to a second fact about reduplication in Somali:

b) The base-affix boundary is opaque to the onset creation rule.

This means that the onset of the first syllable of the simple form may not be taken from the melodic material copied for association with the reduplicative affix template. This is particularly manifest in forms such as **'ad'adag**[1] in which the onset of the first syllable of the base form is a glottal stop which is the result of a rule of onset insertion, the default consonant being glottal stop, ' in our orthography. This is in contrast to the possibility of the onset being provided by the **d**, the final consonant of the reduplicative affix, which would be the case if the base-affix boundary were transparent to the onset creation rule.

A final fact of reduplication we can mention is the following:

c) The reduplicative prefix's vowel is the same length as that of the initial syllable of the simple form.

The vowel may be long or short as exemplified by the two examples: **culculus** and **taagtaagan**. The length is, of course, predictable from the base form and we need to ascertain how this is explained in the rule formalism of reduplication.

We need, therefore, to explain what the shape invariant is in Somali reduplication and how, in that shape invariant, the vowel length is predicted. Is the shape invariant an affix template which is adjoined to the base form, following which the melodic material only is copied from the base form? If this is so, then the affix has no access from this melodic information to the prosodic aspects of the base form. If this were to be assumed, we would need to say that the shape invariant in some other way is sensitive to the prosodic information in the base form which seems impossible other than by means of a clumsy explicit statement such as "the vowel of the reduplicative

---

1 Note that in the Somali orthography the initial glottal stop here would not be written.

affix is the same length as the vowel of the initial syllable of the simple form".

The explanation which we shall provide here is based on the fact that there is actually more carried over in the reduplication process than simply the melodic information. McCarthy and Prince refer to this process which, as they point out, has been labelled "transfer" by Clements, N. (1986). This matter is explained by McCarthy and Prince in the following way:

> Rather than copy the phonemic melody, we copy all the prosodic structure subordinate to the category stipulated by the reduplicative affix. That is, the prosodic hierarchy defines the properties of transfer.
>
> McCarthy, J.J. and Prince, A.S. (1986) p.102

This provides us with the means of explaining how the vowel in the simple form is the same length as the vowel in the reduplicative affix in Somali reduplication. We shall assume that the shape invariant for prefixing reduplication in Somali is a syllable node, σ. Given this, following the statement from McCarthy and Prince above, we must assume that the material which is copied and carried over for reduplicative association is the melodic tier and the moraic tier together. This is because the prosodic structure subordinate to the category stipulated by the reduplicative affix is the mora. Thus, since the length of the vowel is expressed on the moraic tier, we thereby explain the fact that vowel length in the reduplicative prefix is the same as in the simple form. This is demonstrated in the following diagram in which the word **taagan** is given in the underlying representation as assumed by Hyman[1]. Affixed to the left is a syllable node along with a copy of the simple form of the melody

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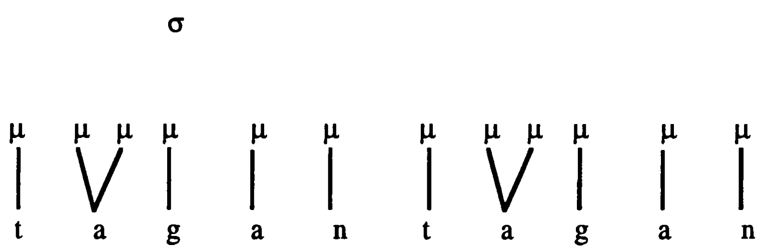
1 From this it may be gathered that the system of underlying representation which will be assumed here is that of Hyman. This has no particular bearing on the immediate argument under discussion. Details are provided shortly.

and the associated moras, ready for association with the syllable affix.

(3.25) <u>The initial stage of the derivation of the reduplicated form **taagtaagan**</u>



Before looking at a full example derivation of a reduplicated form, there is one further important matter which we need to explain, namely, the matter of why the syllable final consonant is associated with the reduplicative syllable template. Referring back to McCarthy and Prince, we find the following statement referring to a process of reduplication in Ilokano:

> We propose that the target is simply σ; given a copy of the bare melody, it satisfies itself to the fullest extent allowed by the usual rules of the language.
>
> McCarthy, J.J. and Prince, A.S. (1986) p.5

This seems at first sight to be a satisfactory explanation for the case of Somali as well as Ilokano. In Somali we know that a syllable may be formed of an onset, a long or short vowel, or diphthong, and a final consonant. Thus, if the reduplicative syllable "satisfies itself to the fullest extent" in Somali, the results are the attested surface forms. A problem arises, however, when we remember that, according to what we have said up until now, we are assuming that CVC syllables in Somali are light; that is, that syllable final consonants are not associated with a mora node. This follows from what we have said with regard to tonal accent assignment and the

Somali scansion system. Again, according to the statement made by McCarthy and Prince, this does not seem to be a problem since the presence of the syllable-final consonant in the reduplicative prefix might simply be regarded as the result of fully satisfying the syllable. This, however, seems to be a flawed statement.

The whole basis upon which moraic phonology is based, as indeed McCarthy and Prince point out, is the assumption that *segments* are not counted. The only entities which are counted are prosodic ones: moras, syllables and feet. Thus, when we speak of a syllable satisfying itself to the fullest extent, the only entities which we can count in order to ascertain that fullest extent are the only countable entities dominated by a syllable node, namely moras. Therefore, in the Somali case, if we are assuming that syllable final consonants are not associated with a mora node, a syllable may be fully satisfied with or without a syllable-final consonant, since the same number of mora nodes are involved and it is only these entities which are countable. Thus, there is no principled way in which we can explain the presence of the final consonant in the reduplicative prefix.

In Somali we shall overcome this problem by assuming that, when reduplication occurs, syllable final consonants are associated with mora nodes. It seems that if this is not assumed and coda consonants not associated with a mora node are allowed to determine a fully satisfied syllable, then we are allowing the counting of segments into the prosodic theory, something which seriously undermines it. So, assuming that syllable final consonants are associated with mora nodes allows us to specify that the syllable reduplicative prefix must associate with the maximum number of moras possible from the moras present in the copied simple form. This argument addresses basic issues relevant to moraic phonology. After all, if we are assuming that a moraless final consonant is relevant in terms of satisfying a syllable to its fullest extent, then we may assume that there is some relevance in a distinction between a light CVC syllable and a light CV syllable, since in the former a moraless margin consonant is present, unlike in the latter. No such relevant distinction has ever come to the attention of the author and certainly in Somali there is no evidence of such a distinction.

Given these conclusions, we are now in a better position to make some decision regarding the nature of underlying representations and the syllabification process in Somali. We are assuming syllable-final consonants to be associated with mora nodes at the stage at which reduplication takes place, but not when tonal accent is assigned or when poetic metre is significant. Thus, it seems more likely that Hyman's model in which all melodic segments are associated underlyingly with a mora is more satisfactory, since the relevant moras are then deleted at some stage by the margin creation rule. In Hayes' theory, on the other hand, we would need to assume that the syllable final consonants are underlyingly not associated with a mora node and that subsequently the weight by position rule applies, thus providing them with a mora in order to account adequately for reduplication, and that then a further rule subsequently deletes the mora node. This is not as satisfactory an account as Hyman's for obvious reasons. This same argument has been put forward by Pillinger, S. (1989) (see p.168) for Rendille.

Thus, underlying representations in Somali will be assumed to be as Hyman proposes; that is, all melodic segments are associated underlyingly with mora nodes. We can now look at other aspects of reduplication which need explanation before looking at the nature of syllabification in more detail.

Before this, however, we shall say a brief word on terminology. In the discussion from now on we shall use the terms "onset" and "margin" in the following way. Onset will be used to refer to any segment at the left-hand edge of the syllable which has undergone the onset creation rule. The term margin will be used to signify a syllable final segment which has undergone the margin creation rule. In Somali, in the vast majority of cases, both onsets and margins will be consonants. In certain cases, however, they will be SONORANT specified segments. We shall return to this matter in section 3.3.2.2.

We mentioned above that the affix boundary is opaque to the onset creation rule. If it was not, then forms such as **ad'adag**, syllabified as **'ad-'a-dag**, would not surface as such but would surface syllabified as **a-da-dag**. The fact that the boundary here is opaque to the onset creation rule might be explained by the syllabification of the simple form prior to affixation of the reduplicative affix. This, however, would have implications for what is copied for association with the reduplicative affix template. Not all the melodic segments would be associated with mora nodes following syllabification because the onset creation rule would have applied. Thus, the explanation above would not be valid.

Referring again to the theory of McCarthy and Prince, we see that there are languages in which the affix boundary is opaque and languages in which the affix boundary is transparent to the creation of an onset:

> When syllabification across the prefix-stem boundary is permitted, as in Orokaiva and Oykangand, an extra consonant will be taken to fill an empty onset position. In Ilokano, by contrast, stem and prefixes form separate syllabification domains, and empty onsets are filled with epenthetic glottal stop...
>
> McCarthy, J.J. and Prince, A.S. (1986) p.16

We must assume that Somali is a language of the second type; that is, that the syllabification process takes place separately for the reduplicative prefix and the simple form.

Let us turn our attention now to the (b) type reduplicative forms, ie. those with a geminate consonant at the prefix-stem boundary.

We shall assume that in these forms the geminate is created due to the fact that the cluster which would be created is not a possible or, if possible, not a favoured consonant cluster in Somali. We shall not deal with the interesting matter of the melodic aspects of these clusters here and shall leave it to future work.

Assuming, then, that the clusters created are not possible we need to explain here why the cluster becomes a geminate and why the resulting geminate is always the initial consonant of the simple form and not the final consonant of the reduplicative affix; that is to say, why is it that the reduplicated form of **guban** is **gugguban** and not ***gubbuban** or, for that matter it is not ***guuguban**.

Firstly, it is clear that the cluster which ultimately becomes a geminate comes together only after reduplication has taken place. This is because it is only after the melodic information has been associated with prosodic entities that the two consonants come together, for it is following this that the extraneous melodic material unassociated with any prosodic structure is deleted. In other words, when the melodic material is associated with the reduplicative prefix syllable template, the unassociated material from the copy is deleted and thus the two consonants come together[1]. Given that these two consonants come together forming an ungrammatical cluster, why is it that they form a geminate? This is shown in (3.26) in the derivation of **gugguban**. We shall assume that a rule deletes the melody of the consonant **b** due to the fact that the cluster **bg** is not allowed or, at least, not preferred[2]. Following this deletion, we see

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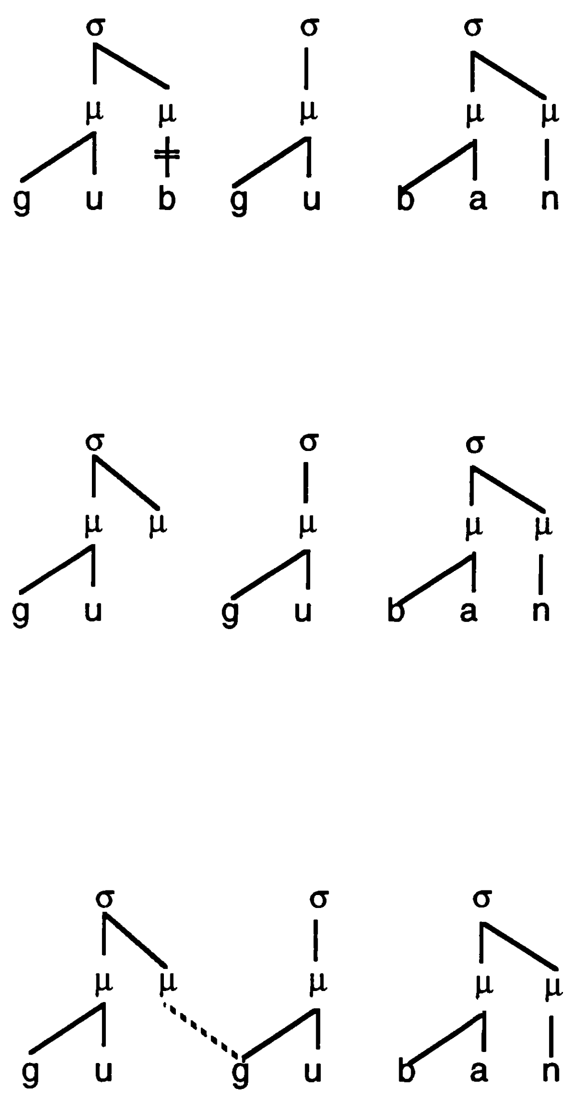
1 This deletion will be assumed to be due to the principle of stray erasure.

2 This is mentioned here because it seems that in some speakers at least the sequence **bg** is allowed in this situation. Further work is

that the mora node remains. Since this may not simply be deleted, especially as it is associated with the syllable node, we shall assume that the melody of the following consonant **g** spreads to the mora node, creating the geminate [gg].

(3.26) <u>Deletion of **b** in the reduplicated form **gugguban**</u>



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needed in the matter of the melodic aspects of these sequences, but this does not detract from our discussion of the prosodic aspects here.

This is a case of compensatory lengthening as proposed by Hayes, B. (1989) (see pp.263, 264 & 279). The fact that the following consonant melody spreads to the empty mora node as opposed to the preceding vowel melody is a result of the syllable forming rules for Somali. This follows from Hayes who states:

> The syllable-forming rules for an individual language may specify that empty prosodic positions are syllabified by spreading from the preceding vowel (as in Latin and most dialects of Ancient Greek); or from the following consonant (as in Lesbian and Thessalian Greek); or not at all (as in Finnish); or even variably, depending on whether the following consonant is allowed as a geminate, as in Tiberian Hebrew.
>
> Hayes, B. (1989) p.264

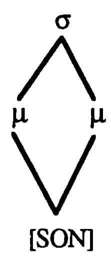
We can assume that the Somali case is the latter since a geminate can only be formed in this process in Somali if it is phonologically possible. What is important to our prosodic concerns here is that the syllable final consonant is dominated by a mora node. This explains why the process of deletion cannot simply take place resulting in a single segment but why a geminate consonant is the result. Thus, we have further evidence that the syllable final consonant is dominated by a mora at this stage in the phonology.

Let us now turn to the (a) type reduplication, as exemplified by **dhaadheer < dheer**, and provide an account for this process. We mentioned above that these examples are assumed to be exceptions. However, although they are exceptional and there are only two examples, we shall nevertheless provide an account for that exceptional behaviour. The relevant forms are repeated below:

dheer	dhaadheer	"long"
weyn	waaweyn	"big"

As we can see, the initial consonant of the singular form is reduplicated and a long vowel [aa] surfaces. We shall assume that this is due to there being a shape invariant which involves a certain pre-association. The following diagram shows the reduplicative prefix we shall assume to account for these examples:

(3.27) <u>Type (a) reduplicative prefix</u>

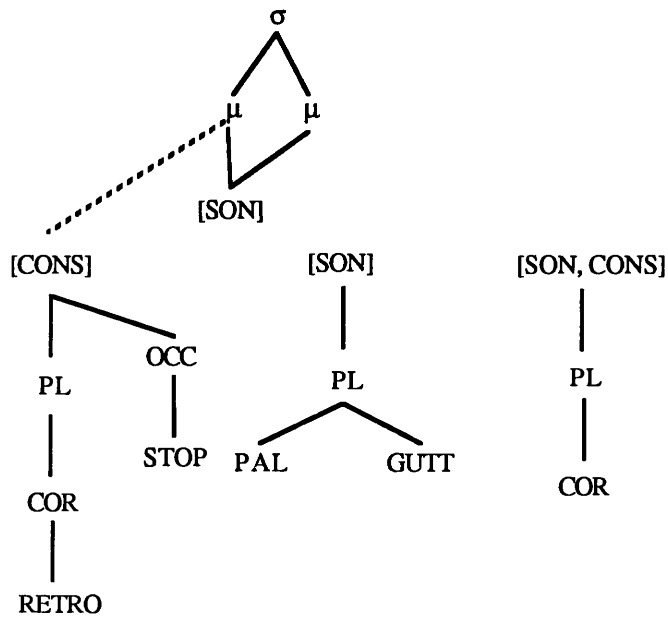


Following prefixation of this affix, we shall assume that the melodic tier is copied. Note that it is only the melodic tier which is copied, without the mora tier, since the lowest level of prosodic structure which forms part of the reduplicative affix is the mora level. The first consonant melody of the copied string is associated with the first mora of the reduplicative affix. This then constitutes the onset of the syllable[1]. This is shown in the diagram below:

---

1 Note that in the case of **waaweyn** the onset is a semivowel. This matter is taken up in section 3.3.2.2.1.

(3.28) <u>Association of the initial consonant melody in the reduplicated form **dhaadheer**</u>



No further association takes place because association is from right to left and is blocked by the fact that the melody /e/ cannot associate with the reduplicative prefix because the next part of the affix is pre-specified[1]. This prevents any further association of the copied string with the reduplicative affix. The fact that further association is blocked accounts for the fact that the middle **dh** in the reduplicated form **dhaadheer** is not a geminate.

In conclusion we see that the process of prefixal reduplication may be handled in an economical and explanatory manner, given the assumption of a moraic model of phonology. We also see, given the above explanation of the process, further very strong evidence for

1 Note that this also prevents the association of the PLACE node, or for that matter any other class node with the pre-specified [SON] node. We may assume this to be for the following reason: since the pre-specification prevents the association of the root node, any node dominated by that root node may also not associate with any part of the reduplicative prefix.

the assumption of syllables in Somali. Furthermore, we have come to some understanding of the syllabification process in Somali. We have then reached a number of conclusions with regard to the Somali-specific syllabification process. Before providing the formal details of these, we shall discuss the matter of semivowels and diphthongs, the behaviour of which has implications for the formalization of the onset creation rule and the margin creation rule.

3.3.2.2. Diphthongs and semivowels

Let us now turn to the explanation of the behaviour of diphthongs and semivowels and see what implications their behaviour holds for a model of prosodic structure for Somali. The behaviour of semivowels can be looked at from two angles. We can look at how semivowels behave at the left-hand edge of syllables and how they behave at the right-hand edge of syllables.

3.3.2.2.1. Vocalic segments at the left-hand edge of syllables

We shall begin by looking at the behaviour of semivowels at the left hand edge of syllables. Looking at examples of semivowels at the beginning of root words, we see that they occur before all vowels, long or short, except in certain cases.

Below is a list of all the accepted Somali underlying sequences of w followed by a long or a short vowel. The sequence is given in bold with the rest of the word in normal style.

(3.29) Examples of root words beginning with the sequence w V

war	"news"
waa	"era"
weli	"still"
weerar	"attack"
wiglo	"genre of poetry"
wiil	"boy"

Missing from this list are the following sequences: **wo, woo, wu** and **wuu**. Words including these sequences are to be found in the language but they can be regarded as exceptions. There are two root words which begin with **wu: wufuud**, "delegates", (an Arabic broken plural form) and **wuqiyad**, "ounce measure of weight". Both of these words are obvious Arabic loan-words and thus may be treated as special cases. Another apparent counter-example is the word **wood**, "to vote". This, however, is a loan from the English word 'vote' and will also be treated as an exception. Other examples of the sequence **wu** and **wuu** may be found on the surface due to the concatenation of various morphemes and subsequent processes of assimilation. For example, **waa + uu -> wuu** (the positive indicative mood classifier with the 3rd person masculine verbal pronoun) or the form **wuxuu** (< **wax + uu**) "thing plus the 3rd person masculine pronoun which together form part of a type of focus construction".

Long and short round vowels are found underlyingly at the beginning of words such as:

ubax	"flower"
uunsi	"perfume"
oday	"elder"
ood	"brushwood fence"

Note that such words surface with a glottal stop at the beginning because of the default insertion of the glottal stop as an onset.

The lack of underlying sequences involving **w** with either **u, uu, o** or **oo** can be explained by a morpheme structure constraint preventing two labial vowel melodies from occurring adjacent to each other. Note that the consonant **b** may freely occur followed by both **o** and **u**. For example, **bood**, "to jump", **bog**, "side", **buur**, "mountain", **burcad**, "butter".

Given this data, we see further evidence that what surfaces as [w] is, underlyingly, the same melody as the surface vowel [u]. In other words, the onset creation rule of Somali forms onsets from /u/ when it is followed by a vowel.

Turning now to the situation with regard to **y**, we see a slightly different pattern. We find that the semivowel **y** occurs before all vowels in root forms except before **ii**. There is a form **yiil** but this is the 3rd person masculine past tense of the prefix verb **yiil**, "he/it (masculine) was"[1] and the **y** is the person marker prefix: **y - iil**. This form may be compared with other persons in this particular paradigm: **tiil** < **t - iil**, "you were", **niil** < **n - iil**, "we were".

The following words are examples of root verbs beginning with **yV**:

(3.30) Examples of root words beginning with the sequence yV

yar	"small"
yaab	"to be astounded"
yerid	"gingivitis"

---

1 Note this verb means particularly "to be in a place" and refers specifically to inanimate objects.

yeedh	"to call"
yib	"a game similar to draughts"
yohoon	"to sail with the wind"
yoos	"bush of unkempt hair"
yucub	"a species of tree"
yuuc	"to bulge"

Again **i**, long and short, is found at the beginning of root words. Note, however, that the surface form of such words includes a glottal stop which is introduced by default as a result of the obligatory requirement for an onset in all Somali syllables.

[']ilig	"tooth"
[']iib	"to trade"

At first sight it seems that the situation with regard to **y** is similar to that of **w**. We might initially assume that **y** is underlyingly represented melodically in the same way as the vowel /i/ and that the formalism of the onset creation rule accounts for the creation of onsets from these vocalic segments. In most cases this is so and a rule to this effect would account for most cases. However, there is one particular instance of a problematic case exemplified by the minimal pair, **iib** and **yib**. The underlying representations of these two words must be distinct. It seems, therefore, that we do need to make a distinction between the glide and the vowel in the case of /y/ versus /i/. What is interesting about this is the fact that, as far as root words are concerned, this distinction need only be made when the distinction is between the sequence /yi/ and /ii/. In the case of the glide preceding all of the other vowels there is no reason to make a distinction between /y/ and /i/. The only other case in which an underlying glide is required as far as we are able to ascertain, is in the case of the 3rd person prefix marker in the prefixing verbs. In forms such as **yimi** (< y + imi), "he came" or **yidhaahdeen** (< y + idhaahdeen), "they said", we must assume the prefix to be underlyingly distinct from a genuine vowel since, if the underlying form were to be assumed to be /i/ (as opposed to /y/), the surface form would be *[iimi] or *[iidhaahdeen].

This difference in the behaviour between the two semivowels is further made clear when we look at the number of root words beginning with the sequences: **yi-**, **ii-**, **wu-** and **uu-**. The following table shows the number of root words which begin with **yi-**, **ii-**, **wu-** and **uu-** in Zorc et al (1991). The list includes a root once. Thus, if a verb and a noun are listed separately but are of the same root, the root is included only once. Equally, compound words are not counted if the initial part of the compound is given as a root elsewhere.

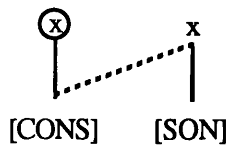
Number of words beginning with:

yi-	6
ii-	9
wu-	2
uu-	15

The two words beginning with **wu-** are the words referred to above, **wufuud** and **wuqiyad**, which, given their highly marked status, are regarded as exceptional.

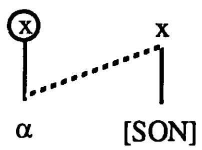
In light of these facts let us look to a formulation of the onset creation rule which accounts for them. The universal level I onset creation rule proposed by Hyman is given above (3.6). In our model this formalism must be altered to account for the difference in features, giving the following:

(3.31) Provisional onset creation rule



The rule, as it stands, however, does not account for semivowel cases. We can therefore expand the rule initially to the following somewhat informal rule:

(3.32) Revised onset creation rule for Somali



Where α represents the following:
- any melody with the root node [CONS] or [SON, CONS]
- the SONORANT melodies /i/ and /u/

This rule accounts for all onsets in Somali, whether consonantal or vocalic, except for the case of [yi] to which we shall return below.

Before continuing we may provide further support for our general assumption that these semivowels are actually onsets created by the onset creation rule and that they are derived from vowel melodies with root nodes specified SONORANT and not melodies with root nodes specified CONSONANTAL or SONORANT, CONSONANTAL. The main argument in favour of this view is the fact that, apart from the /y/ versus /i/ case before /i/, there is simply no evidence of any underlying melodic distinction between what surfaces as a semivowel and as a vowel, that is between u/ and /w/ and between /i/ and /y/ (except in this latter case before /i/). If we were to assume that the initial semivowel in the words above in (3.29) and (3.30) were derived from melodies distinct to the vowel melodies /i/

and /u/, then we would expect that difference to be manifest elsewhere. As it stands, the presence of these semivowels is entirely predictable and thus we may assume that a suitable formalization of the onset creation forms onsets from a restricted set of vowel melodies as well as all consonant melodies. The somewhat anomalous situation of forming onsets from vowel melodies is not regarded as problematic here, given the formalism of the onset creation rule discussed below and the fact that all Somali syllables must have onsets.

