A Phonological Analysis of Somali

And the Guttural Consonants

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Chapter 1 Introduction and Phonetics

1.0 Introduction to the Thesis

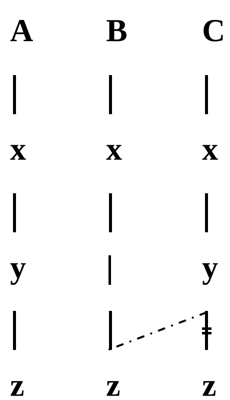
Saeed 1999 remarks that the phonetic and phonological facts of Somali are woefully understudied. He makes a specific appeal for further research on Somali in these fields. This thesis can be said to be a response to Saeed's call for further research on the language.

Given that there are no existing works dedicated to the phonology of Somali this thesis relies on the Somali data gathered through my own fieldwork. The purpose of this thesis is to present the Somali data that was collected, to present a partial model of the phonological facts of the language, and to discuss the theoretical consequences of the data and interpretation. Data presented in this thesis is of my own gathering unless explicitly stated otherwise.

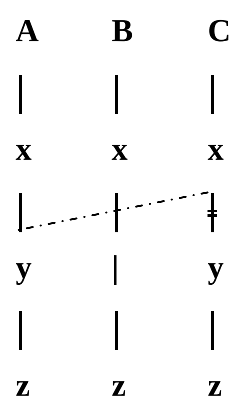
The structure of this thesis is as follows. In chapter 1 we introduce the phonetic facts and assumptions required for the phonological analysis. In chapter 2 we discuss nominal data that display consonant alternations and present phonological rules that account for the alternations. In chapter 3 we discuss nominal data that display vowel alternations and present phonological rules that account for the alternations. Finally, in chapter 4 we discuss data that concern the guttural consonants. Chapter 4 differs from the first three chapters because we not only present rules that account for the guttural data presented but we also discuss the theoretical impact of the phonological account of the guttural consonants. There is no theory of gutturals consonants that can explain the Somali guttural data, and therefore a new theory is required. The first three chapters provide the appropriate context in which to describe the problems of guttural consonants. In the final part of chapter 4 we present a new theory of guttural consonants.

In this thesis we use the unified feature theory presented in Clements and Hume 1995. Where the feature geometry of the account given here differs from Clements and Hume 1995 the reader will be explicitly told. Rules presented in this thesis follow the standard form given for autosegmental phonological accounts. The following schematic shows how rules are presented in this framework.

(1)a.



b.



The capital letters [A, B, C] are the root nodes that correspond to linear segments. The variables {x, y, z} are features of [A, B, C]. The order top to bottom illustrated by connecting solid single lines represents feature domination relationships where {x} dominates {y} and {y} dominates {z}. The features {x, y, z} each exist on their own teir. The domination relationships define feature planes. A plane is defined by a feature strictly dominating another. Planes are used to describe adjacency conditions for segments which are segmentally non-contiguous. In (1) the segments A and C are not segmentally contiguous, but they are adjacent with respect to the plane define by x dominating y. The reason that they are adjacent on this plane is that no intervening segment exists on the x dominating y plane. Adjacency conditions are fully explained in Odden 1994.

Finally, Rules are stated in terms of the spreading of or deletion of a feature. The dashed line represents a feature spreading from one segment to another. A double strike through represents the delinking, or loss of the association with the features connected to a segment below that connecting line. There are two kinds of spreading, represented in (1)a-b. A feature can spread to an adjacent segment on the same tier if the segments are segmentally adjacent. Shown in (1)a the feature {z} spreads from B to C, because they are segmentally adjacent. A feature can also spread to a segment that is not segmentally adjacent if and only if the segment exists on the plane that the feature spreads on. Shown in (1)b. the features {y, z} spread from A to C, because A and C exist on the x dominating y plane.

1.1 Field Work

The data was collected starting in June 2009 and ending July 2010. The recordings were done in thirty to sixty minute sessions with an ATR 20 microphone and with an Edirol recorder. The sound files are saved and transcribed and indexed in an HTML interface database.

The data in this thesis come from extensive work with Abdulkadir Ahmed-Kheyr Abdi, a Somali language instructor and translator for the Ohio State University Medical Center, and Jibril Hirsi, the executive director of SomaliCAN, a community based organization that works to improve the health, safety, and productivity of New Americans in Ohio. Both speakers grew up around Moqadishu and currently live in the Columbus, Ohio, area.

This work would not have been possible without my informants. I am indebted to them for their patience with my questions and their insights on the Somali language. Gentlemen, thank you.

Whatever mistakes remain in this work are mine alone.

1.2 Language Biographics

Somali is an Afro-Asiatic language in the East Cushitic family. It is spoken by 9-16 million people. Speakers live in the Horn of Africa, primarily in Somali, but also in Djibouti, Kenya, and Ethiopia. Another large group of speakers live in diaspora communities in the Middle East, Europe, and North America.

The remainder of this chapter will be focused on the phonetic details of Somali. The first section is on consonants. The second section is on vowels.

1.3 Consonants

In this section, the phonetic details of Somali consonants will be discussed. First, we present all observed consonant phones. Second, we present the underlying forms. Third, we discuss the voicing and aspiration difference among the consonants. Fourth, we discuss the epiglottal consonant. Fifth, we discuss gemination.

The following chart show all of the observed phones in Somali.

(2) Phones

	bilabial	**labio-dental**	**dental**	**alveolar**	**post-alveolar**	**retroflex**	**palatal**	**velar**	**uvular**	**pharyn-geal**	**glottal**	**epiglottal**
stop	b		t d			ɖ		k g	q		ʔ	
nasal	m			n								
flap-tap				ɾ								
trill												ʜ
fricative	β	f	ð	s	š			γ	χ ʁ	ħ ʕ	h	
affricate					č							
approximate	w						j	w				
lateral				l								

The following list shows roots that contain each of these segments. The list is organized so that it follows the above chart by row, reading top to bottom then left to right. The segment of interest for each entry is in bold font.

(3)	[**b**a:bu:ɾ]	'car'	[**k**ab]	'shoe'
	[**t**uke]	'crow'	[**g**al]	'pond'
	[**d**a:h]	'curtain'	[**q**un]	'tonsil'
	[**ɖ**ɛg]	'ear'	[lo**ʔ**]	'cattle'

[**m**almo]	'days'	[ta:rɪ**χ**]	'history'
[**n**o:l]	'livestock'	[taɾa**ʁ**^{j}o]	'matches'
[**r**o:ti]	'bread'	[la**ħ**o:нaha]	'the fritters'
[**н**o:n]	'wasp'	[**ʕ**unto]	'food'
[ka**β**o]	'shoes'	[**h**oj]	'home, settlement'
[**f**uɾe]	'key'	[**č**a:lijad]	'community'
[bah**ð**o]	'the noble'	[**w**ɛ:či]	'face'
[**s**al]	'base'	[a:**j**o]	'stepmother'
[ħo:**š**]	'gray hair'	[**l**ab]	'male'
[lu**γ**o]	'legs		

The segments [н, β, ð, γ, ʁ] all derive from other underlying segments. In chapter 2, a spirantization rule is introduced which explains how [β] derives from /b/, [ð] from /d/, [γ] from /g/, and [ʁ] from /q/. The segment [н] derives from /ħ/, and this fact is discussed later in this chapter in the epiglottal section.

The following chart show all of the phonemes of the language. These segments cannot be derived by any rule, and must be specified underlyingly.

(4) Phonemes

	bilabial	**labio -dental**	**dental**	**alveolar**	**post-alveolar**	**retroflex**	**palatal**	**velar**	**uvular**	**pharyn -geal**	**glottal**	**epiglottal**
stop	b		t d			ɖ		k g	q		ʔ	
nasal	m			n								
flap-tap				ɾ								
trill												
fricative		f		s	š				χ	ħ ʕ	h	
affricate					č							
approximate							j					
lateral				l								

The voiceless stops [t, k] do not usually occur in the coda position in a syllable. The known exception is an Arabic loan word: *hikmad* "wisdom". Both voiced and voiceless stops do occur in the onset position. The occurence of voiceless stops cannot be predicted by a rule if one assumes that only /b, d, g/ are underlying because they do not occur in complementary distribution. The following data show that voicing is unpredictable within a syllable onset.

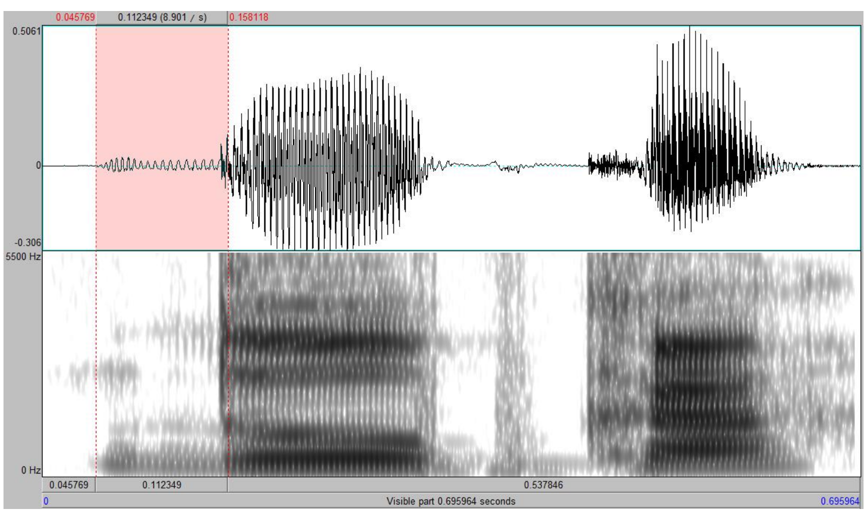
(5) a.	[tun]	'nape'
	[dub]	'turban'
b.	[kal]	'pestle'
	[gal]	'pond'

1.3.1 Voicing and Aspiration

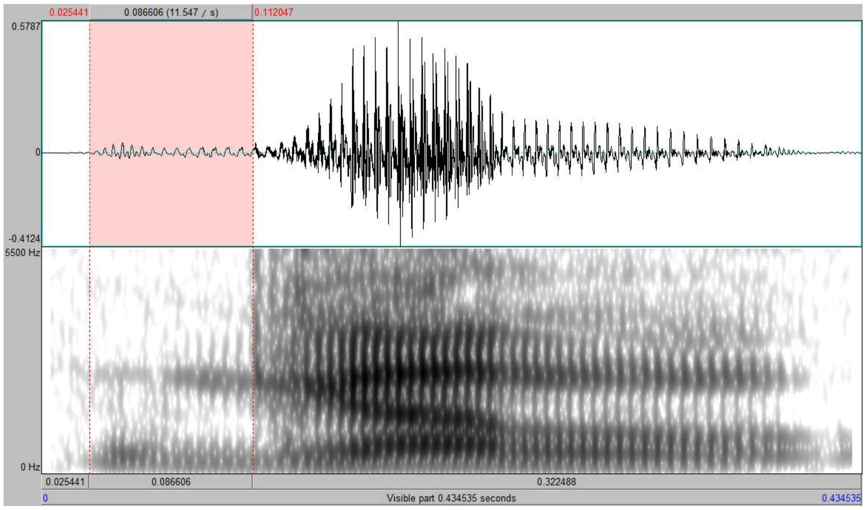
The chart provided in (4) makes a potentially controversial claim; that is that the uvular stop is /q/ and not /ɢ/. Saeed 1999 claims that the uvular stop is /ɢ/. Dubnov 2003 claims that there are both /q/ and / ɢ/. In this section we establish the voicing facts and the aspiration facts of the stops in Somali. We pay special attention to the facts about the uvular consonant, given the range of claims made about them. Understanding these facts will clarify both the phonetic reality of the uvular stop and what phonological relationships are relevant to the rules in the language.

All voiced stops are unaspirated and all voiceless stops are aspirated, excepting the uvular stop. The following spectrograms show the voiced stops in onset position. These segments are highlighted.

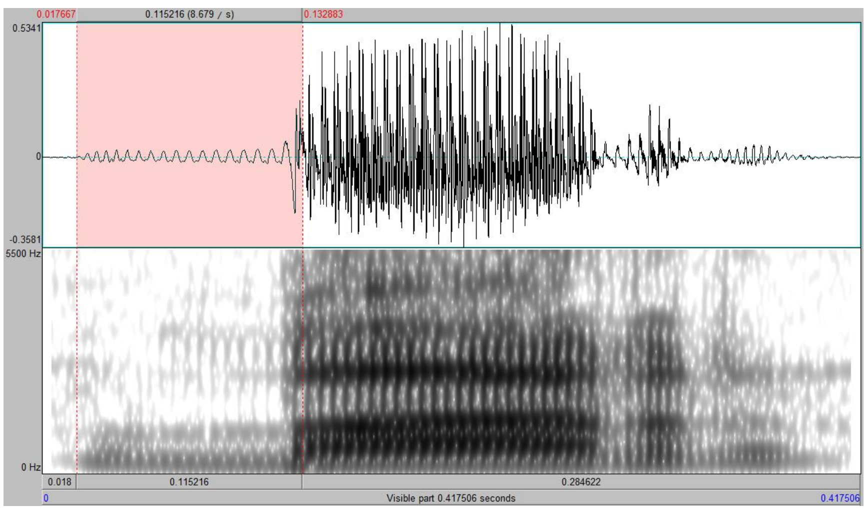
(6) [du:bka] 'the turban'



(7) [gal] 'pond'