A further reason for assuming that the semivowels are produced by the onset creation rule and not some other rule, such as a glide formation rule, is that the semivowels must be assumed to be onsets of syllables. In the case of words beginning underlyingly with vowels, a default rule provides a default glottal stop onset in order that the word complies with the onset requirement. In the case of a word beginning with a vowel which becomes an onset, no glottal stop is subsequently added, thus showing that the syllable already has an onset in the semivowel.

Returning to the rule formalism in (3.32), we must address a further question; namely, do **i** and **u** share some characteristic which allows us to show that they are a natural class? After all, as the rule stands, there is nothing stopping us from stating that the vocalic melody **e** may also become an onset or, for that matter, **a**. In other words, the part of the rule above, stating that **i** and **u** may become syllable onsets, is essentially arbitrary. This is more unsatisfactory when we consider that a distinctive feature system of vowels which includes the feature [±high] allows us to characterize those vocalic entities which form onsets as all those which are specified [+high]. Looking at our representations for vowels we are able to make a statement about these two vowels in a negative way; ie. they are the only two vowels which are not specified GUTTURAL in their surface representations. Given, though, our system of unary features, we are not able to use "-GUTTURAL" as a classification.

Despite this, it is clear that it is these non-GUTTURAL vowels which are the potential vocalic onsets and an account along these lines can be provided which is not as unsatisfactory as simply stating -GUTTURAL. We can propose a sonority hierarchy for Somali. An initial hypothesis based on the data we have seen so far looks like this:

(3.33) <u>Sonority hierarchy for Somali</u>

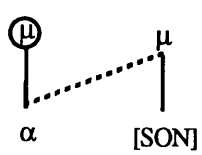
[CONSONANTAL], [SONORANT, CONSONANTAL] 1
[SONORANT] 2

[SONORANT]
|
PLACE
|
GUTTURAL 3

The integers in (3.33) will be referred to as sonority indices.

Assuming this sonority hierarchy for Somali, we can make a positive statement in the Somali onset creation rule accounting for the fact that only **u** and **i** form vocalic onsets:

(3.34) <u>Somali specific onset creation rule</u>



Where α represents any melody of sonority <3

This rule accounts for all cases in which a consonant is followed by a vowel. Equally, it accounts for all cases in which either **u** or **i** precedes a vowel. All of these cases are shown in the list below. The sonority index is given as a subscript number and C stands for consonant, ie. any segment withe the root node specification [CONSONANTAL] or [SONORANT,CONSONANTAL]:

i_2 a_3	-> [ya]	u_2 a_3	-> [wa]
i_2 e_3	-> [ye]	u_2 e_3	-> [we]
i_2 i_2	-> [ii]	u_2 i_2	-> [wi]
i_2 o_3	-> [yo]	u_2 o_3	this string not found underlyingly
i_2 u_2	-> [yu]	u_2 u_2	-> [uu]

C_1 a_3 -> [Ca]
C_1 e_3 -> [Ce]
C_1 i_2 -> [Ci]
C_1 o_3 -> [Co]
C_1 u_2 -> [Cu]

The fact that the long vowels /ii/ and /uu/ do not surface as [yi] and [wu] is because the underlying representations of the long vowels do not meet the structural description of the onset creation rule, since a long vowel is one melody associated with two moras. For example, below is the underlying representation of /ii/.

(3.35) <u>Underlying representation of the long vowel /ii/</u>

$$
\begin{array}{ccc}
\mu & & \mu \\
& \diagdown\ \diagup & \\
& [\mathrm{SON}] & \\
& | & \\
& \mathrm{PL} & \\
& | & \\
& \mathrm{PAL} &
\end{array}
$$

The other sequence which does not surface is the sequence [wo] < /uo/. This, as we have mentioned above, may be regarded as being due to the effect of a morpheme structure constraint preventing two vowel representations, specified LABIAL, from occurring adjacent to one another.

Given all of these matters, we find that the sequences we predict as surfacing are just those which do actually surface, namely: [ya], [ye], [yo], [yu], [wa], [we] and [wi].

The only further sequence which we need to account for is the surface sequence [yi]. As we have mentioned above, we must assume that the semivowel in this case is underlyingly a different representation to the underlying representation of /i/. There are two possibilities which are apparent. Firstly, we may assume that the ROOT node of the underlying representation of the melody is different, namely CONSONANTAL or SONORANT, CONSONANTAL. Secondly, we may assume that the underlying prosodic representation of the segment is different. In this case the only difference which would be possible is that the segment is present underlyingly without an associated mora node. This corresponds to the representation of glides in Hayes' theory, as mentioned above (see (3.11)).

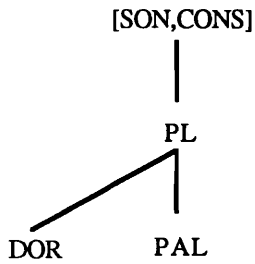
The main factor to bear in mind is the fact that, however represented, this segment only occurs before /i/ at the beginning of a word or on its own in the case of the 3rd person prefix. It is this first matter which gives us a clue to the underlying representation. We must assume that it is distinct from /i/ in terms of the melody, that is in terms of the root node specification. If we were to assume that the segment were to be specified in the same way as the melody of /i/ and distinguished prosodically, namely by the lack of a mora, then the two segments would be identical as regards melody and on the same tier. Thus in the case of a word such as **yib**, in (3.30), this arrangement would be a blatant violation of the obligatory contour principle as shown below:

(3.36) The juxtaposition of the /i/ melody, one instance without an associated mora node, the other with an associated mora node

```
           μ
           |
[SON]    [SON]
  |        |
  PL       PL
  |        |
 PAL      PAL
```

We shall therefore assume that the glide segment is underlyingly represented with the root node SONORANT, CONSONANTAL. It therefore has the same sonority index as consonants and undergoes the onset creation rule as formalized above. We shall assume the highly restricted position in which this segment is found to be due to a morpheme structure constraint formulated as follows:

(3.37) Underlying representation of /y/ with associated morpheme structure constraint[1]



may only occur at the beginning of a root and preceding /i/, or on its own.

This particular explanation for this phenomenon is not as satisfactory as one would wish. However, we shall retain it here with the possibility of revision in the future.

3.3.2.2.2. Vocalic segments at the right-hand edge of syllables

Let us now turn our attention to the other end of the syllable and discuss the behaviour of diphthongs. In discussing diphthongs there are two phenomena which we shall look at: the assignment of tonal accent to words incorporating diphthongs and the status of diphthongs in the system of Somali poetic scansion.

The scansion system has been outlined above. Furthermore, in footnote 1 to the translation of the two lines of the *gabay* poem, we mentioned that the mora in parentheses did not count in the scansion because it was a mora at the right-hand edge of a diphthong in an open syllable. It is this fact which we shall address here. We saw above that the metre of Somali poetry is based on the quantity of moras in a line or half line. Furthermore, we have

1 Note the DORSAL node is specified in the melody otherwise the CORONAL active articulator node would be inserted by the rule in (2.40a).

assumed that the segments which are associated with moras, and thus counted, in the scansion system are all vowel segments which include those segments surfacing as the second half of diphthongs. Thus, both long vowels and diphthongs count as two moras. It has been shown, however, that in certain cases diphthongs may count in the scansion system as one mora. The relevant facts are set out in Johnson, J.W. (1979) where he states of what he terms disemic units, that is, parts of feet which may hold two moras, the following:

> ...disemic units are two morae in length. [They] may consist of two short syllables, or a long vowel, or a diphthong followed by a consonant.
>
> Johnson, J.W. (1979) p.48

He adds the following in a footnote about the diphthong:

> The diphthong which must be counted as a long vowel may be symbolized by the following formula: # V G C #. The symbol # represents syllable boundaries, while V stands for a long or short vowel. The letter G symbolizes the off glide, either /y/ or /w/, and C represents a consonant.
>
> Johnson, J.W. (1979) footnote 16 on p.53[1]

---

1 Johnson mentions here the possibility of a diphthong comprising a long vowel and an off glide; in a closed syllable something such as /aayC/. Long vowels followed by glides in both open and closed syllables are encountered in the Somali literature, although it is recognised here that such strings do not exist, at least phonologically. Armstrong states the following:

> I am tempted to think that ɑɑw and aw belong to the same phoneme. But if this is the case, the difference in the pronunciation of the diphthongs of hɑɑwl and hɑ̀wd is difficult to explain. More examples containing ɑɑw and ɑw must be collected and studied.
>
> Armstrong, L.E. (1934) p. 24/137

One can but agree with Armstrong as to the necessity of further work on this matter.

So, from this we see that a diphthong in a closed syllable must be counted as two moras. However, when we look at what Johnson has to say on diphthongs in open syllables we find the following:

> A diphthong of either a long or short vowel, followed by the offglide, followed not by a consonant as in the above mentioned variety, but by a vowel or by nothing at all, will allow the syllable to be counted as either a monoseme or a diseme.
>
> Johnson, J.W. (1979) p.48

The following footnote is added:

> The anceps diphthong may be symbolized by the formula: # V G (V) #. The parentheses represent an optional choice.
>
> Johnson, J.W. (1979) footnote 17 on p.48

The matter of the optional vowel following the glide is not discussed in detail but we may assume that such occurrences of vowels fit into the bracket of other vowels which are not counted. Aside from the diphthongs, certain instances of long vowels may also count as one mora, such as the long vowel of the definite article suffix **-kii/-tii**[1], also the subject verbal pronouns, **aan**, "I", **aad**, "you", etc. Further details are given in Johnson, J.W. (1979) (see especially pp.48-49). The question raises itself as to why these vowels do not contribute to the quantity of a line. We shall not discuss this further, however, since it is not of great relevance to the specific topic under consideration here and it would require extensive enquiry into poetic sources which is beyond the scope of this thesis.

---

1 **-kii** is added to masculine nouns and **-tii** to feminine nouns. Note also that this particular form of the definite article is one which is used to refer to things in the past or things which have been mentioned previously in the discourse.

Returning to the matter of diphthongs, we may sum up what Johnson states as follows:

- a diphthong in a closed syllable *must* count as two moras
- a diphthong in an open syllable *may* count as one mora or two.

We shall assume that this behaviour is due to the fact that in open syllables with diphthongs the margin creation rule may or may not apply for the purposes of poetic metre. We shall further assume that this is a matter which is specific to the poetic scansion system but with a basis in the phonology of the language.

We find further evidence for this type of phenomenon in the assignment of tonal accent to nouns which contain diphthongs. Consider the following examples in which the accent is marked by an acute accent above the mora to which it is assigned:

(3.38) <u>List of monosyllabic nouns demonstrating tonal accent assignment to diphthongs</u>

daýr (f.)	"lesser rainy season"
dáyr (m.)	"fence"
'aẃr (f.)	"male camels"
'áwr (m.)	"male camel"
'eý (f.)	"dogs"
'éy (m.)	"dog"

The first of each of these pairs of words is feminine, the last two are also plural because of their membership of declension 5 of Saeed's classification and, as these nouns are feminine, the tonal accent is assigned to the final mora. The second of each of these pairs of words is masculine (and singular), the accent therefore being assigned to the penultimate mora, as in the examples in (3.15) above. The accent is realised on the diphthongs as it is on long vowels; that is, with a falling tone when the accent falls on the initial part of the diphthong and with a slightly rising or level tone when the accent falls on the second half of the diphthong. Let us now look at a further set of words which behave in a different way, ie. bisyllabic[1] words such as the following:

(3.39) <u>Examples of bisyllabic words with a final open diphthong</u>

ardáy (f.)	"students"
árday (m.)	"student"
bádow (m.)	"inhabitant, rustic"
badów (f.)	"inhabitants, rustics"[2]
íley (m.)	"one eyed man"
híley (m.)	"strap"
cáday (m.)	"stick for cleaning teeth"

In these words we would assume the same pattern of tonal accent assignment as in the words in (3.38) above according to the gender of the noun. However, as we can see, the surface form of the words in (3.39) differs subtly from those given in (3.38) above. The difference is that in the masculine form the accent has not been assigned to what we would assume to be the penultimate mora, ie., the first half of the diphthong, but is assigned to the first vowel in the word, ie., what seems to be the antepenultimate mora. Furthermore, the feminine form has the accent assigned to what seems to be the penultimate mora as opposed to the final mora.

This particular pattern of accent assignment is assumed on the basis of the phonetic sound of these words. When listening to the examples **árday** and **íley** there can be no doubt that the accent falls on the

---

1 This also includes multisyllabic words greater than two syllables in principle, although we have no examples of such words. This has no bearing on the argument proposed here.

2 Note that this noun also has the following plural form: **badowyo** (f.).

vowels as indicated because of the higher pitch and greater stress of these vowels. The phonetics of the example **ardáy**, on the other, hand are more subtle. The phonetics may best be described in comparison with the word **eý**, "dogs", in which the accent is assumed to be assigned to the mora associated with the final half of the diphthong. In the word **eý** the diphthong is pronounced as long and steady with a certain amount of stress manifest on the final part of the diphthong. The tone is generally slightly rising with a definite higher pitch on the second part of the diphthong or is steady. When pronounced in isolation, the impression is that the two parts of the diphthong are clearly pronounced. In the example of **ardáy**, on the other hand, the diphthong has been perceived by the author as being of slightly less duration when the word is pronounced in isolation. Furthermore, the pitch is realised invariably as a steady pitch as opposed to the slightly rising pitch of **eý**. It is hoped that subsequent experimental phonetic work will show in more concrete terms the precise acoustic details of these differences.

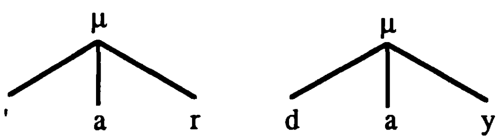
As with the phenomenon met in looking at the scansion system, this particular phenomenon is only manifest with open diphthong syllables and then only in bisyllabic or multisyllabic words. Compare the following words:

samaýn (f.)	"doing"
horraýn (f.)	"being first"
iláys (m.)	"dim light"
adáyg (m.)	"hardness"

From this list of words we can see that, when a diphthong is the final syllable in a bisyllabic word but the final syllable is closed, then the phenomenon found in the **árday** example does not occur. In other words, in closed syllables diphthongs always behave as bimoraic entities.

All of this evidence leads us to assume that in the cases when a diphthong is in an open syllable at the end of a bisyllabic word it undergoes margin creation. This leads to the loss of the mora associated with the second half of the diphthong. Thus, following application of the margin creation rule the word **árday**, "student" looks as follows, as indeed does **ardáy**, "students".

(3.40) Representation of **arday** following application of the margin creation rule[1]



The accent assignment then takes place according to the general rules: assignment to the penultimate mora for masculine nouns, assignment to the final mora for feminine nouns and the surface forms are derived as described above and in section 3.3.1.1.

We see then that we have two examples of phenomena in which we can assume that the margin creation rule applies to semivowels in syllable final position. The major difference between the two examples is that in the case of bisyllabic words the rule applies obligatorily to all such forms, whereas in the scansion system example the rule applies only when required by the metre of a particular line or half line of poetry.

Let us now turn to the formalization of the margin creation rule. Taking Hyman's rule (see Hyman, L. (1985) p.18) and using the features proposed in this work the margin creation rule would look as follows:

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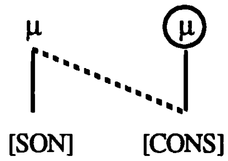
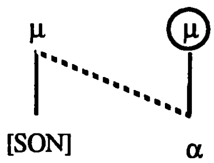
1 Note the glottal stop insertion at the beginning of the word since it begins with a vowel in underlying representation. See (3.63b).

(3.41) Somali provisional margin creation rule



This rule is adequate in accounting for all of the cases in which margin creation takes place with respect to consonants. We need, however, to provide a further formalism to account for the diphthong examples and for the scansion system. What is interesting about these cases is that the vocalic melodies which we need to make provision for in the margin creation rule are precisely those vocalic melodies to which the onset creation rule applies, namely /i/ and /u/. Thus, in our formalism we may refer to those SONORANT specified melodies which undergo margin creation in certain circumstances in the same way, namely by their sonority index. We shall therefore reformalize the margin creation rule as in (3.42) below and formally specify the circumstances in which it applies:

(3.42) Revised formalism of the margin creation rule



Given this basic formalism we can say:

1. The margin creation rule always applies when α has a sonority index of 1.

This accounts for all the consonant examples.

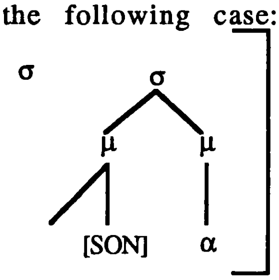
Turning next to the example of the scansion system allowing application of the margin creation rule according to the scansion of a line or half line, the following formalism can be proposed:

2. The margin creation rule may optionally apply for the purposes of poetic metre when α has a sonority index of 2.

The statement "for the purposes of poetic metre" may sound somewhat inadequate. What exactly do we mean by it? We shall provisionally assume that matters relating to the scansion of poetry are applicable in a separate poetic component of the phonology. We shall not discuss this matter further here.

As to the case of the bisyllabic words, we can make the following formalism:

3. The margin creation rule applies at level I in the following case:

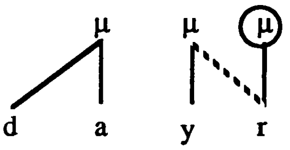


where α has a sonority index of 2

Note that at the stage at which this rule applies the onset creation must be assumed to have already applied, hence the left branch of the penultimate mora which will always be associated with an appropriate melody, hence the lack of the melody specification here.

In the last two cases the margin creation rule is only able to apply to *open* syllables with diphthongs. This is explained by the fact that the margin creation rule applies only once, since following application, the relevant string no longer meets the structural description of the rule. Thus, in a closed syllable it will apply thereby deleting the mora of the consonant and is not able to reapply to delete the mora of the preceding semivowel part of the diphthong. This is demonstrated below in the derivation of the word **dayr**, "lesser rainy season".

(3.43) The margin creation rule applied to the word **dayr**



We stated under 3 of the margin creation rule that it applies at level I, this is for the following reasons. An important fact to bear in mind with the diphthong examples of application of the margin creation rule is that they are interrelated. Since the margin creation rule applies to all examples of bisyllabic words ending in open syllable diphthongs then all such diphthongs are monomoraic if they occur in a line of poetry. The majority of diphthong examples in open syllables in poetry, however, may be assumed not to be such words but instances of inflectional endings such as the past simple endings given in section 4.1.4.1. which are added at the inflectional level in the lexicon. Since such instances meet the structural description of the margin creation rule as formalized above, they would undergo that rule if no reference to level of application were made. This, however, would mean that the vast majority of cases of open diphthong syllables in poetry would be monomoraic, which, it is safe to say, is not the case. We shall assume therefore that the specific case of 3 in the margin creation rule only applies at level I in the lexicon. Thus it applies to all the instances we have discussed but not to those which are the result of the concatenation of inflectional morphological suffixes. More detailed work on a large corpus of poetry will hopefully shed more light on the finer details of these points.

Hyman, L. (1981) also discusses these bisyllabic words ending in diphthongs in a footnote (footnote 2 p.171-172). Here he writes: "Vy and Vw sequences are written Vi and Cu in *monosyllabic* words in order to correctly predict placement of the tonal accent ...". Thus examples such as **dayr** he would write 'dair' but bisyllabic words are written with 'y' or 'w', **arday** being written 'arday'. In other words, the behaviour we have outlined above is accounted for by Hyman by a difference in the representation of the semivowel melody allowing 'i' and 'u' to exist alongside 'y' and 'w'. In addition he provides details of the distribution of these melodies. 'Vi' and 'Vu' in monosyllabic words and 'Vy' and 'Vw' in multisyllabic words. Despite the fact that we do assume different melodic representation for underlying /i/ and /y/ we have provided a restriction on the occurrence of /y/ and in general the approach here is considered to be more adequate than Hyman's depending as it does on prosodic matters.

This concludes our look at diphthongs and semivowels in which we have seen that, with the system of prosodic organization we are assuming for Somali, we are able to explain this behaviour.

3.3.2.3. Vowel deletion

We shall now look at the process of vowel deletion, following the use of this term in Sim, R.J. (1981). It is not a process of syncope since, as we shall see there is no dependence on accent in the process. This process will provide further evidence for the fact that CVC syllables in Somali are heavy at a certain stage in the phonology. The phenomenon is exemplified by the following verbs and nouns:

'aragtay[1]	"you saw it"
'arkay	"he saw it"
dabartay	"you hobbled it"
dabray	"he hobbled it"
xadhig	"rope"
xadhko	"ropes"
'ilig	"tooth"
'ilko	"teeth"

It may be seen from these examples that, when there is a potential form of the pattern (C)VCVCV(V), three light syllables in a row with the final syllable optionally being heavy, then the middle syllable loses its vowel. This is, of course, assuming that the underlying representation of the verb stem is of the form CVCVC. It might be argued that the underlying pattern is CVCC and that the medial vowel is introduced by epenthesis. Such an account of epenthesis within the context of an article dealing with diachronic matters of proto East Cushitic has been proposed by Sasse, H.-J. (1979), pp.7-8. The account of epenthesis, however, is not a possible account for Somali, since the vowel which would be regarded as the inserted vowel is not always predictable. For example, the following forms are from the verb **samir**, "to be patient": **samray**, " he was patient", and **samirtay**, "she was patient". There is no other way in which the second root vowel may be known other than to assume that it is present underlyingly, and is deleted in the forms involving a vowel-initial prefix. In other words, we must assume the underlying representation to be /samir/ and not /samr/.

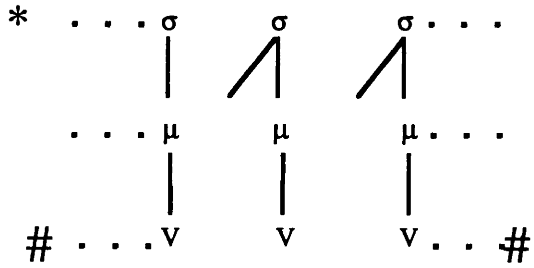
---

1 The Somali orthography does not use the glottal stop letter, ', when writing these words but it is used here to make it clear that, phonologically speaking, there is a glottal stop due to the requirement of syllable onsets in Somali. The rule of glottal stop insertion is formalized in (3.63b).

This process of vowel deletion is also present in Rendille, a language which is very closely related to Somali, and has been discussed by Sim, R.J. (1981) (pp.7-8) and Pillinger, S. (1989) (pp.73-81), although Pillinger labels the process *stem contraction*. Our analysis of Somali will follow closely the analysis of the process in Rendille as presented in Pillinger, S. (1989).

The motivation of the account of stem contraction in Pillinger is that it "seems to be to preserve or create a *heavy syllable* stem finally" (Pillinger, S. (1989) p.80). He goes on to say that this is necessary "to prevent a CVCVCV sequence from arising" (Pillinger, S. (1989) p.80) when a suffix is added to a stem. Thus, the constraint governs the word. Furthermore, the constraint holds only in the lexicon. Pillinger formalizes this in the following lexical word structure condition:

(3.44) <u>Pillinger's lexical word structure condition</u>



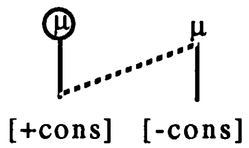
Pillinger, S. (1989) p.80

Pillinger says of this condition:

> It assumes that non-onset consonants would have their own mora at the level at which (47) [ie. the lexical word structure condition] applies - hence the need to specify that the moras in question are associated with vowels.
>
> Pillinger, S. (1989) p.81

This seems superfluous. Since the final two syllables are associated with a mora *and* a melody to the left, as indicated by the left branching association lines from the syllable nodes, then it must be the case that the onset creation rule has already applied. Pillinger assumes the onset creation rule as formalized by Hyman (see Pillinger, S. (1989) pp.167 & 170) which we give again below:

(3.45) Hyman's onset creation rule as given in Pillinger, S. (1989)



Pillinger, S. (1989) p.167[1]

We see, therefore, that given the branching syllable structures in the word condition, we must assume that the final two moras at least are associated with vowel melodies simply because the onset creation rule has applied. As to the initial mora, since it is already associated with a syllable node we must assume it to be associated with a vowel as there are no syllabic consonants in Rendille except at a phonetic level (see Pillinger, S. (1989) p.170). Whether or not the initial syllable begins with a consonant is not relevant to the condition.

In light of these comments we can reformalize Pillinger's condition as below, using the diagrammatic symbols we have used in this thesis:

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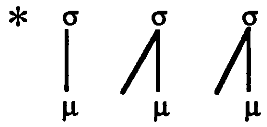
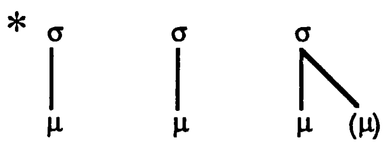
1 Note that Pillinger also uses the symbol μ instead of x for the mora, or as Hyman calls it, the weight unit.

(3.46) Revision of Pillinger's lexical word structure condition for Rendille



The fact that no reference is made to melodic structure is preferable, given that the condition is one on prosodic structure. We shall assume that a lexical word condition very similar to this one holds in Somali, the one difference being that in Somali the final vowel may be long or short. Thus, the condition must be formulated as follows:

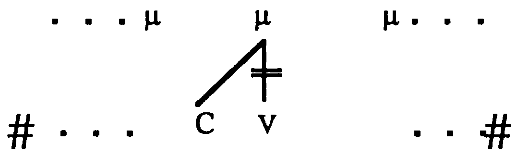
(3.47) Somali lexical word structure condition



In this diagram we see that the final syllable may be associated with either a long vowel or a short vowel. Furthermore, since onsets in our model are associated with moras we do not incorporate the association lines with the melodic tier, let alone represent that tier itself. The requirement that syllables have onsets ensures the grammaticality of structure beneath the mora level.

Moving on to the rule of stem contraction which resolves cases of potential violation of the lexical word structure condition, Pillinger proposes the following formalism:

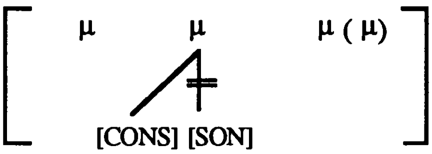
(3.48) <u>Pillinger's rule of stem contraction</u>



Pillinger, S. (1989) p.81

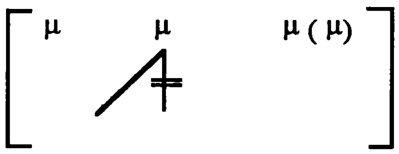
He points out the importance of the fact that it is the vowel, ie. the melody, which is deleted and not the mora. Given this, the mora remains associated only with the consonant which had formed the syllable onset prior to deletion of the vowel. In this way Pillinger points out that the overall weight of the word is not altered. The result of the rule, however, following resyllabification, is the production of an initial heavy syllable of the form CVC. We shall assume this same rule for Somali, since it accounts for the Somali examples in the same way as it does for the Rendille examples. The only difference in the formalism we need to make for the Somali example is to allow for the final syllable to be long as well as short. Thus, the rule formalism for Somali will be as follows:

(3.49) <u>Provisional vowel deletion rule for Somali based on Pillinger's rule in (3.48)</u>



In this rule the melody tier is present. We can see, however, that this is not necessary, since the branching association lines from the mora adequately account for the deletion of the vowel. We shall therefore revise the rule and formalize it as follows:

(3.50) Vowel deletion rule for Somali



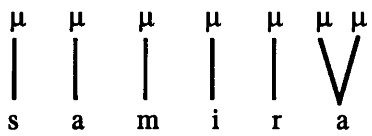
In this rule we see that the left-hand branch of the second mora from the left is necessarily a consonant since the branching at this stage in the phonology can only refer to an onset plus vowel sequence. Given this the entity which is deleted is necessarily a vowel and thus no reference need be made to the melodic tier.

Let us look at an example derivation to see how this works in practice.

(3.51) Derivation of the word **samraa**, "he is patient"

underlying representation: /samir/ + /aa/

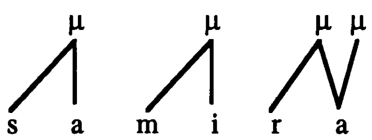
↓



↓

onset creation rule application

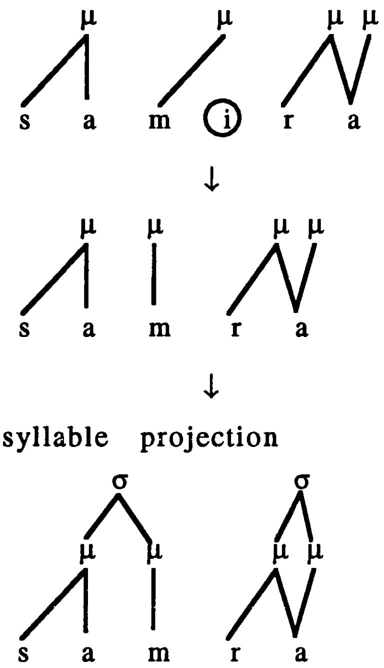
↓



↓

vowel deletion rule

↓



This process provides further evidence for the assumption that CVC syllables are heavy at that particular stage of the phonology, since it is only if this is assumed that we can allow for the initial CVC syllable to be heavy in a word such as **samraa**.

There are certain instances when the process of vowel deletion does not take place. These occasions are relevant to the discussion in the next section (3.3.2.4.) and will be dealt with there.

3.3.2.4. Prosodic restrictions on certain segments in Somali

This section will provide an account of the phenomenon that WIDE GLOTTIS consonants may not occur in syllable final position in Somali. We shall also discuss the status of **j** and the behaviour of **m** in syllable final position.

The restriction on **t** and **k** can be summed up informally as follows:

in Somali **t** and **k** may not occur at the end of a syllable.

When this constraint is violated and one of these consonants finds itself at the end of a syllable, then the consonant changes to a CLOSE GLOTTIS consonant by a process of deletion of the WIDE GLOTTIS feature node. The following provides an example as well as an example of a verb in which the final segment is /g/ underlyingly.

bugtay	"she was ill"
bukay	"he was ill"
tagtay	"she went"
tagay	"he went"

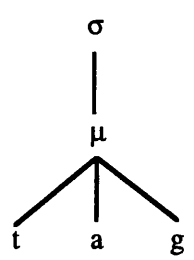
From this we can see that in syllable final position there is a neutralization of the opposition WIDE GLOTTIS versus CLOSE GLOTTIS. In the form **bukay** in which the underlying final consonant of the root /buk/ is in onset position it may surface as [k]. When, however, it is in syllable final position, the WIDE GLOTTIS specification is lost and the segment surfaces as a CLOSE GLOTTIS consonant [g], as in **bugtay**. Although there are no monosyllabic verbs ending in underlying /t/ to demonstrate the process with the coronal consonant, we do find examples from the class of verbs which undergo the process of vowel deletion which we discussed immediately above (in section 3.3.2.3.):

gunudday	< /gunut/ + /tay/	she knotted
guntay	< /gunut/ + /ay/	he knotted
'orodday	< /orod/ + /tay/	she ran
'orday	< /orod/ + /ay/	he ran

In these examples we see that the process of vowel deletion deletes the second underlying vowel in which case the underlying final consonant finds itself in onset position and thus may surface in its underlying form, whether WIDE GLOTTIS or CLOSE GLOTTIS. In the cases where vowel deletion does not take place, however, the final underlying consonant is in syllable final position and the distinction between WIDE GLOTTIS and CLOSE GLOTTIS is neutralized, with the consonant surfacing as a close glottis consonant. Note that in the example **gunudday** above, the rule of geminate formation which will be discussed in section 4.2.1. also applies. The informal derivation of this word is then: /gunut/ + /tay/ -> gunud + tay -> gunudday. Given this data we can assume that there is in Somali a constraint rendering syllable final position WIDE GLOTTIS stops ungrammatical.

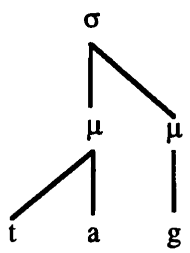
If we are to assume a prosodic basis to this constraint, then we need to make the constraint applicable when syllable initial consonants and syllable final consonants are prosodically distinct. This is the case following application of the onset creation rule but before application of the margin creation rule. The following diagram shows a fully syllabified representation of the Somali word **tag** "Go!" after both onset creation and margin creation. As can be seen, there is no way in which a distinction may be made between the onset and the margin consonant on the basis of the prosodic structure:

(3.52) Syllabified representation of **tag**



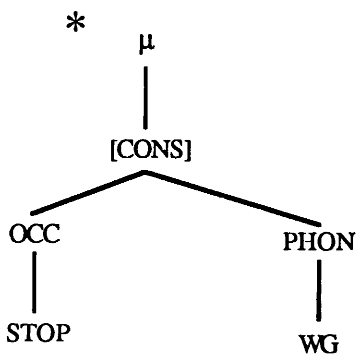
On the other hand, prior to margin creation the onset and syllable final consonants may be distinguished, as evident in the following diagram showing the syllabification of **tag** following the onset creation rule but prior to the margin creation rule:

(3.53) Syllabified representation of tag prior to margin creation



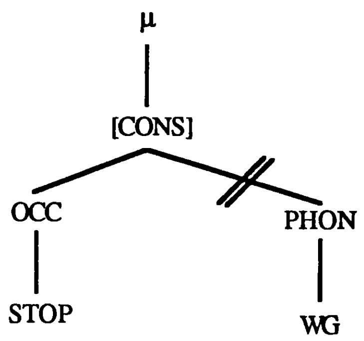
Given this, we shall assume that the following constraint holds:

(3.54) WIDE GLOTTIS constraint



This constraint states that a WIDE GLOTTIS stop is disallowed when associated with a mora node which is not associated with any other melody. The matter of the mora node not being associated with any other melody is crucial in that we do not wish to rule out WIDE GLOTTIS stops which constitute the onset of syllables. We shall assume that the constraint holds in the lexicon but not so as to govern the set of underlying representations, that is to say, it is not a morpheme structure constraint. This constraint, however, does not provide the means for segments which violate the constraint to change. Thus, we need to assume the following rule which is motivated by the above constraint:

(3.55) <u>WIDE GLOTTIS deletion rule</u>



This rule states that WIDE GLOTTIS stops which are associated with a mora node which is not associated with any other melody lose the WIDE GLOTTIS specification. At a later stage in the phonology, due to the class node requirement, the class node PHONATION is inserted into the representation and the default specification CLOSE GLOTTIS is introduced by the complement rule given in (2.33).

We shall assume that this rule is part of the syllabification process of Somali in a manner similar to the assumption by Hayes, B. (1989) that compensatory lengthening is part of the syllabification process: "The correct view, I believe, is that CL [compensatory lengthening] rules ... form part of the *syllabification principles* of individual languages" (Hayes, B. (1989) p.264). This is assumed for the WIDE GLOTTIS deletion rule because of the crucial role the prosodic structure plays in this rule.

It is interesting to note that there is a further way in which the potential violation of the WIDE GLOTTIS constraint is prevented in certain verbs. This is the case in which a wide glottis stop potentially occurs in syllable final position, following potential application of the vowel deletion rule. This is exemplified by the forms of the word **fatah**, "to overflow":

fatahday	"it (f.) overflowed"
fatahay	"it (m.) overflowed"

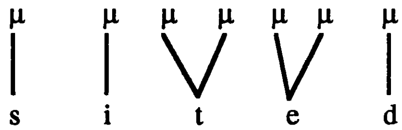
In the case of **fatahay** we have a potential application of the rule of vowel deletion but the rule does not apply. We shall assume this lack of application to be due to the fact that, if the rule were to apply, then the middle consonant of the root, **t**, would find itself associated with a mora node which is not also associated with a vowel melody. In other words, the consonant would have weight which violates the wide glottis constraint given in (3.54). As is evident from the surface form, the potential violation of the constraint is resolved by the lack of application of the vowel deletion rule.

A further aspect of the matters under discussion is the fact that there are no geminate WIDE GLOTTIS stops in Somali. This naturally falls out from the constraint we have assumed about there being no syllable final WIDE GLOTTIS stops, since all geminate consonants are associated with a mora node which is not associated with any other melodic segment before application of the margin creation rule and which therefore could violate the WIDE GLOTTIS constraint in (3.54) above. However, as we mentioned above, the constraint in (3.54) is not a morpheme structure constraint and thus does not in itself rule out the possibility of underlying geminate WIDE GLOTTIS consonants. After all, if an underlying geminate WIDE GLOTTIS consonant were present, it would undergo the WIDE GLOTTIS deletion rule resulting in a geminate CLOSE GLOTTIS stop. An example of such a derivation is given below:

(3.56) Example derivation of underlying geminate WIDE GLOTTIS stop

Underlying representation

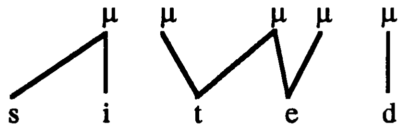
↓



↓

onset creation rule

↓



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WIDE GLOTTIS deletion rule

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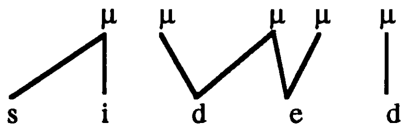
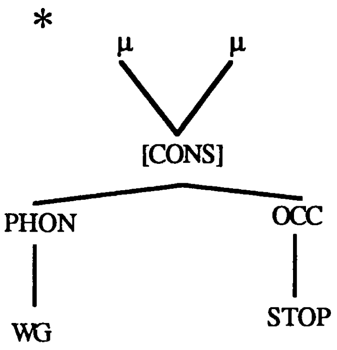


The surface form in the above derivation is in fact a Somali word, **siddeed**, meaning "eight". We must, however, assume that the underlying representation of this word is, in fact, /siddeed/ since there is no case in which anything other than the geminate **d d** surfaces. We shall therefore assume a morpheme structure constraint as follows:

(3.57) Geminate WIDE GLOTTIS stop morpheme structure constraint



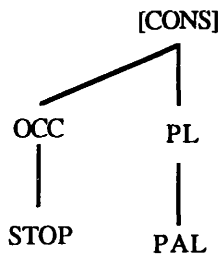
By preventing such underlying representations we prevent the possibility of such WIDE GLOTTIS geminates from ultimately surfacing as geminate CLOSE GLOTTIS stops by means of a "free ride" on the WIDE GLOTTIS deletion rule.

3.3.2.4.1. The case of j

It will be remembered from sections 2.2.1. and 2.4.1.1. that the segment represented as **j** is an affricate only on the surface. Underlyingly we assume it to be a palatal WIDE GLOTTIS stop. One argument we gave for this was that it patterns together with the WIDE GLOTTIS stops in that it does not occur at the end of syllables except in Arabic loan words which are marked. There is, however, an interesting fact with regard to **j**. This is that it never occurs underlyingly in a position which, following syllabification, results in its being at the end of a syllable, and thus it never potentially or actually undergoes the WIDE GLOTTIS deletion rule given above. In other words, there is no alternation between /j/ and another consonant in syllable final position as is the case with /t/ and /k/. This is a matter we need to address.

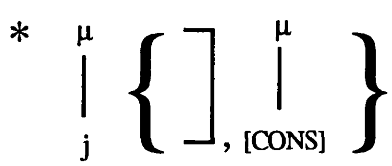
The rule we have assumed to resolve potential violations of the WIDE GLOTTIS constraint is the WIDE GLOTTIS deletion rule. If the WIDE GLOTTIS node is deleted from the underlying melodic representation of **j**, the resulting segment is not an underlying segment. It would in fact be the following:

(3.58) <u>The result of applying the WIDE GLOTTIS deletion rule to the underlying melody of j</u>



Following the application of the default rules as set out in section 2.4.1.1. the segment in (3.58) would surface as a voiced palatal stop, namely [ɟ] in the IPA notation. This means that, if the WIDE GLOTTIS deletion rule were allowed to apply to /j/, the resulting segment would violate the principle of structure preservation, since the structure in (3.58) is never found underlyingly. Thus, we may say that the form of underlying strings conspires in some way to disallow the underlying /j/ from being in a position where it would violate the WIDE GLOTTIS constraint because it is not able to undergo the WIDE GLOTTIS deletion rule. This constraint can be formalized as follows:

(3.59) <u>Constraint on the position of /j/ in an underlying string</u>



This constraint states that the melody **j** and its associated mora are prohibited from occuring before either a morpheme boundary or any segment which is associated with a mora and includes the feature CONSONANTAL in its root node. Note that Arabic loanwords are assumed to be marked for not being subject to this constraint.

Although this is our synchronic account of this behaviour in Somali, it is important to bear in mind that diachronically speaking this distribution of **j** is the result of the history of this segment in East Cushitic. All instances of **j** in Somali words which are not loan words are cognates of Proto-East Cushitic *g, *d'$_1$ or *k' as proposed by Sasse, H.-J. (1979) which have become palatalized due to their preceding *e or *i, thus explaining the fact that they always occur in syllable initial position. Note that the fact that they preceded *e or *i is a diachronic explanation and thus cannot constitute an explanation in our synchronic account here. Further details on these matters are to be found in Sasse, H.-J. (1979), see especially pages 18, 29 and 47.

3.3.2.4.2. The case of m

Let us now turn to the case of **m**, which is also restricted in terms of the position it may hold in a string. The following data show the relevant facts:

(3.60) <u>Examples of words showing aspects of the behaviour of m</u>

(a)

gacan	"hand"	gacmo	"hands"
nin	"man"	niman	"men"
dhan[1]	"Drink!"	dhama	"Drink! (pl.)"

(b)

dhambaal	"message"		
hambalyo	"congratulations"		
inan	"boy"	inammo	"boys"

As we can see from the examples in section (3.60a), **n** alternates with **m** when it occurs at the end of a word. Thus, we can say that no word in Somali ends in **m** on the surface. Whereas this is also the case with **t** and **k**, there is an important difference in the behaviour of **m**; namely, that it is found at the end of syllables as in the three examples in (3.60b) above, while **t** and **k** are never found at the end of syllables. As we can see from these examples, however, the syllable final examples of **m** all occur when the following segment is a labial consonant. Thus, we shall assume that such cases are due to the fact that the nasal is specified LABIAL by virtue of this following consonant. That is to say, we shall assume that the syllable final consonants in these examples are not labial nasals but alveolar nasals and surface as labial nasals due to the process of PLACE node spreading to a nasal from a following consonant. Note that the case of **inammo** is assumed also to be such a case. Thus, we can formulate a lexical constraint on syllable final labial nasals, stating that they may not occur at the end of syllables:

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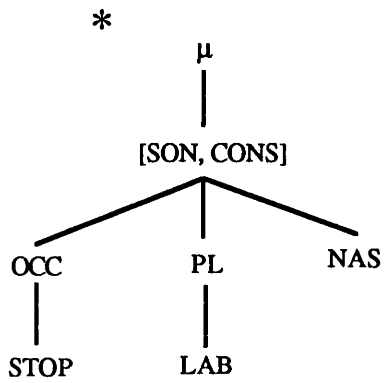
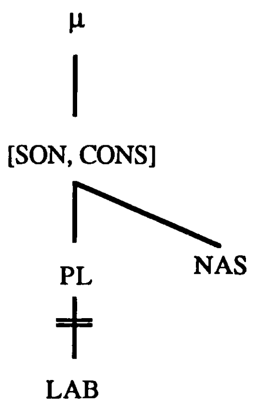
1 Note that this word is only used when drinking milk. The word used for drinking other liquids is **cab**.

(3.61) <u>Constraint on syllable final labial nasal</u>



Potential violation of this may then be resolved by a rule of LABIAL deletion formalized as follows:

(3.62) <u>Nasal LABIAL deletion rule</u>



This rule is a lexical rule as is the WIDE GLOTTIS deletion rule and is also assumed to be part of the syllabification process in the same way as the WIDE GLOTTIS deletion rule. We must also assume it applies following the onset creation rule but before the margin creation rule. The cases of geminate **m m** are then cases in which the post-lexical rule of nasal place assimilation has applied.

3.3.2.5. Summary of Somali specific syllabification

We have now discussed various prosodic phenomena in Somali and have arrived at certain conclusions regarding the explanation of these phenomena. In this section we shall bring together the various points from the explanations and set out the Somali specific process of syllabification.

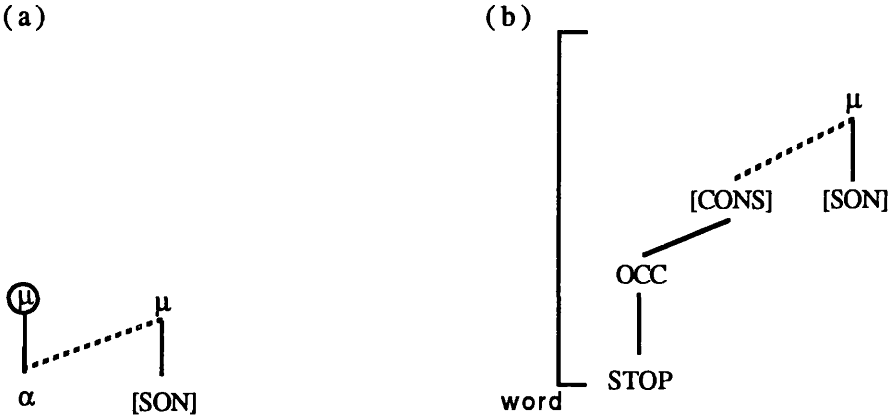
As far as underlying representations are concerned, the type of underlying representation we are assuming is that proposed by Hyman. We are therefore assuming that in Somali all melodies in an underlying representation are associated with moras. Long segments, both consonants and vowels, are represented by association with two moras.

The first rule which forms part of the syllabification process is the onset creation rule. Following Hyman, L. (1985) (see p.16) we shall assume that this is a level I rule. We shall, however, also assume that its domain of application extends to level II. This is not an arbitrary assumption but follows from the assumption that the process of syllabification in the lexicon is cyclic. Thus, it is assumed to apply following any occurrence of the concatenation of any two strings. This, of course, occurs at level II, the inflectional level, as it does at level I. The formalism we have assumed for the onset creation rule is repeated in (3.63a).

A further rule which we must formalize here is that of the insertion of the glottal stop when an onset is not present. We have referred a number of times to the process of default glottal stop insertion due to the condition that all syllables must have onsets in Somali. The formalization of this rule is given in (3.63b). The reason we are assuming the left bracket to be part of the structural desctiption of the rule is to allow the rule to apply only at the beginning of words which begin underlyingly with a vowel. In all instances of word internally the melody for onsets is provided by the string itself. The specification of the OCCLUSION node and the feature STOP accounts for the surface melody being a stop, the other feature specifications are the result of the complement and default rules we have given in section 2.4.1.1.

(3.63) Somali specific onset creation rule and glottal stop insertion rule

(a) (b)



Where α represents any melody of sonority <3[1]

Following on from onset creation is the process of syllable node projection. We shall assume that the final form of a syllabified form is analogous to the types of representations given in Hyman, L. (1985) (see pp.17-18). Hyman does not propose any particular algorithm for syllable projection, he simply states that moras "provide the basis for syllable construction" (Hyman, L. (1985) p.17), following which he gives a diagram showing the most common syllable types.

We shall assume for Somali that syllable creation takes place according to a syllable template. This follows from ideas proposed by Ito, J. (1986) and developed in a moraic model by Pillinger, S. (1989). The lexical syllable template we shall assume for Somali is:

---

1 For details of the sonority hierarchy see section 3.3.2.2.1.

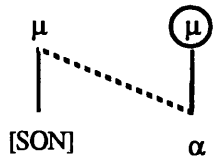
(3.64) <u>Lexical syllable template for Somali</u>

$$_{\sigma}[\ \mu\ (\mu)\ (\mu)\ (\mu)]$$

In his syllable template for Rendille Pillinger includes reference to the melodic tier. This is not necessary in the Somali template of underlying representations assumed here. The two syllable patterns which we need to make sure are ruled out are the following, given here informally using CV notation: *CVVV and *CVCC. Both of these are ruled out by the fact that they never occur in underlying representation. There are no vowel melodies associated with three moras underlyingly, equally we have ruled out the possibility of there being a bimoraic vowel followed by a semivowel. Also, there are no underlying consonant clusters of a length greater than two. This, in conjunction with the onset creation rule, prevents the occurrence of tautosyllabic consonant clusters. Given these underlying constraints, we are able to assume the syllable template as above (3.64).