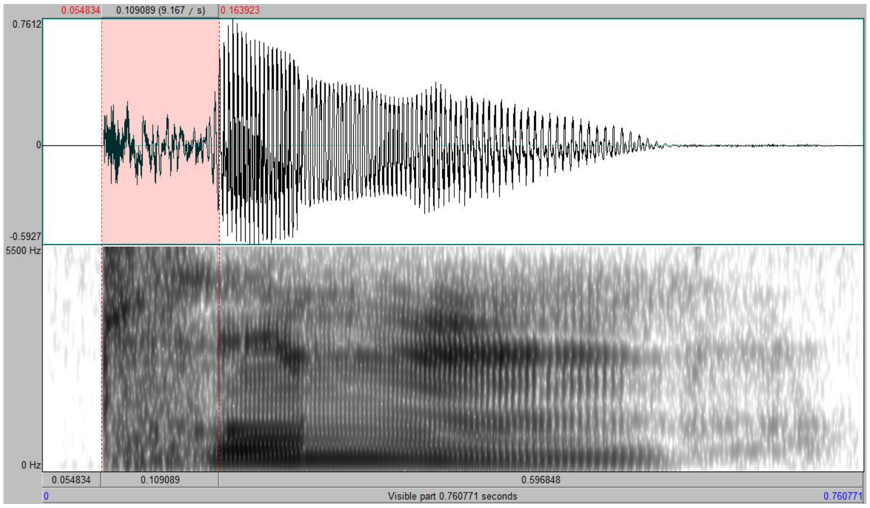


(8) [baɾ] 'freckle'

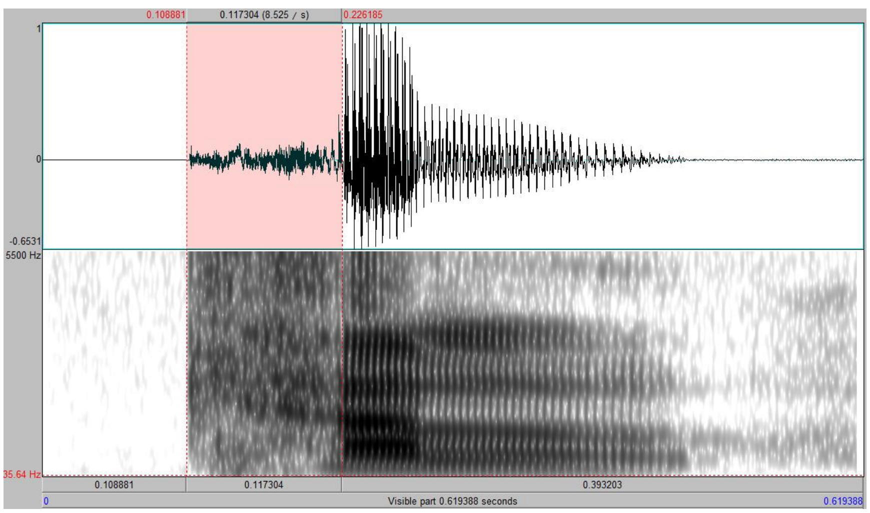


The spectrograms in (6)-(8) show a clear voicing bar and no aspiration during the production of the initial stop. The next set of spectrograms show the voiceless stops in onset position.

(9) tun 'nape'

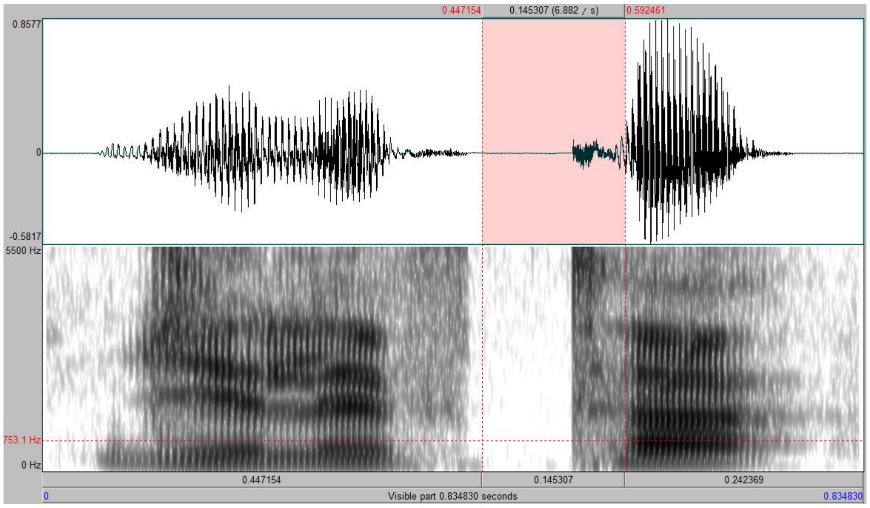


(10) kal 'pestle'

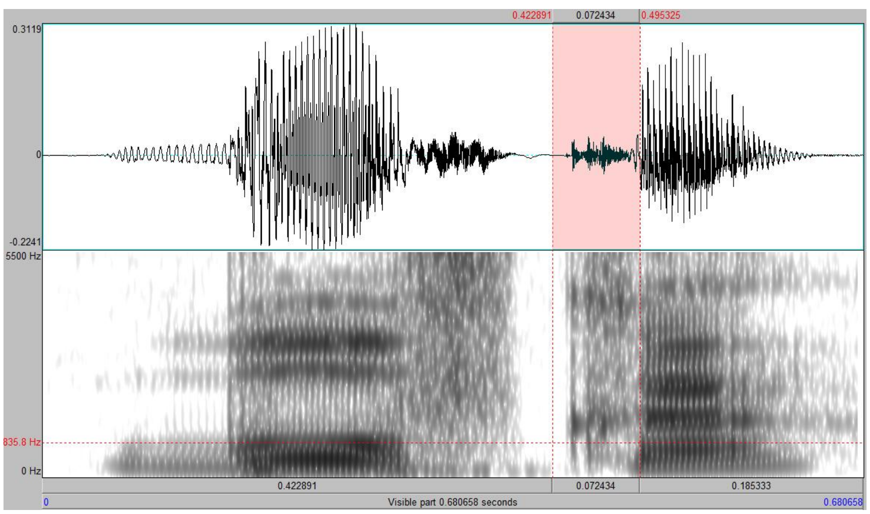


The spectrograms in (9)-(10) show no voicing, but do show aspiration following the release of the initial stop. Finally, we look at [t, k] occuring after other consonants. The following set of spectrograms show that the consonants [t, k] are still aspirated after an [f].