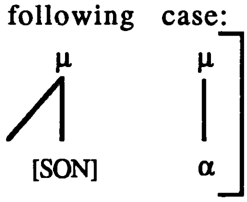
The next stage of the syllabification process we need to consider is the margin creation rule. The formalism for this rule is repeated below:

(3.65) <u>The Somali margin creation rule</u>



1. The margin creation rule always applies at level I when α has a sonority index of 1.

2. The margin creation rule applies in the following case:



where α has a sonority index of 2

3. The margin creation rule may apply post-lexically for the purposes of poetic metre when α has a sonority index of 2[1].

Aside from the formalism of margin creation, however, we do also need to look at the issue when the margin creation rule applies. It has been proposed by Pillinger, S. (1989) (see p.168) that the margin creation rule applies at the interface between the lexicon and the post-lexical components: "Rendille treats non-onset consonants differently at different stages of the derivation (allowing them to have 'weight' lexically but not postlexically)" (Pillinger, S. (1989) p.168. We shall see in Somali that this is not the case. Let us look at the various prosodic phenomena we have discussed in terms of whether they occur before or after the margin creation rule has applied.

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[1] In the discussion in 3.3.2.2.2. the last two statements were in the other order. This was because they were dealt with in that order in the discussion. This matter has no relevance to the discussion in that section or here. The order here reflects the intrinsic order in which the processes actually occur.

reduplication vowel deletion WIDE GLOTTIS deletion	these phenomena depend on CVC as heavy ∴ before margin creation application
tonal accent assignment poetic scansion	these phenomena depend on CVC as light ∴ after margin creation application

We can see from this that there are two processes which occur following application of the margin creation rule the system of poetic scansion and tonal accent assignment. The system of poetic scansion must be assumed to be a process which applies very late in the phonology and certainly at the post-lexical stage. Furthermore the instances of tonal accent assignment which are dependent on the syntax are also assumed to occur post-lexically. As to the processes which are dependent on CVC syllables being heavy, all of these are lexical processes. What prevents us from assuming the margin creation rule to apply as forms exit the lexicon is the fact that certain tonal accent assignment rules are lexical as we discussed in section 3.3.1.1.

Let us now return to see how the processes of vowel deletion, WIDE GLOTTIS deletion and reduplication interact with the process of syllabification.

Vowel deletion as formalized in (3.50) above will be assumed to apply before the projection of the syllable node since the structural description of this prosodic rule makes no reference to the syllable node. As to the WIDE GLOTTIS deletion rule, this we have assumed to be an integral part of the syllabification process see section 3.3.2.4. for details. It remains for us to see how the process of reduplication is integrated. Looking back to the explanation of reduplication in section 3.3.2.1. we see that the syllable prefix associates with the maximum number of moras in the copy of the melody plus mora string of the simple form. This means that we must assume that the projection of the syllable node occurs prior to application of the margin creation rule. Thus the resulting reduplicative prefix is essentially the product of a specific instance of the syllabification process itself which is initiated by the process of reduplication. We see then that all of these processes are in some way integrated with the syllabification system and provide us with the means to make a proposal as to how the margin creation rule fits into the whole process. We shall assume that the margin creation rule is part of the syllabification process and that it is the final part of that process. Thus it applies after all other aspects of syllabification. This explains why CVC syllables are heavy in those circumstances we have discussed and why, for the purposes of tonal accent assignment and poetic scansion, CVC syllables are light.

Note that this does not affect the optional application of the margin creation rule at the post-lexical level for the purposes of poetic scansion. This particular application is regarded as being part of the particular set of pronciples which hold specifically for poetry.

We shall assume that all syllabification within the lexicon is cyclic. That is to say, we shall assume that when a morphological concatenation process or a phonological process applies to a lexical string then the syllabification process applies. When a string which has already been syllabified undergoes a morphological concatenation or a phonological process, then the syllable nodes which have been created by a previous application of the syllabification process are deleted. Following this, the process of syllabification begins again with any possible applications of the onset creation rule and the subsequent construction of syllables followed by application of the margin creation rule. This reapplication will be termed resyllabification. Note that any moras which have been deleted by a previous application of the onset creation rule do not reappear in the representation prior to resyllabification.

This then concludes our consideration of the syllabification process in Somali and also concludes the discussion of the prosodic aspects of the model of Somali phonology we are proposing here.

Chapter 4. The segmental phonology of inflection in Somali

4.1. The inflectional morphological data and underlying representations of the various inflectional affixes

In this chapter we shall look at aspects of the phonology of inflection in Somali. This will involve proposing explanations for various phonological phenomena which occur as the result of inflectional suffixation as well as proposing underlying representations for various inflectional affixes involved. Both verbal and nominal inflection will be discussed, albeit within the following limits. In the verbal system only the inflection of the root form suffix verbs will be discussed. The phonological characteristics of the prefix conjugation will not be dealt with, nor will the inflectional characteristics of derived form verbs. The limits imposed here are for practical reasons, ie. to keep the amount of data within reasonable limits. It is hoped that insights provided by the model of phonology proposed here will prove useful in looking at other aspects of Somali phonology in the future. As far as tonal accent is concerned, we shall look at this only when it proves necessary to do so or for the sake of completeness, as, for example, in the case of the imperative form.

The chapter will comprise two major sections. In the first section the morphological patterns will be given along with underlying representations of the various affixes. This will also include explanations of phonological phenomena which occur in various paradigms but which are not dependent on any segment found in the root of the verb; that is to say, phonological matters which pertain specifically to the inflectional suffixes only and are not influenced by the particular root they happen to be appended to.

The addition of inflectional affixes will be assumed to occur via the application of word formation rules which will be of the following form, following Kiparsky, P. (1982) p.134.

Insert A in env. $[Y \_\_ Z]_X$

Thus, for example, the rule adding the 1st person plural marker suffix will be given as follows:

Insert /n/ in env. $[X \_\_]_{V,\ 1st\ p.pl.}$

As far as the phonology is concerned there are two points which must be made clear with regard to these rules. Firstly, the affix in a word formation rule is given not in its feature geometric form but in the form of an orthographic symbol or symbols. This symbol represents the feature geometric form of the underlying representation of the segment in question. The second point which must be mentioned is the matter of the form of the word formation rules. It has been pointed out[1] that these are essentially "item and process" rules whereas autosegmental phonology, a version of which we are assuming here, is essentially "item and arrangement" in its approach. Whilst it is here accepted that this may seem a little incongruous, the fact that the phonological theory assumed here comprises both rules, which are processes as well as representations, leads us to assume that a process approach to morphology is not too incongruous. Furthermore, although morphology is much "closer" in lexical phonology to the phonological component than in earlier

1 Personal communication by Prof. R.J. Hayward.

classical models of generative phonology, the precise formulation of morphological rules does not have a bearing on the arguments for and against the formalization of phonological rules and representations as discussed in this thesis.

The second major section of this chapter will deal with phonological processes which are dependent on the melodic and prosodic nature of the root forms to which the inflectional affixes are suffixed. Rules will be proposed and arguments provided for some of the processes, showing them to be more explanatorily adequate, given the phonological representations we have assumed here, than other possible explanations. In order to show that the rules assumed here are more adequate "straw man" arguments will sometimes be set up.

As mentioned above, this section will provide verbal morphological data and propose underlying representations for the various affixes. In this way we shall have a solid basis from which to approach the analysis of the phonological phenomena we shall discuss. Matters pertaining to nominal morphology are introduced in the second section as appropriate. The basis for this outline of suffix verb morphology is Saeed, J.I. (1987). Other important works which have also been referred to and to which the reader may refer for further information are Andrzejewski, B.W. (1968) and Lamberti, M. (1988). Saeed summarizes the tenses, moods and aspects of the Somali verbal system as follows:

Tenses: Past, Simple, Future

Aspects: Simple, Progressive, Habitual

Moods: Declarative, Interrogative, Imperative, Conditional, Optative, Potential

Saeed, J.I. (1987) p.75

Since not all the logically possible combinations of these tenses, aspects and moods occur, Saeed provides twelve paradigms as follows:

1. Imperative	7. Present progressive
2. Infinitive	8. Future
3. Past simple	9. Conditional
4. Past progressive	10. Optative
5. Past habitual	11. Potential
6. Present habitual	12. Subordinate clause

Saeed, J.I. (1987) p.75

Of these paradigms we shall look at the following: the imperative, the infinitive, the past simple, the present habitual, the past and present progressive, the optative and the potential. We shall look at all of these in the positive.

4.1.1. The imperative

The singular imperative of root verbs in Somali is the form which resembles the underlying verb stem form more than any other. The only difference between the underlying representation and the surface form is the presence of the tonal accent on the penultimate mora. There is no person distinction in the imperative, all imperatives being in the 2nd person. There is, however, a marker for the plural, /-a/, and the negative, /-in/. The negative imperative also involves the negative imperative particle, **ha**.

The following are the imperative forms of the verb **duub**, "to fold, roll up":

(4.1) Imperative forms of **duub**

sg. imper.	**dúub**
pl. imper.	**duúba**
neg. sg. imper	**ha duúbin**
neg. pl. imper.	**ha duubína**

It can be seen from table (4.1) that the plural marker is /-a/ in both positive and negative and the negative marker is /-in/ plus the particle **ha** in both singular and plural. What is more, the tonal accent is always assigned to the penultimate mora, whatever suffixes may be appended to the root form. If a particular verb comprises only one mora, then that mora is assigned the tonal accent. Thus, for example, the verb **dhis** "to build" has the imperative form **dhís** "Build!". Given this behaviour, the order of suffixation and tonal accent assignment on the underlying representation will be assumed to be as follows:

(4.2) Order of suffixing rules and tonal accent assignment in the imperative

1. Negative marker suffixation
2. Plural marker suffixation
3. Tonal accent assignment

These morphological processes must be assumed to take place at the inflectional level (level II) in the lexicon, since they are quite clearly inflectional processes. The morphological word formation rules which assign the suffixes are set out below:

(4.3) Word formation rules assigning imperative suffixes

(a) Insert /a/ in env. $[X \_\_]_{V\ \text{pl. imper.}}$
(b) Insert /in/ in env. $[X \_\_]_{V\ \text{neg. imper.}}$

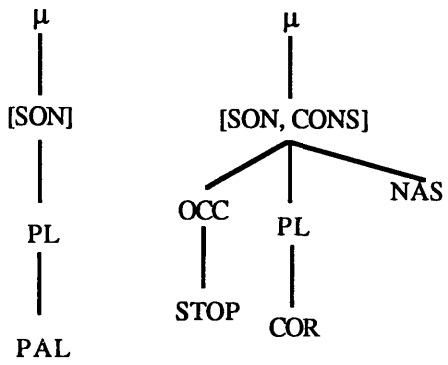
Thus, the following is the derivation, given informally, for the negative plural imperative (which involves all suffixes as well as the tonal accent) of the verb **duub**, "to fold, roll up":

(4.4) Derivation for the negative plural imperative

1. Underlying representation	duub
2. + Negative marker	duub-in
3. + Plural marker	duub-in-a
4. + Tonal accent	duub-ín-a

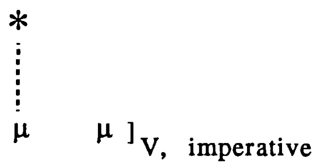
The addition of the particle **ha** in the negative imperative is assumed to be accounted for by syntax since certain preverbal words such as preverbal prepositions and deictic particles are, when present in an imperative sentence, placed between **ha** and the verb form. The feature geometric nature of the suffixes inserted by the word formation rules are given below along with the formalization of the tonal accent assignment rule.

(4.5) <u>Underlying representation of the negative imperative marker</u>



(4.6) <u>Underlying representation of the imperative plural marker</u>

(4.7) <u>Formalization of the rule of imperative tonal accent assignment</u>



It is to be noted that, given the model of representation we are assuming here, these underlying representations are very economical and the tonal accent assignment rule is very readily expressed.

4.1.2. The infinitive

The infinitive is marked in root form verbs by the vowel /i/ as a suffix. Thus, the infinitive of the verb **duub** is **duubi**. The underlying representation of this suffix may straightforwardly be assumed to be as below:

(4.8) Underlying representation of the infinitive suffix

$$
\begin{array}{c}
\mu \\
| \\
[\mathrm{SON}] \\
| \\
\mathrm{PL} \\
| \\
\mathrm{PAL}
\end{array}
$$

The word formation rule assigning this suffix will be assumed to be as follows:

(4.9) Infinitive formation rule

Insert /i/ in env. $[X \_\_]_{V_{\text{root, infinitive}}}$

The derived forms of verbs form the infinitive in a different way which we shall not deal with here.

4.1.3. The present habitual

This paradigm is the first we shall look at which conjugates for all persons and numbers. We shall therefore discuss not only suffixal characteristics relevant to this paradigm but also certain characteristics of the inflectional suffixes which are relevant to other paradigms since the person markers are shared. The present habitual is exemplified below:

(4.10) The present habitual paradigm

1st p.sg.	duub-aa	"I fold"
2nd p.sg.	duub-taa	"you fold"
3rd p.m.sg.	duub-aa	"he folds"
3rd p.f.sg.	duub-taa	"she folds"
1st p.pl.	duub-naa	"we fold"
2nd p.pl.	duub-taan	"you fold"
3rd p.pl.	duub-aan	"they fold"

It is clear from the paradigm given above that the verb endings may be further broken down into regular underlying morphemic constituents. This is necessary to avoid redundancy at the level of underlying representation, following the assumption that only distinctive information is represented in an underlying representation. If, for example, we assumed the endings to be integral underlying representations themselves, that is to say, that the morpheme for 2nd person singular present habitual was represented underlyingly as /-taa/ and the morpheme for 2nd person plural present habitual as /-taan/, then we would be assuming a system in which there are redundancies. Firstly, the representation for the tense part, /aa/, of the ending would be repeated in each underlying representation. Secondly, the person marker /t/ would be repeated in each form of the 2nd person and, although there are only two forms which involve this person marker, the principle of not repeating redundant information in underlying representations should be upheld in this case as in any other. Thus, the /t/ 2nd person marker is regarded as an underlying representation in its own right. The 3rd person feminine marker will be assumed to be a separate morpheme, /t/. This is not a case of redundancy but is simply a case of coincidence in that the two morphemes are identical in their melodic structure[1].

We see then that the breaking up of the inflectional endings of Somali into constituent parts is required theoretically because of the potential redundancies alluded to above. This breaking up of the endings, however, has been done previously in Andrzejewski, B.W. (1968). In this work Andrzejewski provides a detailed and highly observationally adequate treatise of the inflectional endings of suffix verbs in Somali. He shows in this work how the inflectional endings (what he calls terminations) are composed of three constituents: intermedium, link and ending. The intermedium is the progressive marker (see section 4.1.6.), the link is the person marker and the ending is the tense/mood marker. The various inflectional endings of the present habitual are set out in diagram (4.11) below with their constituent parts. Since the details of our discussion of the form of the various constituents differs in substance from Andrzejewski's treatment, we shall provide the

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1 An argument which might be proposed, stating that this is not coincidence, would run along the lines that the consonant marker /t/ is not marked as such but is a default morphemic marker for verbal inflection. If this were accepted, there would still be an element of coincidence in the fact that both the 2nd p. and the 3rd.p.f. are marked by this default consonant. We shall not pursue this further here.

various constituents with the labels we are using and not refer to them using his labels.

(4.11) The inflectional endings of the present habitual, showing the constituent parts

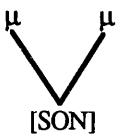
	person marker	tense/ mood marker	number marker	ending
1st p.sg.	-	aa	-	aa
2nd p.sg.	t	aa	-	taa
3rd p.m.sg.	-	aa	-	aa
3rd p.f.sg.	t	aa	-	taa
1st p.pl.	n	aa	-	naa
2nd p.pl.	t	aa	n	taan
3rd p.pl.	-	aa	n	aan

Our task now is to provide formal underlying representations of the various ending constituents in the tables above. Most of these are straightforward. There is, however, one particular phonological point which needs to be addressed and explained, namely, the reason for the lack of a number marker in the 1st plural form. Before we go on to look at this, however, we shall discuss the tense marker and the other person markers.

4.1.3.1. The present habitual tense marker

Since this tense marker is the same throughout the whole of the paradigm, we can only assume that the underlying representation of the marker is the same as the surface representation. The only difference between the formal representations, then, of the underlying representation and the surface representation is that accounted for by the theory of underspecification. We can therefore assume that the underlying representation of the present habitual tense marker is as given below:

(4.12) Underlying representation of the present habitual tense marker

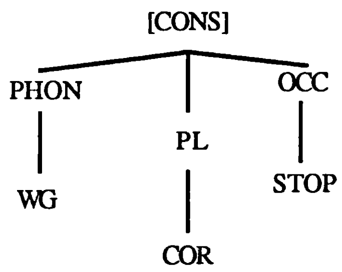


The word formation rule inserting the present tense marker is given below in (4.21).

4.1.3.2. The person markers of the present habitual and of other paradigms

The underlying representations of the person markers, other than the 1st person plural, are straightforward. We shall assume that there is no melodic representation for the 1st person singular, the 3rd person masculine singular or the 3rd person plural. As for the 2nd person marker, it will be assumed to have the following underlying representation. This representation is assumed to coincide with that of the 3rd person feminine singular also.

(4.13) <u>The underlying representation of the 2nd p. marker and the 3rd p.f.sg. marker</u>



The word formation rules which will be assumed to insert this representation as the person marker will, of course, be different in the two cases. The rules are given below:

(4.14) <u>Word formation rules introducing the 2nd p. and 3rd p.f.sg. person markers</u>

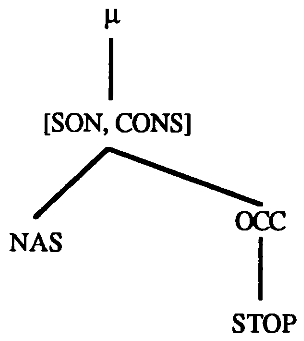
Insert /t/ in env. [X ___ $]_{V,\ 2nd\ p.}$
Insert /t/ in env. [X ___ $]_{V,\ 3rd\ p.f.sg.}$

4.1.3.3. <u>The plural marker</u>

When referring to the plural marker we are here referring to the /-n/ suffix which occurs on the 2nd and 3rd person plural forms. We shall deal with the matter of the 1st person plural marker in section 4.1.3.3.1.. From the paradigm above, we see that the plural marker is the same in each instance that it surfaces. Therefore, we can assume that the underlying representation is the underlying equivalent of the surface representation, ie. that given in (4.15a). In (4.15b) we give the word formation rule which introduces this suffix.

(4.15) <u>The underlying representation of the plural marker</u>

(a)



(b) Insert /n/ in env. $[X \_\_]_{V,\ pl.}$

4.1.3.3.1. <u>The 1st p.pl. and the plural marker</u>

We shall now turn our attention to the matter of the 1st person plural marker. There are two interrelated matters which need to be explained with respect to this marker. Firstly, the phonological melody, /n/, filling the person marker "slot", is not found in the 1st person singular. Secondly, the plural marker, /n/, is not present at the end of the 1st person plural ending as it is in the 2nd and 3rd persons. This is shown in the following breakdown of plural endings:

(4.16) <u>Breakdown of the plural endings</u>

person	form	ending
1st	duubnaa	n + aa + 0
2nd	duubtaan	t + aa + n
3rd	duubaan	0 + aa + n

Given the fact that what appears to be the 1st person plural marker is identical to the plural marker, two explanations suggest themselves. Firstly, it may be that the plural marker is present in the 1st person plural, surfacing before the tense marker for some reason; that is to say, the /n/ in the ending is the same plural marker /n/ as occurs in the 2nd and 3rd persons. Secondly, it may be that the /n/ in the person marker position is actually the person marker, the plural marker being prevented from surfacing for some reason. This second possibility assumes, then, that the 1st person plural marker and the plural marker are coincidentally identical; which is not a problem. However, if we were to assume this second possibility, we would also have to account for the lack of a person marker in the 1st person singular.

Let us begin by exploring the first possibility. A hint as to a possible explanation along these lines has been provided in an article by Fulmer, S.L. (n.d.) entitled, "Dual-position affixes in Afar: An argument for phonologically-driven morphology". In this article Fulmer discusses the position of various morphological affixes in Qafar[1], including the 1st person plural affix, the discussion being particularly pertinent to the Somali case as Qafar is also a Lowland East Cushitic language, spoken in areas adjacent to where Somali is spoken in the eastern part of the Horn of Africa, specifically eastern Ethiopia, southern Eritrea and northern and western Djibouti. Also of particular interest in our context is the fact that the 1st person plural affix which Fulmer discusses is /n/, which is uncontroversially related to the /n/ in Somali.

In Qafar there is a much larger set of verbs which take inflectional prefixes than in Somali. The majority of verbs in Qafar, however, are

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1 The q here is the orthographic symbol for the voiced pharyngeal fricative in Afar and the language name is therefore more correctly spelt Qafar.

still verbs conjugating with suffixes (see Hayward, R.J. and Orwin, M. (1992) for some discussion on this matter). Fulmer accounts for this synchronically with an analysis involving "movement" of underlying suffixes. We shall only look at Fulmer's analysis of the 1st person plural marker.

In Qafar the plural marker in the 1st person plural may occur as a prefix or as a suffix. The following data taken from Fulmer illustrate this:

n - ookom - é "we won"
pl. won perf.
ab - n - á "we do"
do pl. impf.
Fulmer, S.L. (n.d.) p.5

In **nookomé** we see that the /n/ 1st person plural marker is prefixed to the verb stem whereas in **abná** the /n/ is part of an inflectional suffix. This particular pattern of distribution of an affix is accounted for by Fulmer in terms of affixes, labelled dual position affixes, which may appear in one position or another. The factor determining the position in which a dual position affix surfaces is the initial segment of the stem. If the stem begins with any of the vowels /e,i,o,u/, then the affix surfaces as a prefix. If, on the other hand, the stem begins with the vowel /a/ or with a consonant, then the affix surfaces as a suffix. Fulmer argues that the plural suffix, /n/, (analogous to the Somali plural marker /n/) is one of these dual position affixes but that it only displays this behaviour in the 1st person. That is to say, it only occurs as either a suffix or a prefix in the 1st person plural. The distribution of the plural marker in the 2nd and 3rd persons is characterized by the fact that it always surfaces as a suffix, never as a prefix. For example:

kaql- aa- ná[1] "they wash"
wash impf. pl.

y- uktub- ee- ní "they wrote"
he write perf. pl.
Fulmer, S.L. (n.d.) p.5

The plural marker in Qafar, then, may occur as a prefix or as a suffix in the 1st person but only as a suffix in the 2nd or 3rd persons. The reason given by Fulmer to account for this behaviour is that, at the stage in the derivation when the plural marker is affixed, the 2nd and 3rd person markers have already been added as prefixes to the verb base. This can be seen in the example **yuktubeení** above in which the verb stem is vowel-initial and the person marker has been suffixed to it. Thus, phonologically speaking, when the plural marker is appended, the base is consonant initial and a dual position affix may never be prefixed to a consonant initial base. Without further discussion of the Qafar case here we shall consider whether an analogous explanation is adequate for Somali.

As soon as we turn to Somali we notice a big difference to Qafar which leads us to suspect a similar analysis will not be appropriate. This difference is that the prefixing verbs in Somali are a highly restricted and marked set. However, the spirit of Fulmer's analysis may still lead to an explanation. Let us suppose that the inflectional endings in Somali are derived prior to suffixation to the stem. That is

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1 Note the vowel following the plural marker /n/ is determined by the vowel immediately preceding the /n/: if this is /i/ or /u/ then no final vowel is present, if the preceding vowel is /e/ the final vowel is /i/, if the preceding vowel is /o/ the final vowel is /u/ and if the preceding vowel is /a/ the final vowel is /a/.

to say, that the whole of the ending is formed from the various constituent parts and subsequently affixed to the verb stem. Given this, it can be posited that the 2nd and 3rd person markers, assuming a 3rd person marker exists (see below), fill a slot which is empty in the 1st person, thus allowing the plural marker to fill that slot. In other words, the 1st person marker is assumed to be zero and, in order for the whole ending to be derived as a well-formed syllable, the plural marker /n/ must be said to attach to the left-hand side of the vocalic tense marker as the onset of the syllable of which the tense marker vowel forms the moraic element. This is exemplified below where the 1st person plural and 2nd person plural endings are derived informally according to these ideas.

(4.17) <u>Informal derivation of 1st and 2nd p.pl. endings</u>

	1st p.	2nd p.
+person marker	0	t
+tense marker	aa	t - aa
+plural marker	n - aa	t - aa - n

In (4.17), then, we see that in order for the whole ending to be derived as a well-formed syllable, the plural marker /n/ surfaces as the onset of the syllable based around the vocalic /aa/ tense marker. In the 2nd person, on the other hand, the person marker forms the syllable onset and thus the plural marker surfaces in syllable final position. This is a similar analysis to Fulmer's except for the fact that here we are dealing only with the inflectional ending whereas Fulmer takes into account the verb form as a whole, ie. the stem plus affixes.