(11) [ǰilifta] 'the tree bark'[1]



(12) [bu:fka] 'the umbilical cord'

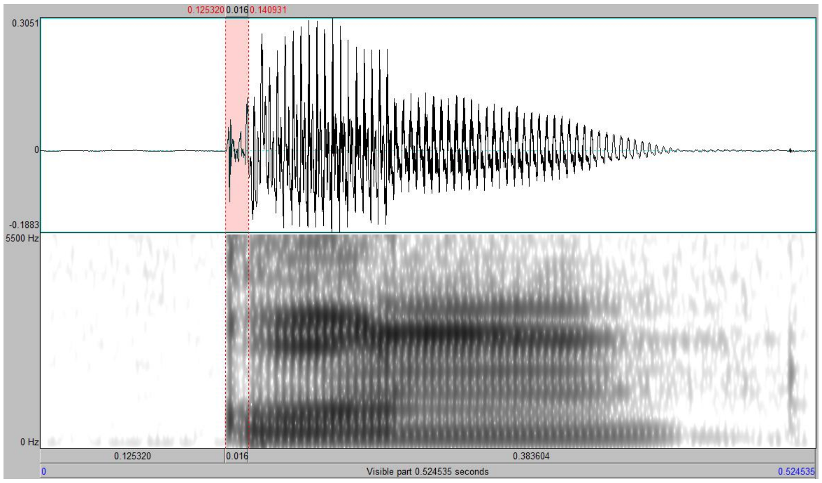


From the data in (6)-(12) we can make two generalizations. First, voiced stops are always unaspirated. Second, without considering [q], voiceless stops, are always aspirated.

Next, we look at a roots with a uvular stop.

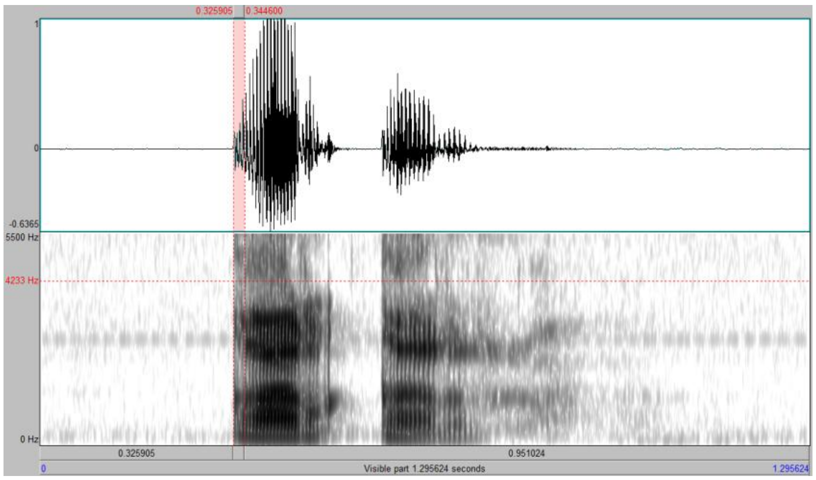
[1] The segment transcribed as [ǰ] in the spectrogram is voiced and unaspirated. This speaker produces [ǰ] in free variation with [č]. This token is one of the [ǰ] productions. Another speaker only ever produced [č].

(13) [qun] 'tonsil'

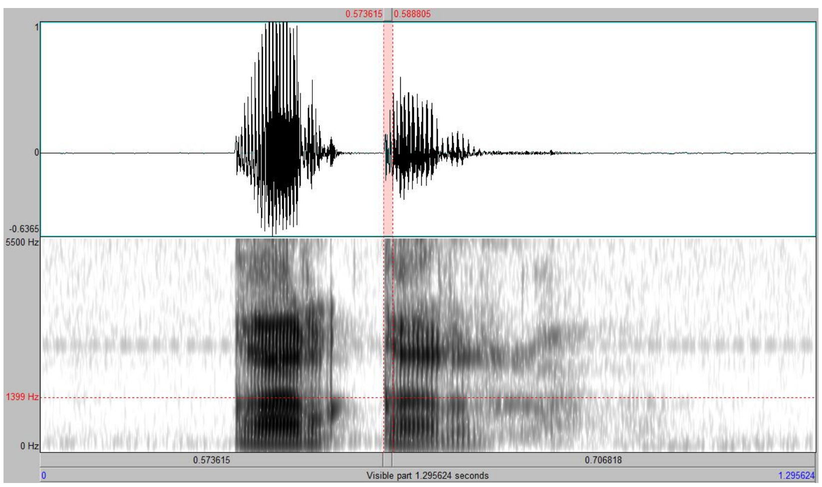


(14) [qarqar] 'shoulder'

a. looking at the first [q] –[**q**aɾqar]



b. looking at the second [q] –[qaɾ**q**aɾ]



The spectrograms in (13) and (14) show that there is never any voicing or aspiration for the uvular stop. Therefore, it is misleading to transcribe the the uvular stops as /ɢ/, or to claim that there are both /q/ and /ɢ/. The uvular stop is transcribed /q/ in this work.

All voiceless stops [t, k] are really phonetically [t^h, k^h]. We see no reason to claim that these stops are unaspirated underlyingly and become aspirated by a rule; this unneccessarily complicates the phonology. In light of these data, and assumptions all symbols [t, k] should in fact be understood as phonetically and phonologically [t^h, k^h].

The reason that this distinction matters is that there is a spirantization rule that affects the voiced stops /b, d, g/, and /q/. The data below show the spirantization phenomenon. The purpose of the data shown below is to illustrate the consequences of this analysis of the uvular consonant. A full analysis of these spirantization data is in chapter 2.

(15)	*bare N*	*plural N*	
	[la:b]	[la:βo]	'chest'
	[bad]	[baðo]	'sea'
	[lug]	[luγo]	'leg'
	[taɾaq]	[taɾaʁ^{j}o] [2]	'match'

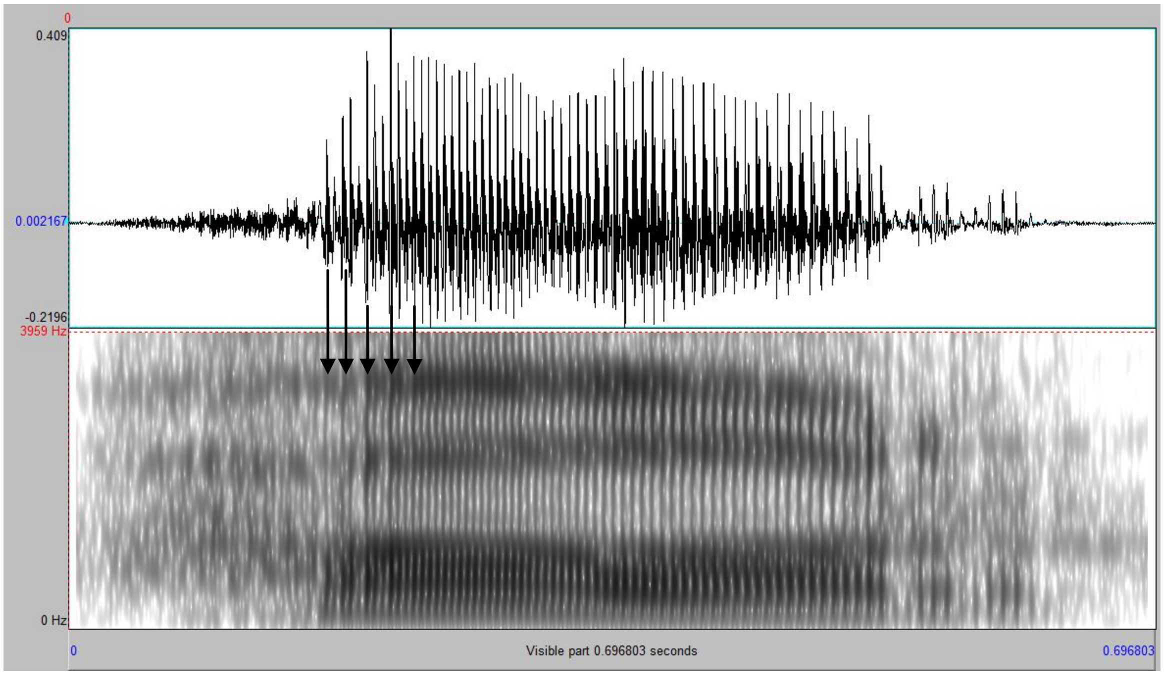
Assuming that there is a spirantization rule, the only way to account for these data is to claim that the phonological target of the spirantization rule is a segment lacking aspiration, and not one that is voiced.

1.3.2 The Epiglottal Consonant

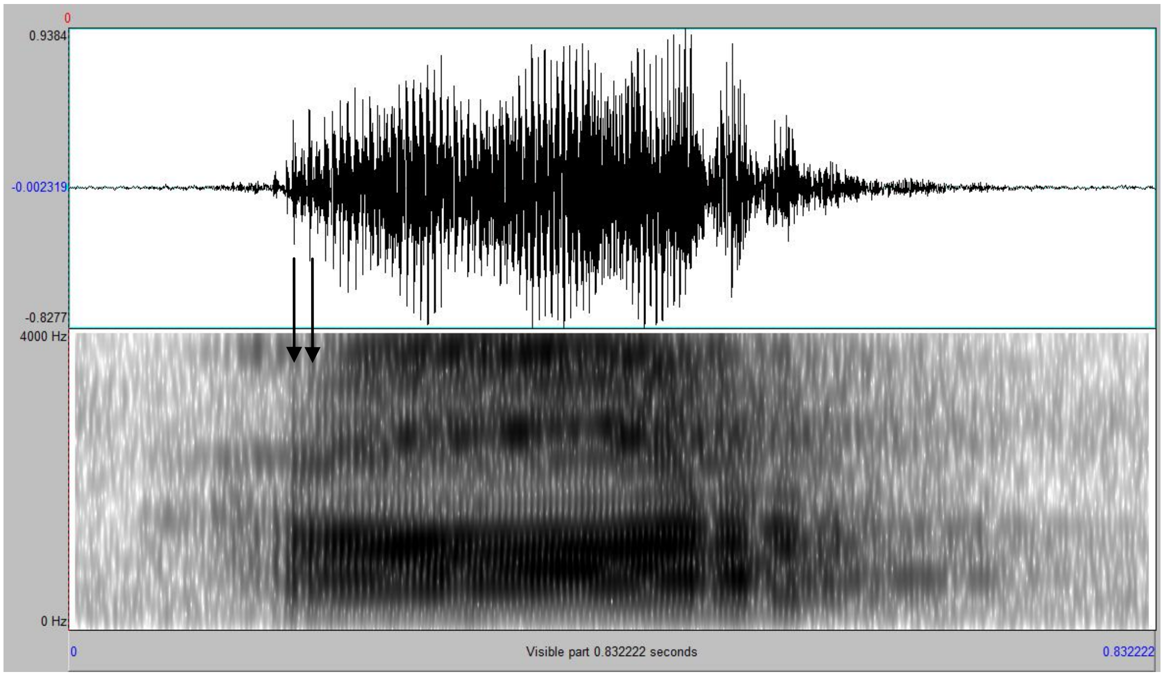
The consonants [ħ] and [ʜ] occur in free variation. For the sake of simplicity both productions were transcribed as [ħ] for this thesis. The spectrograms below show two different speaker's productions of the same 'voiceless pharyngeal onset'. A trill will be indicated using arrows.

[2] The off-glide [^{j}] sometimes occurs between a continuant and a vowel for this speaker.

(16) ħoːɾ 'bubble'



(17) ħoːɾ 'bubble'



As shown in the spectrograms, some speakers produce [ħ] with only a slight epiglottal trill, as in (17). In (17) the waveform and the spectragram do not show the same extensive rippling as (16). Other speakers produce the 'voiceless pharyngeal fricative' as a trilled [ʜ], as in (16). In (16) the effect of trilling is extremely noticeable in the spectrogram, and it is very apparent when one listens to the production of this consonant. In many cases the trilling was so extreme that the consonant sounded like it had voicing. The epiglottal variation is worth a full phonetic investigation given that it is not attested in previous grammars on the language and that radical consonants are generally understudied.

1.3.3 Gemination

The purpose of this section is to state the working assumptions about gemination that affect the analysis presented in this work. A thorough phonetic analysis of gemination was not conducted for this thesis; therefore we rely on perception and gross length difference to distinguish singleton stops from geminate stops.

Sonorants are the only consonants that are uncontroversially geminate; therefore we claim that there are only geminate sonorants in Somali, [mm, nn, ɾɾ, ll]. The uncontroversial geminates can occur in two places in Somali. There are word internal geminates and geminates that are created by sandhi. No geminates occur root initially.

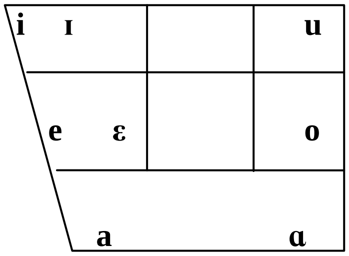
Stops that are represented orthographically as geminates, either word internally, or as a result of the sandhi do not sound like geminates when compared to geminates in other languages. Many stops that are orthographically geminate also do not undergo the spirantization rule that is discussed in chapter 2. Stops not undergoing the spirantization rule are considered exceptions, but raise questions about the nature of gemination. We take the most conservative stance that there are only singleton obstruents. In chapter 2, in the section on degemination, data concerning these orthographically geminate environments is dealt with in a way such that surface geminate stops are not generated. Further research on geminates is required to fully explain these phenomena.

1.4 Vowels

The purpose of this section is to introduce the vowel transcriptions that will be used in the rest of this work and to introduce a problem with vowel transcription. A thorough phonetic analysis of vowel quality was not conducted for this thesis, but should be conducted given the problem that will be addressed below.