The first problem with this analysis is why should the whole inflectional ending be separately derived prior to suffixation to the stem? There is no further independent motivation for this in the language. A second problem which arises with this account is the matter of how to handle the 3rd person. Referring back to table (4.11) we see that, although the 3rd person feminine singular marker has a surfacing melodic representation, there is no phonological segment marking the 3rd person masculine singular or the 3rd person plural; that is to say, that whereas the 2nd person plural inflectional ending surfaces with an initial consonant producing a well-formed syllable (-taan), the 3rd person plural form does not surface with an onset consonant. Given this, we would have to answer the question why the plural marker /n/ does not surface in syllable onset position. The only hope of reconciliation is to assume that, underlyingly, a consonant is present. This assumption may be motivated by the presence in the prefix verbs of a consonant, /y/[1], in the person marker slot in the 3rd person which in this restricted group of verbs is a prefix. This is shown in the past simple of the verb **idhi**, "to say", below:

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1 Note that we shall assume this is the segment with the root node specified [SONORANT,CONSONANTAL] given in (3.37). It is a possibility that in a case such as this when this melody stands on its own it is the SONORANT and SONORANT only specification ond the structural description of the onset creation rule is met due to there being two separate melodies. The obligatory contour principle would need, however, to be taken into account as to how it would interact with the representations and the morphological concatenation. We shall not discuss this here but accept it is an area which may be fruitfully discussed in future work.

(4.18) <u>The past simple paradigm of the verb **idhi**</u>

1st p.sg.	0 - idhi	idhi
2nd p.sg.	t - idhi	tidhi
3rd p.m.sg.	y - idhi	yidhi
3rd p.f.sg.	t - idhi	tidhi
1st p.pl.	n - idhi	nidhi
2nd p.pl.	t - idhaahdeen	tidhaahdeen
3rd p.pl.	y - idhaahdeen	yidhaahdeen

We can see from this paradigm that the 3rd person masculine singular and the 3rd person plural are both marked by the person prefix marker **y**. Returning to the suffix verbs we might assume that this underlying **y** melody, found in the prefix conjugations, is also present at certain stages of the suffix verb derivations and is subsequently lost. This would mean that at the stage of the derivation at which the plural marker is affixed, the onset slot of the syllable formed by the tense marker would be taken up by the person marker /y/. Such a possible derivation (of only the inflectional ending) is given very informally below:

(4.19) <u>Informal derivation of the 3rd p.pl. inflectional ending</u>

Person marker	y
+ Tense marker	y - aa
+ Plural marker	y - aa - n
Loss of the 3rd p. marker	aa - n

This, however, is a very poor explanation. There is no other evidence whatsoever that the /y/ is ever present in the inflectional ending during any stage of its derivation and this, in conjunction with the very weak argument for deriving the inflectional ending separately prior to adjunction with the verb stem, brings this whole straw man argument tumbling down.

Let us approach the problem from a different angle, moving away from the assumption that the **n** of the 1st person plural is the same **n** as the plural marker and assuming that the marker for 1st person plural is **n** and the marker for plural is, coincidentally, **n**. We are assuming, then, that the two markers are totally separate lexical entries which just happen to have the same melodic specification. It must be reiterated here that we are dealing with Somali phonology synchronically and that the matter of whether these two markers may be related diachronically does not enter our argument, although a note on the diachronic aspects is given below. We shall see that, in assuming this to be the case, we can account for the two problems associated with the 1st person plural marker in a principled way. The explanation of the problem lies in the assumption of **n** as being the 1st person plural marker and the assumption of the elsewhere condition as proposed in Kiparsky, P. (1982). This is stated as follows:

> Rules A, B in the same component apply disjunctively to a form ϕ if and only if
> (i) The structural description of A (the special rule) properly includes the structural description of B (the general rule)
> (ii) The result of applying A to ϕ is distinct from the result of applying B to ϕ
> In that case, A is applied first, and if it takes effect, then B is not applied.
>
> Kiparsky, P. (1982) pp.136-137

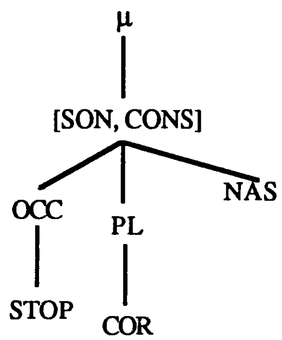
In our case we assume that the 1st person plural marker and the plural marker concatenation rules are formulated as follows:

(4.20) Word formation rules introducing the 1st p.pl. and the plural markers

(a) Insert /n/ in env. $[X \_\_]_{V,\ \text{1st p.pl.}}$

(b) Insert /n/ in env. $[X \_\_]_{V,\ \text{pl.}}$

(c)



The structural description of rule (4.20a) is properly included in rule (4.20b) and the results of applying the rules are distinct. This distinction is the result of the order in which the rules are applied. This order is as follows: person marker suffixation, tense marker suffixation, plural marker suffixation. The word formation rule introducing the tense marker is given in (4.21).

(4.21) Word formation rule introducing the present habitual tense marker

Insert /aa/ in env. $[X \_\_]_{V,\ \text{present declarative}}$

This rule is given as being present declarative since it also applies in the case of the present progressive. Note also that the formal representation of the 1st person plural marker is in (4.20c).

Given all of this, we see that the elsewhere condition prevents the plural marker suffixation rule from applying after the 1st person plural suffixation rule has already applied. We may illustrate this with the following derivations of the verb forms **duubnaa**, "we fold", and **duubaan**, "they fold":

(4.22) Derivations of the 1st p.pl. and the 3rd p.pl. forms of the verb **duub**

	1st p.pl.	3rd p.pl.
UR	duub	duub
+person	duub-n	duub-0
+tense	duub-n-aa	duub-0-aa
+plural	duub-n-aa-0	duub-0-aa-n

Before leaving this matter we shall look again briefly at the prefix verbs and explain something which is apparent in the table (4.18) above. The inflectional characteristics of these prefix verbs are shown in a different way to the suffix verbs. The person markers are, as we have seen, in the form of prefixes and tense or mood is marked by vocalic change in the verb root as well as by suffixes. As with the suffixing verbs, though, we see that the plural verbs have a specific plural marker, all except for the 1st person plural. Although we are not going to look into the details of the prefix verbs here we may easily explain this phenomenon in the same way as we explained the matter in the suffix verbs; namely, that the structural description of the word formation rule which affixes the /n/ prefix to these verbs is properly included in the structural description of the word formation rule which affixes the plural endings to the prefixing verbs. Although we have not detailed the actual word formation rules pertinent here, given the assumption that we have separate word formation rules for the suffixation of the 1st person plural marker and the plural marker, then it must follow that the relationship between these rules is the same as that between the rules for the prefix verbs. Thus, proper inclusion of the plural marker suffixation in the 1st person plural rule along with the distinction in the result after application means that the elsewhere condition prevents the plural marker from being suffixed to the verb stem.

Before leaving this matter a note on the diachronic facts relating to the 1st person plural marker would be of interest. Hetzron, R. (1974) addresses this matter, giving the historical account of the plural marker **-n** as follows. The **-n** which functions now as a plural marker in Cushitic languages is explained by Hetzron as having been a modal marker which has since lost its modal value. This argument is proposed in light of the fact that in Semitic languages **-n** is a modal marker, for example in Arabic and Soddo.[1] The Arabic paradigm is given here as an illustration:

1st p.sg.	albas-u	1st p.pl.	nalbas-u
2nd p.m.sg.	talbas-u	2nd p.m.pl.	talbasuu-na
2nd p.f.sg.	talbasii-na	2nd p.f.pl.	talbas-na
3rd p.m.sg.	yalbas-u	3rd p.m.pl.	yalbasuu-na
3rd p.f.sg.	talbas-u	3rd p.f.pl.	yalbas-na

What is interesting from the point of view of the 1st person plural **n** is that in the Semitic conjugations the modal marker **n** is only found in the 2nd and 3rd persons, ie. its distribution is identical to that in the East Cushitic languages under consideration here. The 1st person

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1 Soddo is a Northern Gurage language spoken in Ethiopia, see Bender, M.L. et al (eds) (1976) pp.28-29.

plural, in the Arabic paradigm at least, is essentially the same form as the singular except for the presence of the 1st person plural marker. It may be that the same explanation we have given for Somali is correct for these other cases.

The explanation assumed here to account for the lack of an overt plural marker in the 1st person plural is straightforward and is based on well motivated aspects of grammar. Furthermore, it is supported by the fact that we can account for similar facts in the prefix verbs in the same way.

4.1.4. <u>Past simple</u>

The paradigm for the past simple tense is given below:

(4.23) <u>The past simple paradigm</u>

1st p.sg.	duub-ay	"I folded"
2nd p.sg.	duub-tay	"you folded"
3rd p.m.sg.	duub-ay	"he folded"
3rd p.f.sg.	duub-tay	"she folded"
1st p.pl.	duub-nay	"we folded"
2nd p.pl.	duub-teen	"you folded"
3rd p.pl.	duub-een	"they folded"

The person and number markers in this conjugation are as in the present habitual which we have dealt with above and as such we need only discuss in this section the tense marker of the past simple tense. Before we move on to this, however, we shall first address an issue which occurs when we take the past simple and present habitual tenses together as positive indicative tenses.

One aspect of the inflectional marking of these two paradigms which might be regarded as redundant information is the prosodic information of the tense markers. The tense marker in both the past simple and the present habitual is made up of either a long vowel or a diphthong, that is to say, the tense marker is always bimoraic. Given this, we might suspect that there is some redundancy in underlying representation here, in that the bimoraic nature of the tense marker is redundant information and need only be stated once in the grammar. In other words, does the template '$\mu\mu$' exist separately from the melodic information with which it is associated in the surface form? A case may be made for this from a morphological point of view in that the past simple and the present habitual are the only main clause indicative positive tenses. Although, in Saeed's labelling of the verbs this is not evident, Andrzejewski, B.W. (1968) labels these tenses "present general extensive" and "past general extensive" (see eg. Andrzejewski, B.W. (1968) p.2), thus hinting at a shared property which might be labelled "positive declarative indicative". We shall assume here, however, that the prosodic information is represented in underlying representation in conjunction with the melodic information, since this is what our model of prosodic representation predicts. Thus, the tense markers are assumed here to be the melodic information associated with two moras in underlying representation.

4.1.4.1. The past simple tense marker

The only phonological aspect of the past simple tense marker which we need to discuss is the matter of the alternation of the tense marker between **ay** and **ee**. This is illustrated in the diagram below in which the individual constituents of the inflectional endings of the past simple are set out.

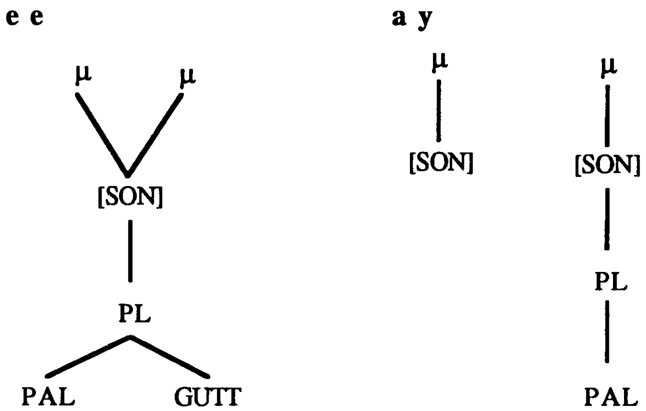
(4.24) Inflectional endings of the past simple

	person marker	tense/ mood marker	number marker	ending
1st p.sg.	-	ay	-	ay
2nd p.sg.	t	ay	-	tay
3rd p.m.sg.	-	ay	-	ay
3rd p.f.sg.	t	ay	-	tay
1st p.pl.	n	ay	-	nay
2nd p.pl.	t	ee	n	teen
3rd p.pl.	-	ee	n	een

We see clearly from table (4.24) that there are two surface melodies of the past simple tense marker: **ay**[1] and **ee**. Given the fact that these variants appear in complementary distribution and are obviously phonetically similar, it must be assumed that they are underlyingly the same melody and that one is derived by rule from the other. The only other possibility is that both are derived from a common, but different, underlying representation which is more abstract and never surfaces in its underlying form. We may dismiss this possibility here and now, since it would lead to a very abstract account and would be highly untenable. The questions we need to answer here are: which is the underlying melody and what is the rule which derives the surface representation from the underlying representation? The full melodic representations of both the surface representations are given in (4.25) below:

1 This may also surface as [ei] due to a late level process. This seems to be rather arbitrary in its application and will not be discussed here.

(4.25) <u>Melodic representations of the surface forms of the past simple tense marker</u>



Given nothing more than the evidence from this verb paradigm, it seems that an arbitrary decision might have to be made as to which is the underlying form as there is no evidence to suggest one or the other. There is, however, evidence elsewhere in the language which provides a hint as to what the answer might be. Let us look briefly at the distribution of the diphthong /ai/ and the long vowel /ee/ elsewhere in the language.

In the vocabulary of Somali there are not a large number of morphemes which end in the long vowel **ee**. The reader will find many verbs in the dictionary ending in **ee** but all of these are derived verbs formed from nouns or adjectives and the verb derivational suffix **-ee** (see Saeed, J.I. (1987) pp.51-53 and Andrzejewski, B.W. (1968) p.6). Thus, the **ee** ending in all of these cases is a reiteration of the same morpheme. Other Somali morphemes ending in **-ee** are the interrogative suffix **-kee/-tee**, "which", and the conjunction **ee**, "and",[1] also the question word **mee** "where". We see then that, despite the large number of verbs ending in **ee**, the *fact that these are derived forms means that the number* of morphemes ending in **ee** is restricted to a small number. This restricted set of morphemes contrasts with the large number of words which incorporate the long vowel **ee** at the beginning or in the middle of a word, eg. **eeg**, "look", **eelo**, "type of gazelle", **geel**, "camels (collective)", **meel**, "place", etc. A further characteristic is that these words are root lexical items. Given these facts, we might assume something as to the relative markedness of the distribution of the underlying sequence /ee/ word-finally. It seems that /ee/ is restricted both in frequency of occurrence as well as in the type of morpheme with which it is found. /ee/ word initially or internally, however, seems to be unmarked and to be found in an unrestricted manner in roots.

Looking, on the other hand, at the diphthong **ay**, there are a fair number of words (root words as well as derived words) which end in this diphthong, eg. **culay**, "bunch of grass burnt to purify milk vessels", **shalay**, "yesterday", **caday**, "tooth brushing stick", **arday**, "student". There are also words beginning with this diphthong, eg. **ayddin**, "muscular pain", **aynab**, "massacre"; and those with the diphthong word internally, eg. **kaydi**, "store", **nayl**, "lamb", etc. We see then that there is no limitation on the distribution of the diphthong.

Given the above pattern of distribution of the **ee** long vowel and the **ay** diphthong, we can make a statement as to the relative markedness of these bimoraic sequences in Somali. It seems that in

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1 Despite the English translation as "and" this word has limited usage, see Saeed, J.I. (1987) pp. 252 & 233.

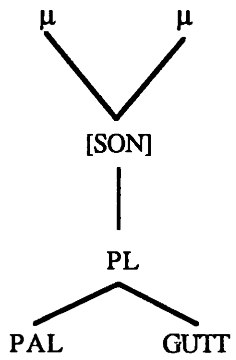
initial and medial position each sequence is unmarked. In final position, however, the diphthong is unmarked whereas the long vowel, **ee**, is relatively marked.

Looking further at words ending in **-een** and **-ayn** or **-eyn**, we find basic roots with both endings, including a minimal pair: **deyn** "debt" and **deen** "not crowded (of a well)". Thus, neither one of this pair of endings may be assumed to be more marked than the other. On the basis of this we can make a statement about the vocalic melody marker of the past simple. Let us look at the two possibilities available to us in light of the facts we have outlined above. Let us assume firstly that the underlying sequence is the long vowel /ee/. When it occurs in word final position, it then diphthongizes by rule to [ay] which in that position is unmarked. Where it precedes the segment /n/, on the other hand, it remains as the long vowel [ee] (</ee/) which, in that environment, is also unmarked. If we were to assume that the tense marker were underlyingly /ai/, on the other hand, then surface realization in word final position would be straightforward, since [ai] in word final position is unmarked. However, in the pre-nasal position we would have to explain why /ai/ changes to the equally unmarked [ee] in that position. In other words, a rule must be posited which changes the unmarked underlying sequence /ain/ to the equally unmarked sequence [een]. There seems to be no further evidence as to why this change should take place. It would therefore simply be an arbitrary change, unmotivated by the phonology. The change from underlying /ee/ to surface [ai], though, is motivated by the fact that /ee/ in morpheme final position is relatively more marked than /ai/.

The underlying representation melody of the past simple will, therefore, be assumed to be /ee/. It diphthongizes by rule to [ai] in word final position, the rule application being motivated by the fact that /-ee/ stem finally is marked in the Somali lexicon whereas /-ai/ is not.

The formalization of this rule of diphthongization is not straightforward since the formalism is such that we are not able to simply delink one node from another. We are, in fact, faced with an instance of the diphthongization paradox discussed in Hayes, B. (1990). Hayes' resolution of the diphthongization paradox involves the setting up of a revised theory of phonological representation which centres on coindexing (see Hayes, B. (1990) pp.40-44). We shall not here alter our theory of representation but shall acknowledge the reasons behind the diphthongization paradox and attempt a reasonable formalization of diphthongization in Somali. Hayes proposes that it is the ambiguity between the role of lines in phonological diagrams which lies at the heart of the diphthongization paradox. He states that they act in two ways: as association lines and as category membership lines. This distinction of roles of lines in a diagram is linked with a further distinction which will play a role in the formalization we shall propose here. That is that certain elements of a phonological representation in a string are in an order whereas certain others are not. Let us look at the representation of the long vowel /ee/.

(4.26) <u>The representation of the long vowel /ee/</u>

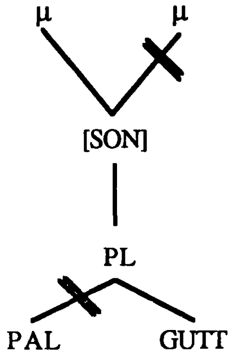


It is crucial to remember that in this representation the two moras are in a precedence relation, that is to say one follows the other, the order being isomorphic with the passage of time. The two features PALATAL and GUTTURAL, however, are not ordered. PALATAL does not precede GUTTURAL despite the way the representation is drawn. Given this we shall formalize a process of diphthongization which involves two delinkings.

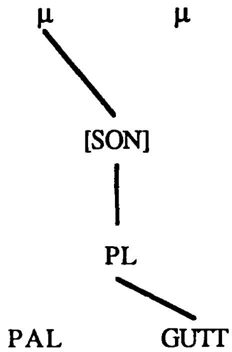
Both the second mora and the PALATAL node will be delinked. Following this the PALATAL node will be associated with the delinked mora, the association involving the introduction of all the intervening nodes in the representation. This process is given below, note the sequence is given by the letters (a), (b) etc.

(4.27) Process of dipthongization of /ee/

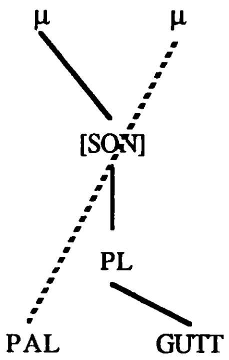
(a)



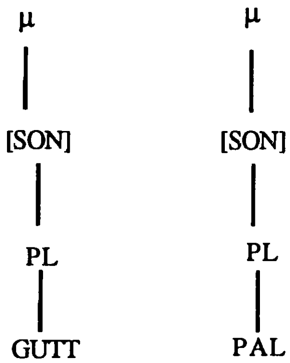
(b)



(c)



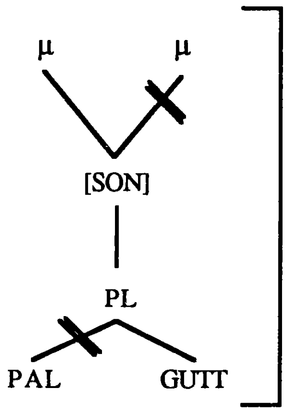
(d)



Following the delinking of the mora node and the PALATAL node the association is represented by the broken association line. Despite the way this looks in the two-dimensional representation on paper there is no crossing of association lines involved in the representation, thus no line crossing prohibition is being violated despite the way the diagram looks. This is because, although the two moras are ordered, the feature PALATAL is not ordered with regard to any other feature in the melodic representation at the moment of association. As soon as association is completed, however, the PALATAL node (and all the intervening nodes) *are* ordered in relation to the melodic representation of what is now a, hence the final representation in (d). Given the problems associated with the diphthongization paradox and the model of phonological representation assumed here we shall assume this proposal to be adequate pending further investigation, including a possible investigation of aspects of Somali phonology in the model of representation proposed by Hayes, B. (1990).

The actual rule of diphthongization is formalized as the first part of the process in the diagram above we restate this below:

(4.28) <u>The rule of diphthongization</u>



Where the bracket indicates a word boundary

This may not be a very convincing explanation, depending, as it does, on the notion of phonological rules changing marked sequences to unmarked sequences in preference to changing unmarked sequences to equally unmarked sequences. It is, however, an explanation of sorts and not merely an arbitrary assumption, and thus retains a certain validity in the absence of any further explanation. Having assumed this explanation, we must mention and explain the lack of application of this rule in other environments. We saw above a list of the morphemes which end in the melodic shape /ee/. Of all these examples, however, it is only the tense marker which undergoes the diphthongization rule. Pending further investigation of the matter we shall assume here that this is due to the fact that the tense marker is marked for application of this rule. Other possible instances of this rule such as diphthongization of the derivational ending **-ee** before consonants, need to be investigated before the final word may be said on this.

4.1.5. The optative

The optative paradigm is as follows:

aan duúbo	"may I fold"
aad duúbto	"may you fold"
há duubo	"may he fold"
há duubto	"may she fold"
aannu duúbno	"may we fold"
aydin duúbeen	"may you fold"
há duúbeen	"may they fold"

Coming to this paradigm, after having looked at others, we recognize the familiar markers of person and the familiar pattern of number marking; namely, the **-n** plural marker in the 2nd and 3rd person plural forms but no plural marker in the 1st person. Leaving aside the matter of the underlying representations of the pronouns and the particle **há**, we shall provide underlying representations for the optative endings themselves. These can be informally given as /o/ in the singular and /ee/ in the plural. What we must decide is whether this is a case of two separate underlying representations, the choice of which is dependent on the number and person of the verb, or whether it is a case of one form being the underlying form, the other one deriving from that form.

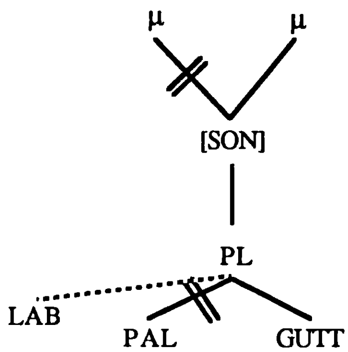
The second assumption would be more appropriate given the complementary distribution of the two forms. A problem, however, is that they are not phonetically very similar, another important, if somewhat vague, condition on an alternation explanation. This makes the explanation and formalization of a process changing one to the other difficult. In the example of the past simple tense marker above, we showed how the relative markedness of one form in relation to the other brought us to an explanation, although in that case there was much more phonetic similarity than in the present case.

Looking to the matter of markedness for some clues, we see that the optative endings seem to be of equal value in terms of markedness. There are root forms ending in /-o/, such as **weyso**, "water for prayer ablutions", **jiifto**, "a genre of poetry" and **gabaddano**, "cold weather". There are also root forms ending in /-een/ **keen**, "to take", **been**, "a lie" and **dheen**, "a large type of tree with edible fruit". What we demonstrated above in the discussion on the past simple ending was that the ending /-ee/ is relatively marked in word final position in Somali and that this fact accounts for the diphthongization rule in that it changes to an unmarked form in this position, whereas before **n** it remains as the unmarked **een**. In the case under consideration here we might attempt an explanation along similar lines.

If we assume the underlying representation of the optative to be /ee/, then with the plural marker it surfaces in the unmarked string [een]. In the other cases, though, the marked /-ee/ surfaces as the unmarked [-o] which is a common root form ending. If, on the other hand, we assume the underlying representation to be /o/, then we would need to account for why the potential ending [-on] is ill-formed; that is to say, the optative ending plus the plural marker, despite the fact that this ending is found in roots in Somali such as **hodon**, "a rich person", **boqon**, "achilles tendon" and **doqon**, "a fool". We would therefore need to account for why a potential unmarked form is not allowed to surface when the surface form itself is equally unmarked.

Following this line of argument, the conclusion we must arrive at is that the marked underlying /ee/ is changed to the unmarked [o] when nothing further follows it. This, however, does not seem satisfactory. The above rule of diphthongization is regarded as satisfactory, given that /ee/ and [ai] are melodically related. In this case, on the other hand, the rule would change a long /ee/ vowel to a short [o] vowel and would therefore look something as follows:

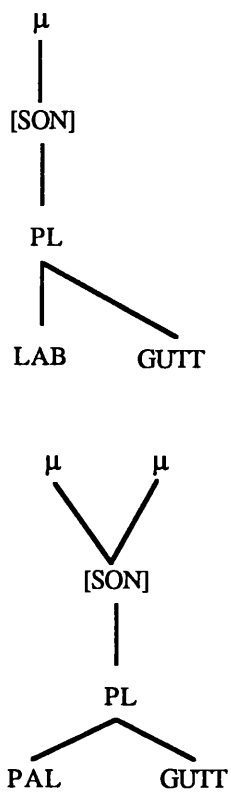
(4.29) Possible formalism for the rule deriving [o] from /ee/



Such a formalization is not very satisfactory. There seems to be no relationship between the representation which is present before application and the result of the rule. Also, the loss of the mora node is not explained by any prosodic principle. Furthermore, we need to order the rule externally in relation to the diphthongization rule to account for the fact that the diphthongization rule does not apply in this case.

Given these problems, we shall assume that the endings for the optative are underlyingly different. The underlying representation for the optative ending for the singular forms and for the 1st person plural will be assumed to be /o/ and the optative ending for the 2nd and 3rd persons plural will be assumed to be /ee/.
We shall thus assume the optative endings to be as follows in underlying representation:

(4.30) <u>Underlying representations of the optative markers</u>



The word formation rules for introduction of these representations are as follows

Insert /o/ in env. $[X \_\_]_{V,\ \text{optative, singular and 1st p.pl.}}$
Insert /een/ in env. $[X \_\_]_{V,\ \text{optative, 2nd and 3rd p.pl.}}$

4.1.6. The progressive aspect

The progressive aspect will be dealt with here under one heading. This is because any morphological or phonological matter which applies to the present progressive applies equally to the past progressive. The present progressive paradigm is given below:

(4.31) The present progressive paradigm

	singular	plural	
1st p.	duubayaa	1st p.pl.	duubaynaa
2nd p.	duubaysaa	2nd p.	duubaysaan
3rd p.m.	duubayaa	3rd p.	duubayaan
3rd p.f.sg.	duubaysaa		

The progressive marker will be assumed to be a marker with its own underlying representation and a word formation rule governing its insertion into phonological strings. The progressive affix only ever surfaces in one form. Thus, the underlying representation will be assumed to be as below:

(4.32) Underlying representation of the progressive marker

$$\begin{array}{ccc} \mu & \quad & \mu \\ | & & | \\ \text{[SON]} & & \text{[SON]} \\ & & | \\ & & \text{PL} \\ & & | \\ & & \text{PAL} \end{array}$$

As to the word formation rule, this will be assumed to be as follows:

Insert /ai/ in env. $[X \_\_\_]_{V,\ \text{progressive}}$

The only phonological phenomenon which we need to look at with respect to the progressive aspect is the change of the person marker /t/ to [s] when it follows the /i/ of the progressive marker, as can be seen above. This contrasts with the change of the /t/ person marker to [d] when the /t/ follows /i/ as a final segment of a root verb. For example, when the 2nd person singular person marker /t/ is suffixed to a root verb ending in /i/ the person marker changes to [d]. This is exemplified below by the verb **akhri** "to read":

akhri + ay	akhriyay	"I read"
akhri + t + ay	akhriday	"you read"

The case of verbs like **akhri** is taken up later in section 4.2.2.2. However, it is relevant to our discussion of the progressive marker's behaviour. What is it that accounts for this difference in behaviour? Light may be shed on this problem by the causative suffix which can also informally be said to be represented as /i/. When the /t/ person marker follows the /i/ causative suffix, it surfaces as [s]. Thus, from the verb **kari**, "to cook" (<**kar-i**) the form **karisay** (</kari + t + ay/), "you cooked" surfaces. It comes to mind that the explanation of the causative and the progressive may in some way be linked.

Hints as to an explanation of this phenomenon are to be found in the historic development of the progressive suffix as well as present evidence from some Somali dialects. This matter is mentioned by Moreno: "Il progressivo del tema primitivo si ottiene, dunque, aggiungendo a tale tema il suffisso *ay*, che non è altro che il verbo *hay* «possedere, avere, tenere» ..." [The progressive of the simple stem is obtained, therefore, by adding to the above-mentiond stem the suffix *ay* which is nothing more than the verb hay "to possess, have, hold"] (Moreno, M.M. (1955) p.79). This view is confirmed by Andrzejewski who states the following (note that what we are calling the progressive marker Andrzejewski calls "intermedia"):

> In some dialects, notably that spoken in the Mijurtinia province of Somalia, the intermedia contain the consonant **h** (which is preceded in some cases by a short vowel). e.g.
>
> **Wuu ɖísahayaa.** He is building it.
>
> This fact confirms Moreno's hypothesis that the intermedia were originally roots of the verb **hày** 'to hold, to have, to keep' used as an auxiliary verb.
>
> Andrzejewski, B.W. (1968) p.13

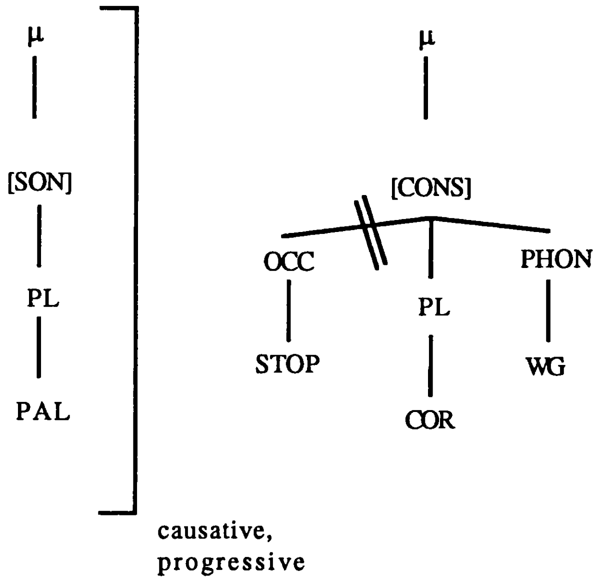
In a further work, Lamberti, following an exposition of the present progressive, goes on to show how what he labels the present "ingressive" is a periphrastic formation involving the verb **hay** "to have, hold". This tense expresses imminent commencement of an action in certain dialects and has in other dialects become fused with the present progressive. In Standard Somali, which forms the basis of the present study, the present progressive is also used to express imminent action. Lamberti, therefore, expresses the close relationship between the present progressive and the periphrastic present ingressive forms as follows: "Das Präs.Progr. und das Präs.Ingr. weisen historisch gesehen dieselbe Bildungsweise auf, beide haben nämlich hay- als Hilfsverb ..." [The present progressive and the present ingressive point historically to the same formation, namely with hay- as an auxiliary verb...] (Lamberti, M. (1988) p.198, my translation).

We shall not look into the details of these matters here but we should note that there is a definite historical link between the progressive marker /-ay-/ and the verb **hay** used as an auxiliary. What is more, given the fact that this auxiliary construction is still present in certain dialects, including certain northern dialects, we can assume that this historical process is very recent.

Having established this historical link, we can go on to look at the verb **hay** itself, as this will provide us with clues as to how the rule changing /t/ to [s] came to be. The important fact about the verb **hay**, relevant here, is that it is a verb which conjugates like the causative verbs. It is, indeed, described in descriptive grammars as a conjugation 2 verb (see, for example, Zorc, R.D. and Abdullahi A. Issa (1990) pp.453-455). Thus the /t/ person marker surfaces as [s]. This may be taken further and it can be assumed that **hay** is essentially a member of the group of verbs which consist of a stem and the causative suffix.

Note that, if this form is the result of the addition of the causative suffix to a stem, then the root form from which it is derived no longer exists in Somali. However, given the phonological and grammatical realities, this is no problem. We shall assume that the melodic structure of the verb is the same as the melodic structure of the causative stem. We shall assume, then, that the process which accounts for the change from /t/ to [s] in the progressive aspect will be handled in the same way as the process which accounts for the same change when the /t/ person marker follows the /i/ of the causative stem. This can be formalized as follows:

(4.33) <u>Process deriving [s] from /t/ following causative and progressive suffixes</u>



Although not the most explanatory of processes we shall assume this here pending further investigation.

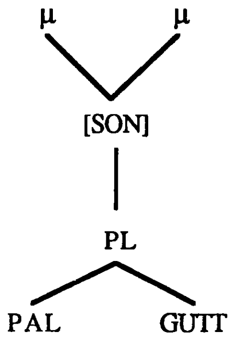
4.1.8. The potential

This verb paradigm is very straightforward as can be seen below:

shów	duubee	"maybe I will fold"
shów	duubtee	"maybe you will fold"
shów	duubee	"maybe he will fold"
shów	duubtee	"maybe she will fold"
shów	duubnee	"maybe we will fold"
shów	duubteen	"maybe you (pl.) will fold"
shów	duubeen	"maybe they will fold"

From this we can see that the underlying representation for the potential can undoubtedly be assumed to be /ee/. This is uncontroversial, since all instantiations of the bound morpheme are the same. However, we do need to account for why the diphthongization rule does not apply in this case. It seems from the above paradigm that diphthongization could quite simply apply, given the present formalization of the rule, since it would apply in all cases apart from the 2nd and 3rd person plural forms. We shall therefore assume that the potential is lexically marked as not undergoing the diphthongization rule. Thus the formal representation of the potential suffix is as follows:

(4.34) Underlying representation of the potential suffix



The word formation rule inserting the suffix is:

Insert /ee/ in env. $[X \_\_]_{V,\ potential}$

The presence of the word **show** is assumed to be explained by the syntactic component.

4.2. Phonological processes manifested when inflectional suffixes are appended to stems

In this section we shall look at some phonological phenomena which are dependent on some phonological characteristic of the root to which the inflectional suffixes are added. The first of these phonological processes we shall look at is one which will be called geminate formation.

4.2.1. Geminate formation

The title of this section is the label given to a rule which, as we shall see, accounts for a number of phonological alternations in the verbal and nominal morphology. These, in previous literature, have been adequately described and observed. Here, though, we shall propose a rule which handles in a unified and economical manner these various alternations which in other models, particularly linear ones, would need to be accounted for by a much more complicated formalism, or indeed formalisms.

Let us first of all turn our attention to behaviour which is manifested when an inflectional suffix beginning with /-t/ is added to a verb stem ending in /d/. This is exemplified by the verb **shid**, "to light (ie. a fire)", in the verbal morphology.

(4.35) Example showing the change from /t/ to [d] following /d/

dhis + ay	->	**dhisay**	"I built"
dhis + tay	->	**dhistay**	"you built"
keen + ay	->	**keenay**	"I brought"
keen + tay	->	**keentay**	"you brought"
shid + ay	->	**shiday**	"I lit"
shid + tay	->	**shidday**	"you lit"

In the 2nd person we see that the /t/, the WIDE GLOTTIS voiceless stop, has become a CLOSE GLOTTIS voiced stop, /d/ when it follows /d/. This contrasts with the non-alternating examples **dhistay** and **keentay** in which there is no phonological change. Before embarking on an attempt to explain this process, let us immediately turn our attention to the same process, as well as another very similar process, occurring in the nominal morphology and exemplified by the words in (4.36) below. In these words the suffix /-ta/ is a form of the feminine definite article and the suffix /-ka/ is a form of the masculine definite article. Non-alternating examples are also given in (4.36).[1]

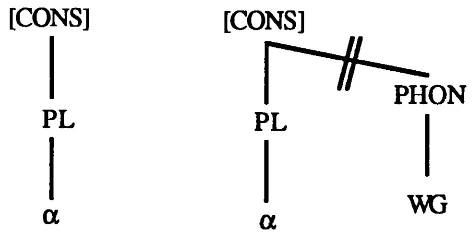
(4.36) Examples of nouns showing the formation of a geminate following a homorganic voiced stop

sonkor + ta	sonkorta	"the sugar"
durdur + ka	durdurka	"the stream"
bad + ta	badda	"the sea"
rag + ka	ragga	"the men"

It seems clear from the above examples that what is in question here is a uniform process of assimilation of some sort. At first sight it might look as though voicing assimilation from a voiced stop to a homorganic voiceless stop is a possibility. This, however, is ruled out, because the phonation specification of segments in our model is not [±voice] but WIDE GLOTTIS. It may be, then, that we have a rule of disassociation of the WIDE GLOTTIS specification which is triggered by the homorganicity of the two adjacent stops. Such a rule might be formulated as follows:

1 The vowel used in the definite article suffix here is one which is absolutive non-anaphoric. See Saeed, J.I. (1987) pp.150-152 for the uses of the different vowels.

(4.37) <u>Rule formalism for WIDE GLOTTIS deletion in a WIDE GLOTTIS stop following a homorganic CLOSE GLOTTIS stop</u>



Bearing this idea of a homorganic WIDE GLOTTIS disassociation rule in mind, let us look at a further process in Somali which causes us to think again. When an inflectional suffix (nominal or verbal) beginning with /-t/ is affixed to a noun or verb stem ending in /dh/, then the following process takes place: dh + t -> dhdh.[1] Consider the following examples:

(4.38) <u>Examples of the change t -> dh following dh</u>

gaadh + tay	gaadhdhay	"you reached"
gabadh + ta	gabadhdha	"the girl"

Given the similarity of this process to that displayed in (4.35) and (4.36), we might assume that it is the same process which is accounting for all of these alternations. However, if we are assuming

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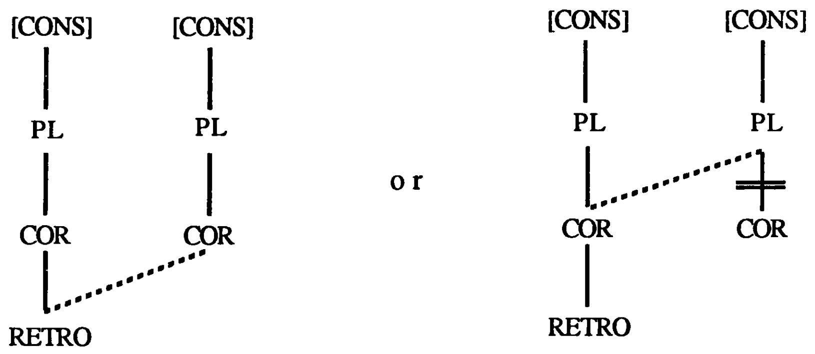
1 Note that, in the dialects in which the /dh/ segment is pronounced as [r], this process does not occur; that is to say, that for a speaker for whom the noun for "girl" is /gabar/ the form with the definite article is [gabarta]. This constitutes evidence that for these speakers the underlying representation of this segment is /r/ and not /dh/ which subsequently changes to [r]. Note also that, in the Somali orthography, geminate **dh** is not written with two digraphs, as here, but as a single digraph, ie. **dh**. It is given in this form here for clarity's sake.

that process to be WIDE GLOTTIS deletion as formalized in (4.37), then we need to assume a further phonological rule to account for the assimilation of the RETROFLEX tongue configuration specification in the examples in (4.38). This might be formulated as follows:

(4.39) RETROFLEX node spreading



This particular rule may be regarded as necessary, if the structural description of the WIDE GLOTTIS deletion rule is to be met, since the PLACE specifications of /t/ and /dh/ are not identical, this identity being part of the structural description of the rule as formulated in (4.37).[1]

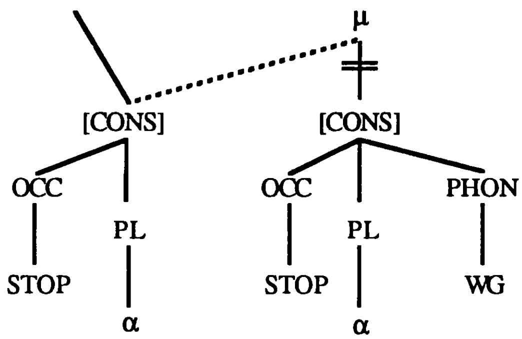
There are other undesirable aspects which this analysis faces. Firstly, two rules are involved and secondly, one rule, namely RETROFLEX spreading, must be ordered prior to the WIDE GLOTTIS node deletion rule in order to feed it. If no other explanation were

1 We shall see later, however, that this is not necessarily the case and that the WIDE GLOTTIS deletion rule is still possible as far as this matter is concerned, given our theory of PLACE node types; that is to say, we shall see later that the only node which is relevant in this possible rule application is the node immediately dominated by the PLACE node.

possible then we would simply have to accept this analysis. But we can put forward another more explanatory account.

This is so if we assume a rule of assimilation to be involved as opposed to one of deletion. This rule of assimilation may be assumed to apply at a higher prosodic level than the melodic level, that is, we may assume the spreading of the whole segment. We shall label it provisionally "geminate stop formation". What we shall assume to occur is the spreading of the root node of the initial stop onto the mora node of the following stop whilst the melody of the second stop is disassociated from its original mora node. This is formulated in (4.40):

(4.40) <u>Geminate stop formation</u>



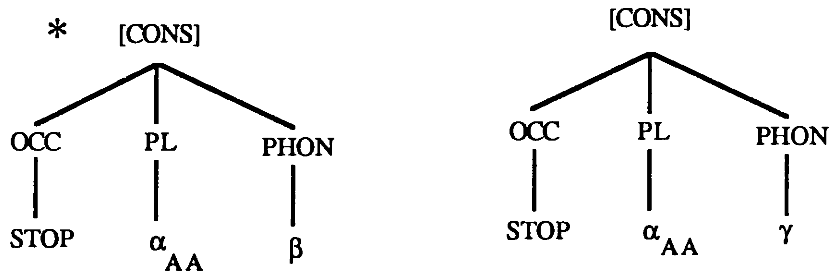
There is no other node within the feature geometric representation which could be spread to account for all of the examples in (4.35), (4.36) and (4.38). This rule immediately prompts some questions. What motivates the rule? How is it that the PLACE specification for both the retroflex and the dental may be represented by the variable "α"? Finally, is it possible that the rule, or a revised version of it, accounts for any other phonological processes in Somali?

Looking firstly at motivation, this rule, instead of being simply an arbitrary rule of Somali phonology, can be seen to be motivated by a co-occurrence restriction which holds in the language. In Somali there are no sequences of stops which disagree in their PHONATION specification but agree in the specification for the active articulator. Spelling this out in full, all of the following stop sequences are prohibited in Somali:

* kg *gk *td *dt *tdh *dht[1]

This can be formalized in the following way:

(4.41) <u>Constraint on stop sequences which share active articulator specification but differ in phonation specification</u>



Where AA stands for active articulator

It is interesting to note that this formalization is a further argument in support of the existence of the PHONATION class node, since without that class node we would not be able to show that the variable which differs in the two melodic representations is the phonation specification in particular.

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1 As far as the final two pairs are concerned, a further constraint might be assumed which states that any pair of adjacent stops sharing the same active articulator also share any configuration features which are dependent on that active articulator node. This, however, is irrelevant to the argument being made here.

No underlying sequences of these types are found and, when such sequences might potentially arise due to morphological concatenation, the potential violation of the constraint is resolved by the rule of geminate stop formation. The rule is therefore motivated by this co-occurrence constraint.

Of particular importance here is the use of the term active articulator. It is this node which is the important one, both in the constraint and in the geminate stop formation rule, since in the sequences *tdh and *dht the actual set of nodes dominated by the PLACE node is not identical because the consonant **dh** is also specified by the configuration feature RETROFLEX, not present in the representation of **d, t** or any other coronal[1]. The only common node is the active articulator node, namely CORONAL in these examples. The diagram below shows the underlying feature geometric representations of the segments /t/ and /dh/, showing the common active articulator node.

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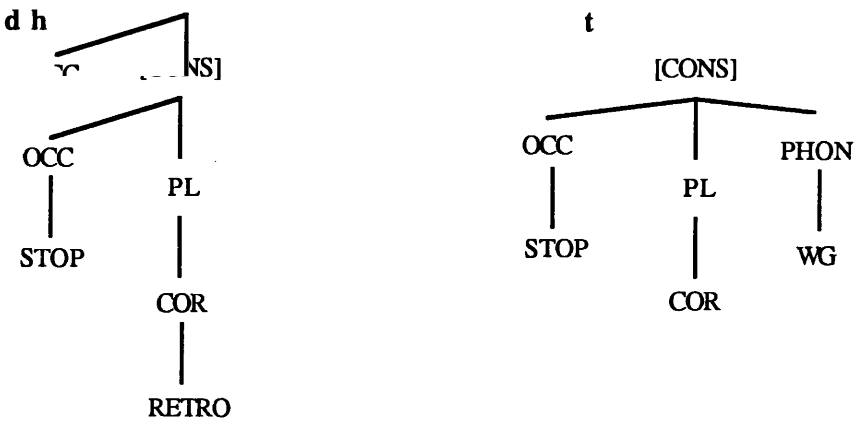
1 Except for the phonetic realization of /n/ before /dh/ as [ɳ].

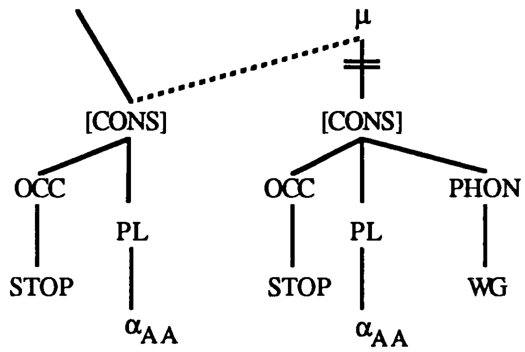
(4.42) Underlying representations of the segments /dh/ and /t/



The matter of the "α" variable representing only the active articulator node is represented in the constraint by the label AA in the diagram. We have not as yet introduced such labels into any melodic representations. However, their introduction causes no problems, since we have already set out the co-occurrence restrictions on different PLACE node types and thus have assumed that the different node types are inherently labelled. In this formalization of the constraint we are simply making explicit the label of the node types. Note that we cannot rely on the position of the relevant nodes within the melodic representation, since zone of constriction node types share the relevant position within the feature geometric representation, namely, immediate domination by the PLACE node but do not undergo geminate formation.

We can therefore revise the geminate stop formation rule formalism, incorporating the labels for active articulator:

(4.43) <u>Revised formalism for the geminate stop formation rule</u>



This rule, then, provides some further evidence in favour of a formal distinction between the active articulator node and the configuration nodes.

It must be noted here that the fact that only the active articulator node is relevant in the rule may also have applied to the WIDE GLOTTIS deletion rule given above in (4.37). If the "α" variable in that rule also refers solely to the active articulator node, then the rule accounts for the case involving /dh/ in the same way as it accounts for the other cases involving /d/ and /g/. In other words, one of the arguments against a WIDE GLOTTIS deletion solution to the problem in hand is deemed not a problem, given our ability of referring to active articulator nodes in rules and constraints. However, we shall not return to the WIDE GLOTTIS deletion rule as we shall now see that it is possible to account for further phonological processes with a modified version of the geminate stop formation rule, processes which would not be accounted for at all by the WIDE GLOTTIS node deletion rule.

We shall now examine a further two processes occurring in the verbal morphology and exemplified by the following verbs[1]:

(4.44) Examples of the processes: /l/ + /n/ -> [ll] and /r/ + /n/ -> [rr]

hel + nay	hellay	"we found"
qor + nay	qorray	"we wrote"

Looking at these processes we see that there are certain similarities to the processes accounted for by the geminate stop formation rule; that is to say, a geminate segment is formed when the active articulator specification of the two segments is identical (CORONAL in the cases here). The further specification that is common in the consonants concerned in (4.44) is the ROOT node specification which is [CONS,SON].