The vowels that were used to transcribe the data are shown in the following vowel chart.

(18) Vowels



The front vowels [ɪ, ɛ] are [- ATR] vowels. All of the cardinal vowels can also occur as long vowels. The following list shows roots containing these vowels.

(19)	[kibis]	'bread'	[bi:q]	'coward'
	[bɪɾ]	'iron'	[bɪɾɪ:q]	'husk'
	[hu]	'clothing'	[bu:f]	'umbilical cord'
	[tuke]	'crow'	[ge:l]	'camels'
	[dɛmbi]	'transgression'	[lɛ:ħ]	'curdled milk'
	[qoðob]	'article, paragraph'	[ro:ti]	'bread'
	[ɑfɑɾge:s]	'quadrilateral'	[wɑ:ħ]	'quarter'
	[laħ]	'ewes'	[wa:b]	'small hut'

Finally, we turn to the problem of ATR vowel transcription. In this study judgements on the ATR vowel quality for non-front vowels could not be reliably reproduced. Therefore, the ATR distinction for these vowels is not included in the transcriptions in this work. Instead we use the cardinal vowels to cover both. We suspect for every cardinal vowel there is an ATR counterpart. A phonetic study of vowels in Somali is needed in order to better characterize the ATR vowel distinction. Additionally, a phonological study of the rules that affect or are affected by [+ATR] is needed. These two studies are interdependent and either one is beyond the scope of this work.

Chapter 2 Consonant Rules

2.0 Introduction

This chapter is a broad overview of the phonological rules of Somali. The discussions of vowel harmony and the problem of guttural consonants with respect to the spirantization rule each require the attention of an entire chapter. When these discussions are relevant in this chapter the reader is told that a further discussion will follow. In this chapter we look at data from nominal forms. From these data rules are posited as a partial model of the grammar. We discuss rule ordering after the presentation of the rules along with a summary of the rules.

2.1 Introduction to the forms relevant to the examples.

Nouns have two grammatical genders, feminine and masculine. Most nominal suffixes begin with a gender marking affix. The gender marking affixes are /-d/ or /-g/ for feminine and masculine agreement, respectively. Verbs in the third person singular must agree with the gender of the subject noun. The form of the gender affix is determined by the gender of the noun. Therefore, the third person singular form of a verb can be used as a diagnostic tool for determining the underlying form of the gender affix that the verb's subject noun takes. There are several definiteness suffixes. In this thesis we focus only on the definite suffix /-a/. The feminine definite suffix is /-d+a/. The masculine definite suffix is /-g+a/. When a 'definite marking suffix' is mentioned here it refers to the combination of the gender marking affix and the definite marking affix because both are obligatory for marking definiteness.

There is no gender oriented noun-verb agreement with plural nouns—the third person plural is unmarked for gender. As a potential diagnostic tool, one could look at the definite plural form of a noun. The definite suffixes /-da/ and /-ga/ attach to the root in both the singular and the plural; there are no separate morphemes to mark definiteness exclusively in the plural. However, the use of /-da/ in the singular does not entail the use of /-da/ in the plural, nor does the use of /-ga/ in the singular entail the use of /-ga/ in the plural. Therefore, the gender of plural nouns is indeterminate. When a noun is refered to by its gender its being referred to by its gender in the singular form.

The motivation for assuming that the underlying forms of the gender affixes are /-d/ and /-g/ will be discussed after the data have been presented. The discussion of this motivation requires an understanding of the data. Therefore, it is advantageous to work through the data with these assumptions in hand, and to return to a discussion of motivation afterward.

There are a few plural paradigms with Somali nouns, but only two are relevant for the present data. In the first paradigm the plural is formed by adding an /-o/ suffix to the root. In the second paradigm the plural is formed by reduplicating the root final consonant and inserting an epenthetic [a] between the root and the reduplicated consonant. These two plural paradigms are illustrated below.

	Plural Form	*Bare Form*	
(1)	[aʁalo]	[aʁal]	'home'
(2)	[dalal]	[dal]	'country'

2.2 Rules

2.2.1 Rule Ordering

A specific rule order must be imposed on the rules that follow in this chapter in order to make correct predictions about the surface forms. The rules occur in the following order.

(3)
I. Root Final Consonant Cluster Separation
II. Spirantization
III. Velar Deletion
IV. Velar Debuccalization
V. Coalescence
VI. Degemination
VII. Devoicing
VIII. syllable final /m/→[n]

The rules in this chapter are presented in this order. When order is relevant to the formalization of a rule a discussion of ordering follows the formalization.

2.2.2 Root Final Consonant Cluster Separation

Some nouns underlyingly end in consonant clusters. When these consonant clusters occur in the coda position in a syllable the consonants are separated by the insertion of a vowel. Generally, the epenthetic vowel is a copy of the root vowel directly preceding. A list of nouns with coda consonant clusters underlying are shown below. The syllable breaks are shown with a period.

	bare N	plural N		
(4)a	[ga.lab]	[gal.bo]	/galb/	'afternoon'
	[dɪ.βɪn]	[dɪb.no]	/dɪbn/	'cheek, buttock'
	[čɪlɪf]	[čɪlfo]	/čɪlf/	'tree bark'
b	[ma:.lɪn]	[ma:l.mo]	/ma:lm/	'day'

When consonant cluster final roots take the plural suffix [-o] the members of the consonant cluster are separated not by an epenthetic vowel. The alternation of [n] and [m] in (17)b are explainable by a rule to be discussed later. Finally, again looking at (17)b, roots do not always take a copy vowel. There is no predictable pattern for the roots that do not take a copy vowel. They are assumed to be idiosyncratic exceptions.

This copy vowel epenthesis rule must be ordered before the spirantization rule. The example *dɪβɪn 'cheek'* has the fricative [β] in its surface form. This segment only occurs as a product of a rule. If the consonant cluster separation rule applied after the spirantization rule we would incorrectly predict the surface form **dɪbɪn 'cheek'* because at the time that the spirantization rule applies the root would be *dɪbn* where [b] is not intervocalic.

2.2.3 Spirantization

Spirantization is relevant to both the masculine and feminine gender affixes. All guttural consonants are transparent this rule. However, the uvular consonant [q] can also undergo the spirantiztion rule. This is a problem that demands attention. In chapter 4 we discuss the uvular's ability to be both targeted and ignored by the spirantization rule. In this chapter we only discuss the facts concerning the cases where [q] undergoes the spirantization rule. We also postpone a discussion of vowel harmony in this chapter. In the following data in this chapter, a root with a non-high final vowel [e, o] alternates when the root takes a suffix. These facts are the focus of chapter 3. In this chapter feminine nouns are discussed first and masculine nouns are discussed second.

The feminine definite suffix surfaces as [-ða] when it follows a vocoid. Shown below are feminine nouns that show that the suffix consonant spirantizes.

		bare N	*definite N*		*bare N*	*definite N*	
(5)	a.	**[i] final roots**					
		[afti]	[aftiða]	'referendum'	[ʕɪdi]	[ʕɪdiða]	'fingernail'
		[da:fi]	[da:fiða]	'grain for caanjero'	[mɪndi]	[mɪndiða]	'knife'
	b.	**[o] final roots**					
		[asmo]	[asmaða]	'curse'	[ʕunto]	[ʕuntaða]	'food'
		[ǰiho]	[ǰihaða]	'direction'	[a:jo]	[a:jeða]	'stepmother'
		[bamba:no]	[bamba:naða]	'bomb'	[ħo:lo]	[ħo:laha]	'cattle, wealth'
		[a:jo]	[a:jaða]	'stepmother'	[ʕa:no]	[ʕa:naha]	'milk'
		[bɛla:jo]	[bɛlaja:ða]	'calamity'	[bowðo]	[bowðaða]	'thigh'
		[ʕunto]	[ʕuntaða]	'food'	[ħiɾmo]	[ħiɾmaða]	'bundle, package'
		[dɛwoʕo]	[dɛwoʕaða]	'jackel'	[ba:βaʕo]	[ba:βaʕaða]	'palm of a hand'
		[ɖunkašo]	[ɖunkašaða]	'kiss'			
	c.	**vocoid final roots**					
		[ej]	[ejða]	'bitch'	[gaboj]	[gabojða]	'hunter, archer'
		[čalaqlej]	[čalaqlejða]	'wrist'			

These data show that the feminine suffix surfaces as [-ða] after a vocoid. There are a few gaps in the data presented above. There are no observed feminine nouns that end with [e, w, a:]. We predict that the feminine definite suffix would surface as [-ða] after these vocoids as well.

Next, we will look at masculine nouns. The masculine definite suffix has two different surface forms between vowels. The masculine definite suffix surfaces as [-γa] after a vocoid, but only after glides, high vowels, and the long vowel [a:]. After non-high, non-low vowels [e, o] the masculine definite suffix surfaces as [-ha]. Those data are discussed in the next section. Here we only look at the cases where the masculine definite suffix surfaces as [-γa]. Shown below are masculine nouns that show that the suffix consonant spirantizes.

		bare N	*definite N*		*bare N*	*definite N*	
(6)	a.	**long vowel final roots**					
		[aɾda:]	[aɾda:γa]	'courtyard'	[gaβija:]	[gaβija:γa]	'poet'
		[wa:]	[wa:γa]	'dawn'	[baqbaʁa:]	[baqbaʁa:γa]	'parrot'

b. **vocoid final roots**

[anqaw]	[anqawγa]	'ankle'	[ʕaðaw]	[ʕaðawγa]	'enemy'
[fulej]	[fulejγi]	'coward'	[oðej]	[oðejγa]	'old man, father, husband'
[ej]	[ejγa]	'dog'			

c. **[i] final roots**

[ɾo:ti]	[ɾo:tiγa]	'bread'	[duqsi]	[duqsiγa]	'fly, insect'
[diβi]	[diβiγa]	'bull, ox'	[galti]	[galtiγa]	'immigrant'
[dɛmbi]	[dɛmbiγa]	'crime, sin'	[ʕa:ɾi]	[ʕa:ɾiγa]	'low tide'
[gɛβi]	[gɛβiγa]	'dock, pier'	[oɾgi]	[oɾgiγa]	'male goat'
[ʕa:ɾi]	[ʕa:ɾiγa]	'low tide'	[fara:nti]	[fara:ntiγa]	'ring'
[maɾu:di]	[maɾu:diγa]	'elephant'	[dowli]	[dowliγa]	'well rope'
[ači]	[ačiγa]	'upper caste'	[guɾi]	[guɾiγa]	'home, settlement'
[ɾati]	[ɾatiγa]	'female camel'			

These data show that the masculine suffix surfaces as [-γa] after glides, high vowels, or long vowels. After non-high short vowels another rule applies, and these data are discussed in the next section on debuccalization.

The data from both the feminine and the masculine noun lists show that voiced stops [d, g] spirantize when both the unaspirated stop occurs in syllable initial position and after a vowel. The data in the rest of this section show two things. First, the rule targets the unaspirated stops, which include all of the voiced stops [b, d, g] and the voiceless uvular stop [q]. Second, the rule applies universally, not just suffix initially.

Below we show that all the unaspirated stops spirantize. The following list show that /b, d, g, q/ spirantize when they are in the onset position in a syllable and follow a vowel. (see fn.2 above)

bare N	*plural N*		*bare N*	*plural N*	

(7) a. **[b] final roots**

[la:b]	[la:βo]	'chest'	[kab]	[kaβo]	'shoe'
[toħob]	[toħoβo]	'fishscale'	[ɑγɑb]	[ɑγɑβʲo]	'thing

b. **[d] final roots**

[ummad]	[ummaðo]	'community'	[ɪɾɾɪd]	[ɪɾɾɪðo]	'door'
[ča:lijad]	[ča:lijaðo]	'community'	[bɛ:d]	[bɛ:ðo]	'egg'

[čowhaɾad]	[čohaɾaðo]	'gem'	[kɛlbɛd]	[kɛlbɛðo]	'bitch'
[do:d]	[do:ðo]	'argument'	[čalħad]	[čalħaðo]	'water jar'
[bad]	[baðo]	'sea'	[kɛbɛd]	[kɛbɛðjo]	'mat'

c. **[g] final roots**

[ɖɛg]	[dɛγo]	'ear'	[bɛ:g]	[bɛ:γʲo]	'measure of grain'
[lug]	[luγo]	'leg'			
[bɪg]	[bɪγʲo]	'spark, flash'	[ʕa:g]	[ʕa:γʲo]	'hard plastic

d. **[q] final roots**

[bi:q]	[biʁaq]	'coward'	[taɾaq]	[taɾaʁʲo]	'match'
[bɪɾi:q]	[bɪɾɪ:ʁaq]	'husk'	[dɛ:q]	[dɛ: ʁo]	'donation, generosity'
[ɪɾsa:q]	[ɪɾsa:ʁʲo]	'food'			

bare N	*def. plural N.*		*bare N*	*def. plural N*	
[sɪɾɪq]	[sɪɾɪʁʲaða]	'noose'	[taɾaq]	[taɾaʁʲaða]	'match'
[wɪɾɪq]	[wɪɾɪʁʲaša]	'lightening'	[lu:q]	[lu: ʁʲaða	'corner'

From these data we conclude that the spirantization rule targets all unaspirated stops.

The next set of data show that the spirantization rule applies universally and not just next to a morpheme boundary. We know that all instances of spirants are underlying unaspirated stops, as discussed in chapter 1. Therefore, the data in the following list show that the spirantization rule must apply within a root because the data in (8)a-d. show forms that surface with a word internal spirant.