Looking back we notice also, that in all the cases of geminate formation exemplified above (ie. those examples accounted for by geminate stop formation along with the examples in (4.44)), the root node specifications of each member of the relevant pair are identical. In geminate stop formation it is [CONS] whereas in the examples in (4.44) the ROOT node specification in each segment is [CONS,SON]. What is different is that, firstly, the segments involved in (4.44) are not both stops and, secondly, there is no difference in the PHONATION specification, /l/, /r/ and /n/, all underlyingly not specified for phonation, surfacing with CLOSE GLOTTIS by default.

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1 These examples of the formation of geminates are, to a certain extent, optional. I have not been able to ascertain the conditions for when the geminate is formed and when not. However, the consistency with which geminates are formed by some informants leads me to believe that we are dealing with a lexical phonological process as opposed to a low level, more phonetic process.

Given these similarities, there is a strong possibility that a rule, formally very similar to geminate stop formation but with a wider range of application, accounts for all the examples in (4.35), (4.36), (4.38) and (4.44). In order to ascertain the nature of such a rule we shall reiterate here all of the individual processes which we assume should be accounted for by this rule.

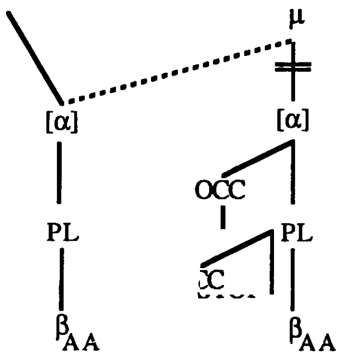
(4.45) Summary of the various geminate formation processes exemplified in (4.35), (4.36), (4.38) and (4.44)

shid + tay	->	shidday	"you lit"
bad + ta	->	badda	"the sea"
rag + ka	->	ragga	"the men"
gaadh + tay	->	gaadhdhay	"you reached"
gabadh + ta	->	gabadhdha	"the girl"
hel + nay	->	hellay	"we found"
qor + nay	->	qorray	"we wrote"

All of the relevant two segment sequences involved have the following characteristics in common:
-the active articulator specification is identical in each member of the pair
-the ROOT node specification is identical in each member of the pair
-the second segment in each pair is a stop.

On the basis of this evidence we shall propose the following rule which will be called geminate formation :

(4.46) Geminate formation



This rule will handle all of the cases which we have exemplified above in (4.45). There are, however, two points which must be made with regard to this rule. We can see that allowing the labelling of the "β" variable as an active articulator node allows this rule to account for not only the /dht/ sequences but also the /ln/ /rn/ sequences. In these examples the /l/ and /n/ have different PLACE specifications if we take into account all of the nodes dominated by the PLACE node, but they share the active articulator node, namely CORONAL. The /l/ includes in its specification the node LATERAL, a configuration node which /n/ lacks. However, since this is a configuration node, it does not have any bearing on the application of the geminate formation rule which specifies the "β" variable as representing potential active articulator nodes only.

Assumptions made here with regard to the node types are assumptions which have universal implications. A number of questions immediately raise themselves. For example, one might ask whether certain node types are involved in particular types of rules more than others? Such matters should prove to be very interesting but shall be left to future work and not dealt with here.

There is a further matter which must be addressed with regard to the geminate formation rule. This is the matter of its generating certain geminate consonants which are ungrammatical. To show this, all of the logically possible segment combinations which satisfy the structural description of the geminate formation rule and the resulting geminate segments (were geminate formation allowed to apply to them all) are set out in (4.47) below. The geminate segments which are ungrammatical in Somali are marked with an asterix.

(4.47) List of all the possible results of the geminate formation rule

l + n -> ll
r + n -> rr

f + b -> *ff
s + t -> *ss
d + t -> dd
dh + t -> dhdh
s + d -> *ss
t + d -> *tt
dh + d -> dhdh
g + k -> gg
k + g -> *kk
q + k -> qq[1]
kh + q -> *khkh
h + ʔ -> *hh

Of these forms we see that the ones which are ill-formed are those we have already said are ill-formed in Somali due to two language

1 Note that the case of geminate **qq** is not straightforward. We shall return to this below.

specific constraints; one of which states that there are no geminate fricatives in the language (see section 2.2.1.1.), the other that there are no geminate WIDE GLOTTIS stops (see section 3.3.2.4. and (3.57)). The matter of the geminate uvular stop will be dealt with later in light of the restriction that there are no geminate guttural consonants see section 2.2.1.1. We shall assume here that the way in which the potential violation of these constraints is resolved is through the non-application of the geminate formation rule. We can assume this to be due to the principle of structure preservation which holds in the lexicon, disallowing any entity to be formed that does not occur underlyingly. In other words, geminate formation could, for example, potentially apply to the sequence /st/ but fails to do so because the resultant geminate *[ss] is ungrammatical. It is prohibited by the language specific constraint on geminate fricatives. If the rule were to apply, then the resultant sequence would violate the principle of structure preservation. Thus, the rule is prohibited from applying in such cases.

A further possibility which comes to mind is that the rule of geminate formation does actually generate such geminates but, since they are not allowed due to structure preservation, they are altered by a rule of degemination. This is, however, ruled out here, since it would result in unattested forms. For example, if the geminate formation rule were allowed to apply to the sequence /st/, the result would be *[ss]. If this were then reduced by a degemination rule, it would surface as [s]. Let us take the example of the word **gees**, "side" which, as a feminine noun, takes the defining suffix /-ta/. When this suffix is added to **gees** the structural description of the geminate formation rule is met. If it were allowed to apply, the resultant form would be *[geessa] which would then undergo degemination and surface as *[geesa]. The actual attested surface form is [geesta], thus showing the degemination argument to be false. Aside from this empirical evidence, the degemination account is less desirable from a theoretical standpoint. Given the important status of the principle of structure preservation in lexical phonology, it seems much more desirable for forms violating this principle never to be generated in the lexicon at all rather than to be allowed to be generated and subsequently modified by rule.

A further matter which we can explain with regard to this rule is the direction of spreading. It is the constraint on geminate WIDE GLOTTIS stops which prevents the spreading of the ROOT node from right to left in the geminate formation rule. If it were from right to left, then geminate WIDE GLOTTIS stops would be formed which are not allowed as we have seen above. Note that this direction argument does not specifically apply to the examples in which the second of the pair is /n/. However we can suggest that the matter of direction is the result of these pairs behaving in a manner analogous to the pairs in which the second of the pair is a WIDE GLOTTIS stop.

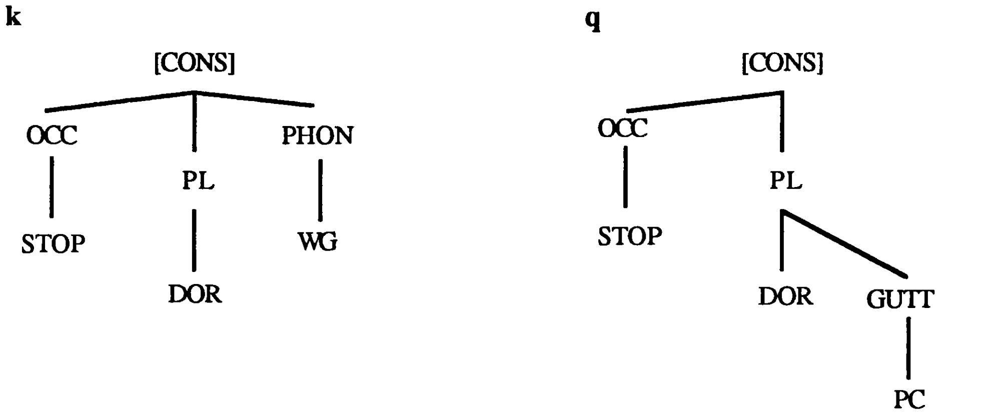
Thus, we can say that the direction of spreading is also not an arbitrary assumption but is motivated by the fact that in Somali phonology geminate WIDE GLOTTIS stops are ungrammatical. Let us return now to the matter of the distinction between the active articulator nodes and configuration and zone of constriction nodes in a discussion on the /qk/ sequence.

4.2.1.1. Geminate formation and the /qk/ sequence

As we have seen above, one of the most interesting aspects of the geminate formation rule is the way in which it demonstrates the status of active articulator nodes as formally distinct from the other types of PLACE dominated nodes, the configuration nodes and the zone of constriction nodes. The behaviour of the sequence /qk/ provides some interesting insight into this matter.

Given the assumption of the formal distinction between types of PLACE dominated nodes, we must account for the lack of application of the geminate formation rule in the case of the sequence /qk/. This sequence occurs with the concatenation of the masculine definite article /k/ initial suffix with a noun ending in /q/. An example is **baaq + ka -> baaqa**, "the announcement". The underlying feature geometric representations of /q/ and /k/ are given in (4.48) below to show how the structural description of the rule of geminate formation is met by this sequence:

(4.48) Feature geometric underlying representations of /q/ and /k/



We see from this that the structural description of the rule is met only if, as we assume, the variable "ß" in the rule refers exclusively to the active articulator node and not to any other. In this case, the zone of constriction node, GUTTURAL, is also present but, given the structural description of the rule, it does not prevent the rule's application because it is a zone of constriction node, not an active articulator node. The structural description of the rule is met by the presence of the DORSAL node which is an active articulator node. However, as we have already seen above the guttural consonants do not occur as geminates and thus potential violation of this constraint blocks the application of the geminate formation rule in this case. There is therefore a potential application of the rule but this is blocked by the fact that geminate guttural consonants do not occur in Somali.

Despite this observation we must take into consideration two works which state that geminate [qq] does occur in the language. These are Armstrong, L.E. (1934) see pp.123-124 and Cardona, G.R. (1981) see p.12, although the latter does state that this is not regular. An important factor pertaining to the geminate occurrences of [qq] which are cited by Armstrong is that all of them occur as the result of the addition of the definite article suffix /-kV/ to a noun ending in /q/. Armstrong says:

> Double q also occurs between vowels and may be represented by *qq*...
> *ħáqqa* the truth *mìiqqa* the thread
> *dúqqa* the old person
>
> Armstrong, L.E. (1934) p.10/123

Interestingly, in my own investigations I have heard a geminate [qq] but not in this environment. It may occur in the imperative plural of verbs ending in /q/ due to a process apparently similar to *radoppiamento sintatico* in Italian which we shall not be discussing in the present work. Despite the fact that most authors do not acknowledge the existence of geminate [qq], we cannot dismiss lightly the fact that two scholars do acknowledge its existence.
Rather than dismiss these authors' findings as merely incorrect, we may venture an explanation for their observations. This might be

along the lines that the /qk/ sequence in some cases, albeit only in certain cases, does undergo the geminate formation rule. In such cases we may assume that the speakers in question allow geminate **qq**. What is particularly interesting to us is that it is precisely the rule of geminate formation as formalized above which accounts for these geminate cases. If the "ß" variable on its own, ie. without any qualifying active articulator label, were present in the rule, then the structural description for the /qk/ cases would simply not be met, because without the active articulator specification the sequence would not satisfy the structural description of the rule. However, assuming, as we do in the formalization, the active articulator to be the significant node, allows for the potential application of geminate formation to the sequence /qk/ as it does equally to the sequences /dt/, /dht/, etc.

The fact that these potential geminate uvular stops are in most cases blocked does not refute this argument, and the fact that two scholars, including Armstrong, accept the existence of geminate /qq/ strengthens the argument for the gemination formation rule.

Before leaving this matter, the thought raises itself as to the reason why some speakers might allow geminate **qq** when others do not. We have noticed earlier 3.3.2.4.1. that certain speakers allow a syllable final **j** when in general this is disallowed. We have assumed that this is because those speakers who allow syllable final **j** are familiar with Arabic and thus allow this due to the influence their knowledge of that language has on their phonological competence in Somali. It is possible that a similar phenomenon is occurring here, since geminate **qq** is a sequence allowed in Arabic. However, one informant who knows Arabic very well and allows syllable final [j] does not allow [qq] when it potentially arises as the result of the geminate formation rule in the nominal morphology, just those cases reported by Armstrong and Cardona. This informant does, however, allow geminate [qq] in the imperative cases due to the *raddopiamento sintatico* type process. This hints at the involvement of the principle of structure preservation, since the process which produces the cases in the imperatives must be assumed to be a post-lexical process as it also occurs across word boundaries.

More research on this particular matter is needed. Some precise phonetic measurements of [q] and/or geminate [qq] from a number of speakers, both those allowing [qq] and those not allowing [qq], will hopefully shed further light on this matter. It may be that the case of [qq] is analogous with that in which /ln/ and /rn/ may surface as [ll] and [rr] in certain cases and not in others.

4.2.1.2. Brief summary of the geminate formation rule

Let us now summarize what has been considered in this section. We have examined various phonological processes which occur at the inflectional level of the lexicon (see the list in (4.45)). All of these processes have been shown to be accounted for by a single rule, called the geminate formation rule (the final version of which is formalized in (4.46)). The potential over-generation of this rule is not a problem due to the co-occurrence constraints which have been outlined elsewhere. The rule is simple and economical and provides good evidence for the feature geometric type of phonological representation we are assuming here. Another point which can be made with regard to the assumption of this rule is that it shows further evidence for the root node, in so far as the specification of the features which comprise the root node and only the root node are expressed in the form of a variable.

4.2.2. Post GUTTURAL DORSAL deletion and WIDE GLOTTIS deletion following vowels

This section deals with a number of processes which occur when inflectional suffixes are appended to stems in Somali. They affect both segments coming together due to verbal as well as nominal morphological concatenation. There is a larger corpus of data with respect to these processes than with the geminate formation rule and we shall look at all the relevant data before attempting to provide accounts for this behaviour. The first set of processes to be examined is exemplified in the following list and involves post-vocalic processes in which the WIDE GLOTTIS stops may surface as CLOSE GLOTTIS consonants.

(4.49) Post-vocalic processes involving /t/ and /k/

(a) vowel-final final nouns + /-ka/

bari + ka	bariga	"the east"
ey + ka	eyga	"the dog"
qabow + ka	qabowga	"the cold"
bare + ka	bareha -> baraha	"the teacher"
kabo + ka	kaboha -> kabaha	"the shoes"

(b) vowel-final nouns + /-ta/

shinni + ta	shinnida	"the bees"
ey + ta	eyda	"the dogs"
rajo + ta	rajoda -> rajada	"the hope"

(c) vowel-final root verbs + /-tay/

bari + tay	bariday	"you implored"
waa + tay	wayday[1]	"you neglected to..."

There are a number of matters which must be clarified with regard to these examples. The only vowel which occurs finally in root verbs, ie. in underived verbs, is /i/. It must be noted, however, that the ending /-i/ is also the surface form of a derived verb ending, namely the causative/transitivizing suffix, following which the person marker /t/ surfaces as [s] see (4.33). Thus, the verb **kari**, "to cook, boil (transitive)", which is the causative/transitive derived form of **kar**, "to boil (intransitive)", produces the form **karisay** < /kari/ + /tay/ "it (feminine) boiled". However, these particular cases do not concern us here. There is at least one verb which, when the ending /-tay/ is added, surfaces with either [-day] or [-say], apparently optionally. This is **akhri**, "to read", and the form in question may be either **akhriday**, "she read", or **akhrisay**, "she read".[2] The vocalic endings **ee** and **o** are also found in verbs but these are always derivational suffixes and will not be dealt with here. Of the nouns, it is to be noted that masculine nouns may end in the following vowels: i[3], u, e and o (see examples in (4.49)), whereas the feminine nouns only end in the vowels and semivowels: i, y, w, and o. This accounts for the gaps in examples for other vowels in the table above.

---

1 The surfacing of this form as **wayday** is a feature of this particular verb and others like it. This matter is not investigated here and has no bearing on the arguments put forward in this section or elsewhere, the important matter being that the **t** in the suffix follows a vowel.

2 A possible explanation for this behaviour might be the fact that this verb is a loanword from the Arabic root **q-r-ʔ**.

3 Remember that **i** is written **y** at the end of a syllable in the orthography and **u** written **w**.

The alternations exemplified in (4.49) are summarized in the following table.

(4.50) <u>Table of alternants of inflectional suffixes following vowels</u>

final underlying vowel of stem	form of /k/ suffix	form of /t/ suffix
i/(y)	g	d
u/(w)	g	d
a	h	d
e	h	-[1]
o	h	d

From this we see that all of the consonants undergo a process of disassociation of the WIDE GLOTTIS node except for the DORSAL specified stop when it follows either /a/, /e/ or /o/. Following these vowels, the underlying DORSAL consonant surfaces as a laryngeal fricative. It is this behaviour of the DORSAL stop which leads us on to look at the next set of data we shall attempt to explain in this section.

The behaviour of the DORSAL consonant becomes more intriguing when we examine a further process involving the DORSAL initial inflectional suffixes. Whenever a DORSAL initial suffix is added to a noun ending in a GUTTURAL specified consonant, then the DORSAL consonant is deleted in the surface representation. Examples of this are given in (4.51). It must be noted that this only occurs in the nominal morphology, since there are no verbal endings beginning with /k/. This is, therefore, an accidental gap and has no bearing on our argument.

1 Remember there is no case of a /t/ suffix following the vowel /e/.

(4.51) Examples of GUTTURAL + k → GUTTURAL

baaq + ka	baaqa	"the announcement"
tookh + ka	tookha	"the boast"
madax + ka	madaxa	"the head"
sac + ka	saca	"the cow"
rah + ka	raha	"the frog"
go' + ka	go'a	"the portion"

The final group of data is given in the following list in which the /t/ of both the nominal and verbal inflectional suffixes is changed to [d] when it follows a GUTTURAL consonant. That is to say the WIDE GLOTTIS consonant alternates with a CLOSE GLOTTIS consonant follwing a GUTTURAL consonant.

(4.52) Examples of /t/ changing to [d] after GUTTURAL consonants

(a)	duq + ta	-> duqda	"the old woman"
	taariikh + ta	-> taariikhda	"the history"
	jararac + ta	-> jararacda	"the rip"
	madax + ta	-> madaxda	"the head"
	bah + ta	-> bahda	"the children of the same mother"
	lo' + ta	-> lo'da	"the cattle"
(b)	baq + tay	-> baqday	"she was frightened"
	tookh + tay	-> tookhday	"she boasted"
	raac + tay	-> raacday	"she accompanied"
	bax + tay	-> baxday	"she left"
	sooh + tay	-> soohday	"she wove"
	go' + tay	-> go'day	"she cut"

This exhausts our overview of the data which we intend to account for in this section. As we can see, there are three types of behaviour exhibited:

- the WIDE GLOTTIS disassociation of /k/ after vowels of sonority index 2 and of /t/ after all vowels and guttural consonants
- the change of /k/ to [h] after vowels of sonority index 3
- the loss of /k/ after a guttural consonant

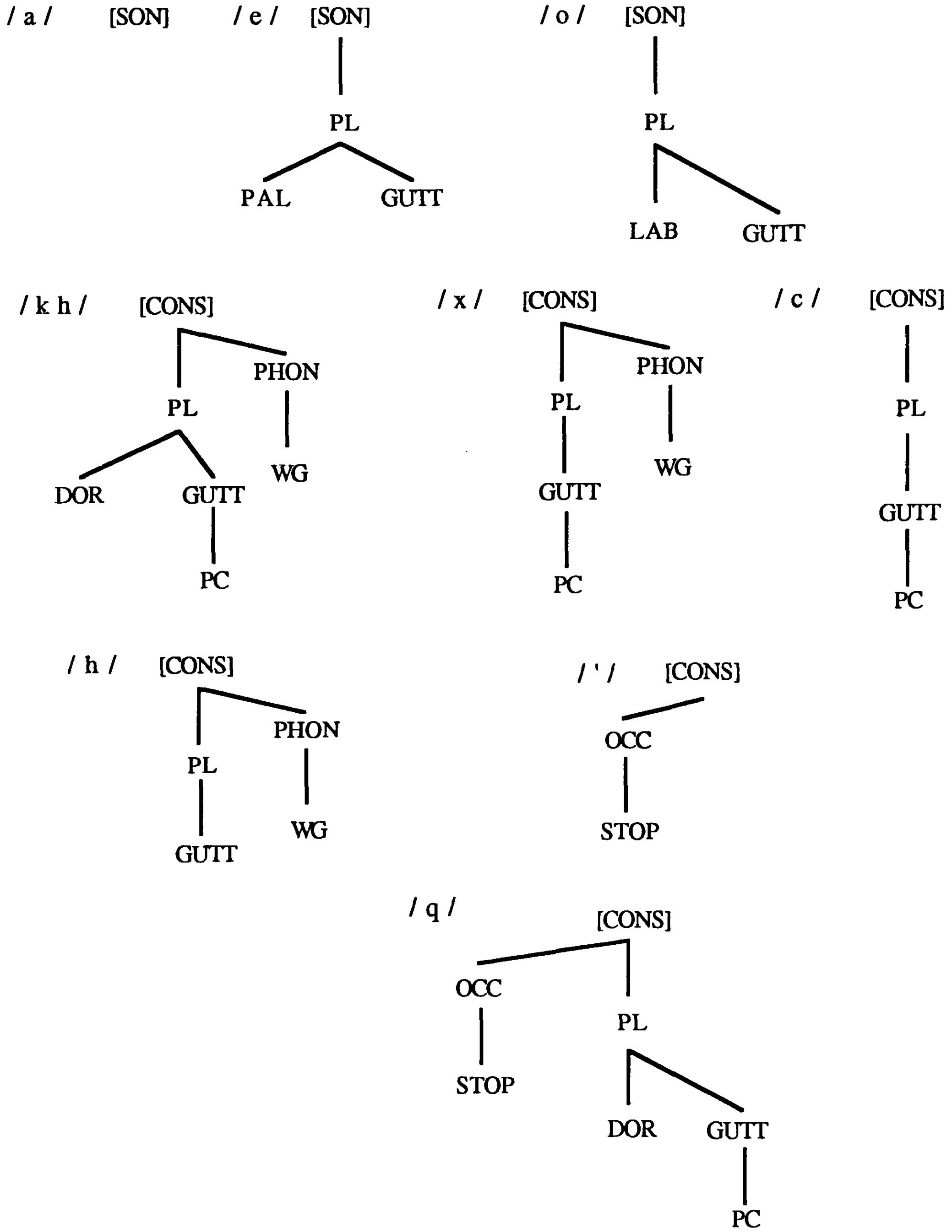
We shall show here that an account involving only two rules can be proposed to account for all of these processes. The first direction in which we shall turn our attention is to the behaviour of the DORSAL stop when it follows "non-high" vowels and the guttural consonants.

4.2.2.1. Post GUTTURAL DORSAL deletion

We have seen that when /k/ follows a guttural consonant the /k/ is deleted and when the /k/ follows one of the vowels: /e/, /o/ or /a/ it surfaces as a laryngeal fricative, /h/. These processes might appear at first sight to be unrelated and the result of separate rules. However, given the model of representation we are assuming here, we shall see that a single rule can account for both of these processes.

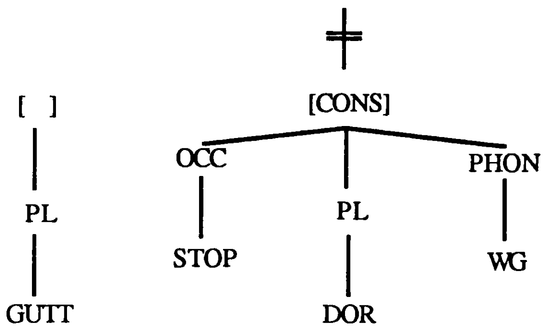
In order to show how we might arrive at this we must look at the specifications of the segments concerned. The /k/ has obviously the same specification in all cases. However, the preceding segments which may be said to "trigger" the processes in hand seem quite different from one another. This, though, is only so if we are assuming a distinctive feature system of the more "traditional" type. Given the model we have proposed here, we find a feature common to all of these segments, both consonants and vowels. Below are set out the underlying feature geometric specifications of all the vowels and consonants concerned:

(4.53) <u>Underlying feature geometric representations of /a/, /e/, /o/ and the guttural consonants</u>



It is quite clear from these specifications that the common feature which all of them share is the zone of constriction feature, GUTTURAL. Indeed, not only do all of these segments share the feature GUTTURAL but the list exhaustively defines the set of segments incorporating the feature GUTTURAL in Somali. This naturally leads us to the conclusion that the feature GUTTURAL is of great importance in these processes which involve the DORSAL stop. We can, in fact, formulate a phonological rule involving the feature GUTTURAL which will account for this phonological behaviour. This rule is formalized in (4.54) and will be called post-GUTTURAL DORSAL deletion.

(4.54) Post-GUTTURAL DORSAL deletion rule



The rule states that when a DORSAL stop follows a GUTTURAL segment it is deleted. Note that the GUTTURAL segment may be any type of segment, since further details are not given in the representation in the rule, thus in the one rule we account for both consonants and vowels.

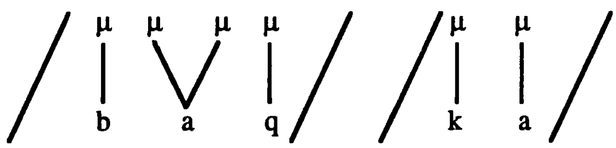
By deletion we mean here the delinking of the melody from the mora node with which it is associated. The mora node remains as shown in (4.55).

We shall now look at how this rule functions with both GUTTURAL consonants and GUTTURAL vowels. Let us take first of all an example derivation of a guttural consonant plus DORSAL sequence. Note that we are assuming that the process of resyllabification takes place immediately following any morphological concatenation (see section 3.3.2.5.). Thus, the onset creation rule and syllable creation have taken place prior to the application of the post-GUTTURAL DORSAL deletion rule. For the sake of convenience we have substituted orthographic symbols for feature geometric representations in the following diagrams. We have also included the moraic tier to make the derivation clearer.

(4.55) <u>The derivation of [baaqa] from /baaq + ka/</u>

underlying representations

↓



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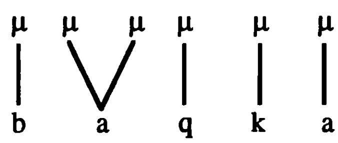
concatenation

↓



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onset creation rule

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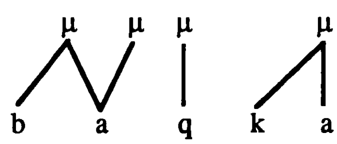

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syllable construction

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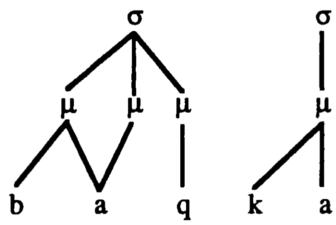

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post-GUTTURAL DORSAL deletion

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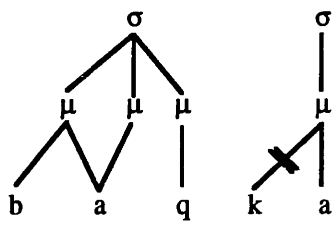

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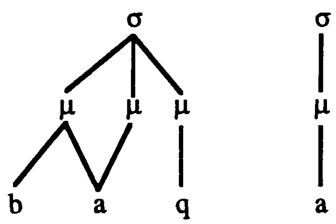
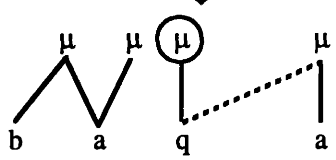


↓

resyllabification beginning with onset creation

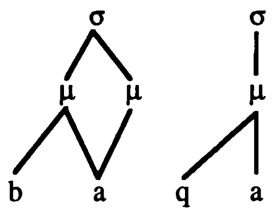
↓



↓

syllable construction

↓



↓

surface form: [baaqa]

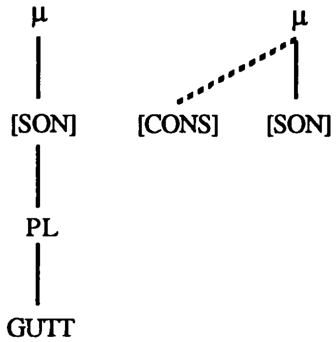
In the above diagram we see the delinking of the root node of the dorsal consonant due to the rule of post-GUTTURAL DORSAL deletion. Following this delinking, syllabification takes place and, as we have shown above, the first part of this whole process is the onset creation rule. This applies to the output of the post-GUTTURAL DORSAL deletion rule resulting in the surface form as shown in (4.55). This treatment of a guttural consonant plus /k/ sequence is quite straightforward in the way it interacts with the process of resyllabification.

When the guttural segment preceding the DORSAL consonant is a vowel, however, the matter is somewhat different, as a vowel which is specified GUTTURAL cannot form an onset of a syllable because the sonority index does not fit the structural description of the onset creation rule. We shall see, however, that the consonant which surfaces as the onset of the syllable, namely [h], is the result of well motivated aspects of the phonology, ie. that in such cases the onset is an epenthetic consonant which is introduced via a rule motivated by the requirement that an onset be present.

Looking at the derivation of a form in which the /k/ initial suffix is appended to a noun ending in a GUTTURAL vowel, following the initial syllabification process (due to the morphological concatenation), the rule of post-GUTTURAL DORSAL deletion applies.

When the resyllabification process takes place, following the application of this rule, the onset creation rule cannot create an onset for the final vowel. Thus, a consonant is epenthetically inserted into the appropriate place in the string, namely, immediately prior to the final vowel[1]. This is formalized in the following rule:

(4.56) Rule of onset insertion following a GUTTURAL vowel[2]



Having assumed, then, that an epenthetic CONSONANT node is introduced, it remains for us to account for the melodic specification of that consonant on the surface. This, we shall see, follows on from the default rules we have assumed for Somali.

The epenthetic entity which we assume is inserted into the appropriate part of the string is a maximally underspecified consonant. Hence the melody [CONS] in the rule formalism. In other words, nothing more than the feature CONSONANTAL will be inserted

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1 Note that this case is not handled by the rule of glottal stop insertion in (3.63b) since it is not at the left-hand edge of a word.

2 Note this rule is assumed to apply following the GUTTURAL insertion rule in (2.36a). The specification for SONORANT only means that this accounts for application with any vowel melody.

and associated with the mora node. Since this feature is one of those which defines the ROOT node in the model of feature geometry assumed here, there is no problem in assuming this to be inserted alone. We shall assume, then, that the rule of onset insertion following a GUTTURAL vowel is a rule of Somali phonology, motivated by the fact that all syllables in Somali must have consonantal onsets.

We shall now look to the further matter of the continued derivation of the inserted consonant and its surfacing as [h]. This surface representation is the result of the application of the various default rules given in section 2.4.1. whose application is motivated by the class node requirement. Since the epenthetic consonant is represented solely by the root node specified CONSONANTAL, the class node requirement means that we must introduce the PLACE, OCCLUSION and PHONATION nodes, providing them with adequate specifications by means of the default rules assumed above. When we discussed these default rules and the introduction of the class nodes, we left open the matter of the order in which they occur. The matter under discussion at this moment, however, provides us with evidence as to the order in which the class nodes are introduced.

The matter of the ordering of the default and complement rules can be conveniently discussed in light of the following quotation from Durand, J. (1990):

> The first general claim made by UT [underspecification theory] is that RRs [redundancy rules] apply as late as possible in a derivation. Secondly, complement rules are assumed to be automatically ordered after rules which supply a value for unspecified feature [sic]...
>
> Durand, J. (1990) p.163

It is the second part of the quotation which is most important for us here as we shall find that the ordering of the rules in Somali follows this pattern. If a different pattern were allowed to prevail, the wrong surface form would result. In the above quotation the statement "rules which supply a value for unspecified feature" can be taken to mean default rules other than complement rules in our model, since these have already been mentioned. In our Somali case then, the rule providing the PLACE feature can be assumed to be the rule which applies first, since this is a default rule. The default PLACE specification, as we have seen above, is GUTTURAL. Thus the feature GUTTURAL is inserted in the representation. Following this application the GUTTURAL forces the application of the complement rule inserting the default active articulator feature LARYNGEAL since the feature GUTTURAL is a zone of constriction feature occurring with CONSONANTAL (see (2.36b)). Following the application of these default rules, the other rules will apply.

The matter of the order in which they apply is something we must address. If we assume that the complement rule supplying the PHONATION specification applies first, then the default specification CLOSE GLOTTIS will become part of the segment's melody. Since we already have the specification GUTTURAL, this will result in the insertion of the OCCLUSION - STOP specification, as, given the fact that the default GUTTURAL specification is LARYNGEAL, the only LARYNGEAL consonant with the CLOSE GLOTTIS specification is the glottal stop which is not the melody that surfaces in this case.

Assuming, on the other hand, that the OCCLUSION node were to be inserted first, then the default specification CONTINUANT would be inserted. Following this, the only possible PHONATION specification which can be inserted is the WIDE GLOTTIS specification, resulting in the segment [h] on the surface.

This is shown in the following diagram in which the two possibilities are given. In (a) the PHONATION complement rule is assumed to apply first; and in (b) the OCCLUSION complement rule is assume to apply first.

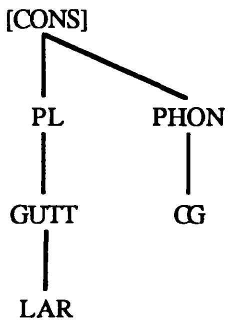
(4.57) <u>Derivations showing difference in complement rule order</u>

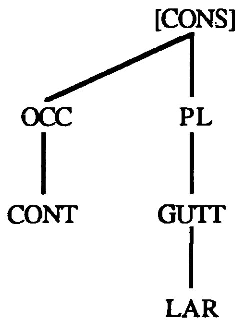
(a)

(b)

PHONATION
complement rule

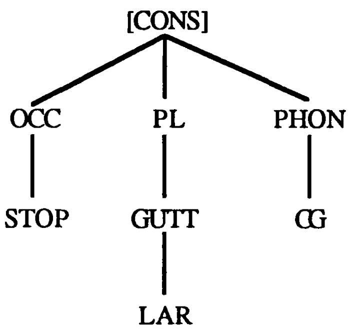
OCCLUSION
complement rule

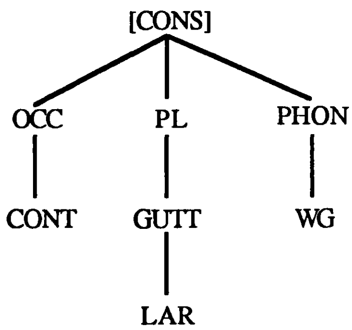




default insertion of the only possible OCCLUSION specification for a consonant specified LARYNGEAL and CLOSE GLOTTIS

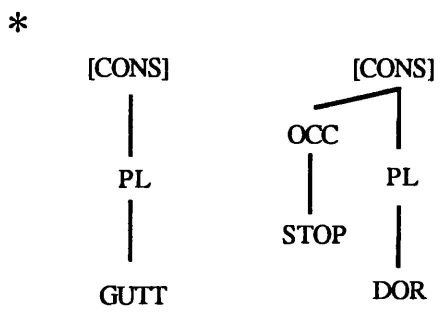
default insertion of the only possible PHONATION specification for a consonant specified LARYNGEAL and CONTINUANT





Let us turn now to the motivation for the rule of post-GUTTURAL DORSAL deletion. We can assume that the rule is not an arbitrary rule but one which is motivated by a general constraint in Somali on sequences of GUTTURAL consonants followed by a DORSAL stop. This can be formalized as follows:

(4.58) <u>Constraint on GUTTURAL consonants followed by DORSAL stops</u>



This motivation, however, does not explain the sequences of a GUTTURAL vowel followed by a DORSAL stop, since such sequences are found in the language. For example: **bakayle**, "hare", **xoog**, "strength". The case of the application of the rule of post-GUTTURAL DORSAL deletion when the leftmost segment is a vowel is not therefore directly motivated by the constraint in (4.58). It is assumed therefore that these particular applications of the rule fall out from the simple fact that the particular vowel consonant sequences match the structural description of the rule and thus undergo the rule application.

Before leaving this matter we must consider a further possible explanation for the phenomenon under discussion. It has been suggested by Moreno, M.M. (1955) (p.34) that the single guttural consonant is the result of a geminate consonant having been formed due to assimilation of the /k/ with the preceding guttural, this being followed by a rule of degemination. We reject this possibility due to the fact that to allow a rule of degemination would be undesirable. This is because we would have to explain why the rule would apply in this case but not in the potential cases of geminate consonants being formed by the geminate formation rule discussed in section 4.2.1. What is more, a separate explanation of the cases involving the GUTTURAL specified vowel final stems would have to be proposed. Thus, what can be accounted for by one rule here would have to be accounted for by two rules.

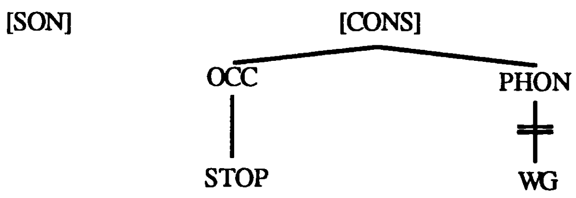
4.2.2.2. /t/ after vowels and GUTTURAL consonants and /k/ after vowels of sonority index 2

Examples of the process under discussion here are given in (4.49) and (4.52).

We see that when a suffix beginning with /t/ follows a vowel or a GUTTURAL consonant then the /t/ loses its WIDE GLOTTIS specification. In the case of the suffixes beginning with /k/, they also lose their WIDE GLOTTIS specification except for those examples which undergo the rule of post-GUTTURAL DORSAL deletion. This means that when /k/ follows any vowel which is not specified GUTTURAL, ie. of sonority index 2, it undergoes a WIDE GLOTTIS node deletion rule in the same way as /t/.

Let us now look at the possible formalization of a WIDE GLOTTIS deletion rule.

(4.59) Post-vocalic WIDE GLOTTIS deletion



The rule in (4.59) accounts for the cases exemplified above in (4.49a, b and c). There is nothing, however, in the rule formalism to prevent the deletion of the WIDE GLOTTIS node from the melody of /k/ when it follows a GUTTURAL vowel. We must assume, therefore, that the rule of post-GUTTURAL DORSAL deletion is ordered before the rule of post-vocalic WIDE GLOTTIS deletion. We need to establish whether or not this is due to extrinsic ordering or, preferably, due to intrinsic ordering.

Intrinsic ordering would be the result of the elsewhere condition which we have already assumed to hold for Somali in the morphology (see section 4.1.3.3.1.). Looking at the two rules we wish to order here, we can see that in terms of the left-hand melody description, the post-GUTTURAL DORSAL deletion rule properly includes the left-hand melody description of the post-vocalic WIDE GLOTTIS deletion rule. The melody at the left-hand edge of the rule is:

(4.60) <u>The left-hand melody in the post-GUTTURAL DORSAL deletion rule</u>

```
[ ]
 |
PL
 |
GUTT
```

In the post-vocalic WIDE GLOTTIS deletion rule the melody is:

(4.61) <u>The left-hand melody in the post-vocalic WIDE GLOTTIS deletion rule</u>

[SON]

In order for the rules to be ordered according to the elsewhere condition, the melody in (4.60) must properly include the melody in (4.61); that is to say, the segments whose melodies are represented by the melody in (4.61) must be a set of segments which is properly included in the set of segments represented by the melody in (4.60). We can ascertain this by listing the relevant sets of segments. Those which are included under the melody in (4.60) are:

a, e, o, q, kh, c, x, h, '

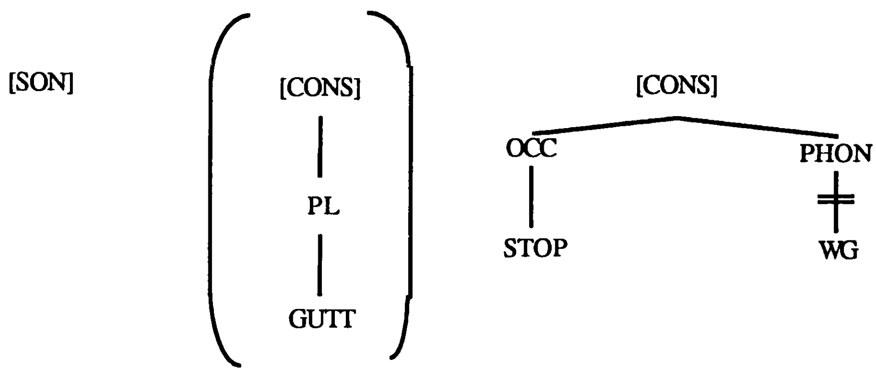
Those included under the melody in (4.61), on the other hand, are the following:

a, e, i, o, u

As we can see, the condition of proper inclusion is not met. Thus, we may not state that the ordering of the rules is due to the elsewhere condition, they must therefore be ordered extrinsically. The post-GUTTURAL DORSAL deletion rule will therefore be ordered before the post-vocalic WIDE GLOTTIS deletion rule.

The only remaining examples to account for are those involving the segment /t/ following GUTTURAL consonants. We shall assume here that this is due also to the post-vocalic WIDE GLOTTIS deletion rule which applies when a GUTTURAL specified consonant intervenes. We shall account for this in terms of the rule including the option of an intervening GUTTURAL consonant. Thus, the rule of post-vocalic WIDE GLOTTIS deletion will be reformulated as follows:

(4.62) Reformulation of the post-vocalic WIDE GLOTTIS deletion rule



It would be preferable if this "transparency" of the GUTTURAL consonants were the result of some aspect of the phonological representation of these consonants. However, there is no way in which this can be achieved, given the model we are assuming here. Thus, we shall leave it to future work to ascertain possible revisions which might provide a more satisfactory explanation for this matter.

In this section we have seen that all of the processes exemplified in diagram (4.49), (4.51) and (4.52) are accounted for by two rules: post-GUTTURAL DORSAL deletion and post-vocalic WIDE GLOTTIS deletion.

We shall here conclude our discussion of aspects of the inflectional phonology of Somali. We have demonstrated that the model of representation we are using here allows us to posit rules which are economical in terms of their complexity as well as in actual number when compared to the number of apparent processes to be explained.

Chapter 5. Conclusion

In this thesis we have set out a model of phonology which we have shown in various ways to be particularly explanatorily adequate for the phonology of Somali. The two main areas of this model are the theory of representation of melodies and the theory of prosodic representation.

The theory of representation of melodies is a version of the feature geometry model. As a basis for discussion we took the models of feature geometry proposed by Clements, N. (1985), Sagey, E.C. (1986) and McCarthy, J.J. (1988). Although certain characteristics of the models proposed by these authors form part of the model we have proposed here, there are certain characteristics which are particular to our model, these may be summarized as follows:

- the class node requirement (section 2.3.1.2.)
- the use of unary features and complementary features (sections 1.2.4. and 2.3.1.3.)
- the classification of the features dominated by the PLACE class node (section 2.3.2.5.)

The main aim in setting up the model of phonological representation proposed here was to provide a model which explains aspects of the phonology of Somali. We have aimed to do this in as restricted a manner as possible. The various characteristics mentioned above are instrumental in restricting the model.

The class node requirement is a requirement which states that all class nodes need to be present in a melodic representation as it exits the lexicon. In addition it must be adequately specified. This adequate specification was discussed in relation to each class node. The class nodes dominate the features of the system and here the model has been restricted in that we have proposed a system of unary features as opposed to binary features (sections 1.2.4. and 2.3.1.3.). The use of unary features in itself was shown to be more restrictive than a binary system and this was further developed in the assumption of a system of features which are common to both consonants and vowels. This was, for example, shown to be explanatory in the discussion of the post-GUTTURAL DORSAL deletion rule (section 4.2.2.1.). In this process, we accounted for the behaviour of the segment **k** when it follows a GUTTURAL specifed consonant and a GUTTURAL specified vowel with one rule. The different surface results in the two cases were shown to be due to the application of other independently motivated rules.

The relations between features dominated by the different class nodes was discussed and restricted the model further. In a sense there is a relation between the two features CONSONANTAL and SONORANT since it is they which comprise the ROOT node (section 2.3.2.3.). The features dominated by the class nodes PHONATION and OCCLUSION are related in that they are complementary features (sections 2.3.2.6. and 2.3.2.1.). This relation was shown to explain aspects of phonological behaviour such as the matter of contour segments which were explained by Sagey in a model utilising binary features. Furthermore, the adoption of complementary features allows us to retain some of the power of the theory of underspecification in our model of unary features despite the fact that this was developed within a theoretical framework involving binary features. Our criteria for setting up features as complementary features were set out and do not allow for any arbitrary pair of features to be set out in this way. We assumed that the complementary feature pairs, namely WIDE GLOTTIS and CLOSE GLOTTIS, and STOP and CONTINUANT are represented in that relation universally.

The other class node is the PLACE node and this also dominates features which are in relation to each other restricting their co-occurence (section 2.3.2.5.). We proposed three types of features which are dominated by this node: zone of constriction features (PALATAL and GUTTURAL) (section 2.3.2.5.1.2.); active articulator features (LABIAL, CORONAL, DORSAL, PHARYNGEAL CONSTRICTION and LARYNGEAL) (section 2.3.2.5.1.1.); and configuration features (ROUND, RETROFLEX and LATERAL) (section 2.3.2.5.1.3.). We proposed that for the class node requirement to be satisfied, an active articulator must be present in the representation of a consonant although not necessarily for a vowel in which only a zone of constriction feature may be present. Also a configuration node must co-occur with the active articulator node which dominates it, something reflected in the diagrammatic representation of these features.

The only other feature which is in the model of representation is the NASAL feature which we assume to be immediately dominated by the ROOT node (section 2.3.2.2.). This, we have not set up as a complementary feature, since there is no other feature which would satisfy the role of the other complementary feature. This way of setting up the NASAL node does explain certain aspects of the phonological behaviour of nasality as we have shown.

The specific features themselves are mostly features which are familiar in the literature on phonology and we have provided definitions for the features. The assumption of the various default rules allows us to posit underlying representations which are made up of a small number of features. This provides for more restriction in that since there are a smaller number of features there is a corresponding smaller number of potential rules for which the melodic representations might meet the structural description. Furthermore in relation to the default rules themselves we see that some are motivated by underspecification theory given the notion of complementarity we assumed.

As to the model of prosodic representation, this is based on the mora and the syllable. We demonstrated the adequacy of this model of representation for Somali by looking at the tonal accent system (section 3.3.1.1.) and the scansion system of Somali poetry (section 3.3.1.2.). Once assumed, the model was proved to be adequate in the explanation of other prosodic phenomena. The interaction of the melodic level and the prosodic level was discussed in a number of contexts and it was attempted to restrict matters in terms of explaining prosodic matters purely on the prosodic level as far as possible, for example, in the matter of the word structure condition (diagram (3.47)). Another context in which this interaction was discussed was in terms of developing the onset creation rule and the margin creation rule in which it was shown the sonority hierarchy played a role (section 3.3.2.5.).

In specifically Somali terms the models of representation we have proposed, along with the rules, has provided explanations for a number of aspects of the phonology of Somali. Certain general aspects have been addressed, such as the behaviour of the WIDE GLOTTIS segments (section 2.3.2.6.1.) and the patterning of the glottal stop with the CLOSE GLOTTIS segments. We have also addressed some of the matters relating to the prosodic phonology, such as the matter of reduplication the prosodic aspects of which have been explained in a very economical manner (section 3.3.2.1.). Also the matter of the behaviour of diphthongs and how they interact with the tonal accent assignment system has been explained as has the matter of the possibility of open syllable diphthongs being able to count as monomoraic or bimoraic in poetry section 3.3.2.2.2.). Furthermore we explain why it is only in open syllables that this is the case.

In the fourth chapter we have begun the work of providing underlying phonological representations for the various inflectional morphemes of Somali. We have also tried to account for various phonological phenomena which are apparent in the inflectional morphology. We have seen that the underlying representations of the morphemes we have discussed are very economical given the model of representation assumed here, as we mentioned above, this provides for a more restricted model of the phonology of the language. The processes, also, which we have discussed in the final chapter are economical in that we are able to account for what on the surface seem to be a number of separate phenomena. Geminate formation is able to account for all instances of what seem to be diverse assimilation processes in the inflectional phonology (section 4.2.1.). Also, as we mentioned above, the rule of post-GUTTURAL DORSAL deletion accounts for the behaviour of **k** following both vowels and consonants (section 4.2.2.1.).

It was the aim of this thesis to contribute to the study of Somali phonology and to the study of generative phonology in general. Both goals are, obviously, interrelated. The future is also interrelated. In terms of the study of Somali phonology, it is hoped that this model of representation will prove to be adequate for the investigation of further aspects of Somali phonology. Particular areas which come to mind are the phonology of the various derivational suffixes and further investigation into the relationship between the phonology and the system of poetic scansion. Also in the course of writing the thesis various aspects of the sound system of Somali which are more part of phonetic investigation have come to the fore and it is hoped that further work on these matters will be of use both in themselves as well as in terms of the light they may shed on phonological phenomena.

In terms of the study of generative phonology in general, future investigation lies not only in looking at the application of the model developed here in relation to Somali but also in relation to other languages. Thus by looking at phonological phenomena in other languages we shall be able to further develop the model we have proposed here to account for aspects of Somali phonology.

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