(8) a. **[b] spirantizing**

[gaβija:]	'poet'	[ħaβu:b]	'cereal grain'
[geβoj]	'hunter'	[haβa:ɾ]	'curse'
[tiβa:ħ]	'report	[kaβan]	'guitar'
[gɛβi]	'pier, dock'	[dɪβɪn]	'cheek, buttock'
[waβaɾ]	'wiseman'	[ba:βaʕo]	'palm of a hand'
[diβi]	'bull, ox'		

b. **[d] spirantizing**

[ʕaðaw]	'enemy'	[qoðob]	'article, paragraph'
[oðej]	'old man'	[gaða:l]	'back'
[uðub]	'pole'	[bɪðɪħ]	'left side'

c. **[g] spirantizing**

[ɑγɑb]	'thing'	[lowγal]	's.t related to the knee'

d. **[q] spirantizing**

[aʁal]	'home'	[gaɾnaʁe]	'judge'
[daʁi:q]	'flour, meal'	[baqbaʁa:]	'parrot'

The data in (7) and (8) show that the spirantization rule targets all unaspirated stops and applies universally.

The environment that triggers the spirantization rule requires that the rule refer to syllable structure. The rule targets an unaspirated stop that follows a vowel and occurs in the onset position in a syllable. The continuant feature spreads from the left flanking vowel.

The data in (9) show that the rule is blocked when an upper oral consonant occurs between the target stop and the left flanking vowel. The term "upper oral" refers to all consonants articulated in the oral cavity. This term will be discussed in detail in chapter 4.

(9)a. **[b] preceded by a consonant root internally**

[ʔam**b**aɾ]	'amber	[ʕam**b**e]	'mango'
[bam**b**a:no]	'bomb'	[gal**b**o]	'afternoons'
[dɛm**b**i]	'transgression'	[baq**b**aʁa:]	'parrot'

b. **[d] preceded by a consonant root internally**

[ar**d**a:]	'courtyard'	[gabal**d**aje]	'sunflower'
[mɪn**d**i]	'knife'		

c. **[g] preceded by a consonant root internally**

[oɾ**g**i]	'male goat'	[čen**g**ɛli]	'bumpkin'
[afaɾ**g**ɛs]	'quadrilateral'	[taɾ**g**al]	'pair of pants'

d. **[q] preceded by a consonant root internally**

[an**q**aw]	'ankle'	[qaɾ**q**aɾ]	'shoulder'

We conclude from the data in (9) that the rule requires both that the targeted stop be in the onset position in a syllable and follow a vowel. This rule must be written so that the rule's environment specifies both the target segment's position in a syllable and the preceding vowel.

It is incorrect to state that the sprirantization rule applies to any unaspirated stop in the onset position in a syllable because root intial unaspirated stops do not spirantize. This is shown below with roots in their bare form

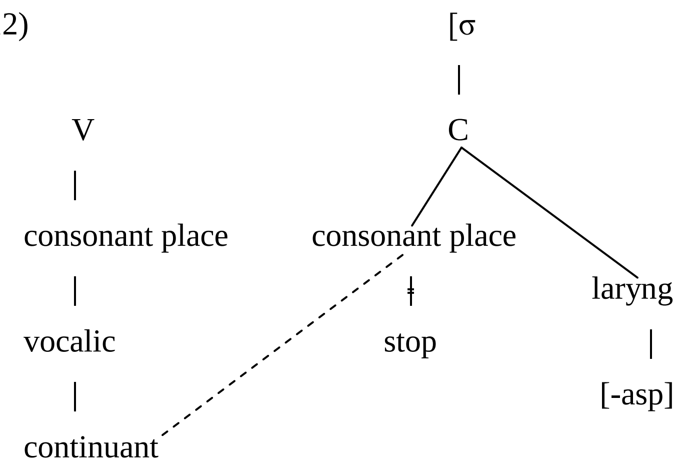
	bare N	
(10)	[**b**aɾ]	'freckle'
	[**d**aɾ]	'clothing'
	[**g**ɛbi]	'dock, pier'
	[**q**aɾqaɾ]	'shoulder'

It is also incorrect to state that the spirantization rule applies to any unaspirated stop after a vowel because root final unaspirated stops do not spirantize. This is shown below with roots in their bare form.

	bare N	
(11)	[l**a:b**]	'chest'
	[umm**ad**]	'community'
	[l**ug**]	'leg'
	[ɪɾs**a:q**]	'food'

We conclude we need to specify in the rule that the targeted unaspirated stops must follow a vowel and be in the onset position in a syllable. Ignoring, for now, the fact that guttural consonants are ignored by this rule we claim the following spirantization rule.

(12)



This rule states that when an unaspirated stop follows a vowel and occurs in the onset position in a syllable the unaspirated stop delinks from its manner feature and the manner feature of the left flanking vowel spreads to it. This formalization assumes that the continuant feature branches off of the consonant place node. This assumption comes from the discussion of the *oral cavity node* in Clements and Hume 1995, § 3.3.3. A further discussion of this assumption comes in chapter 4 when assumption will be returned to in chapter 4.

We formalize this rule as a working hypothesis regarding spirantization. This formalization is useful for understanding the basic workings of spirantization in Somali and is necessary for understanding how spirantization affects and is affected by rule order; but, the guttural consonant data are not yet in consideration.

2.2.4 Velar deletion

Velar deletion is only relevant to the masculine nouns. The masculine definite suffix surfaces as [-a] after guttural consonants. The following list shows this pattern.

	bare N	*definite N*		*bare N*	*definite N*	
(13)a.	**[q] final roots**					
	[bɪɾɪ:q]	[bɪɾɪ:qa]	'husk'	[duq]	[duqa]	'elder'
	[lu:q]	[lu:qa]	'alley'	[fi:q]	[fi:qa]	'point, tip'
	[bi:q]	[bi:qa]	'coward'	[taɾaq]	[taɾaqa]	'match'
b.	**[h] final roots**					
	[da:h]	[da:ha]	'curtain'	[ča:h]	[ča:ha]	'visage, face'

c. **[ħ] final roots**

[čiɾnaħ]	[čiɾnaħa]	'compassion'	[čɛ:ħ]	[čɛ:ħa]	'valley'
[salaħ]	[salaħa]	'flat rock'	[čɪɾnaħ]	[čɪɾnaħa]	'compassion'
[alwa:ħ]	[alwa:ħa]	'wood'	[salaħ]	[salaħa]	'flat rock'
[lohloħ]	[lohloħa]	'bad breath'	[saɾaħ]	[saɾaħa]	'chest'
[ħo:ħ]	[ħo:ħa]	'first milk'	[taɾo:ħ]	[taɾo:ħa]	'thief'
[le:ħ]	[le:ħa]	'curdled milk'	[tiβa:ħ]	[tiβaħa]	'report'

d. **[χ] final roots**

[to:χ]	[to:χa]	'boast'

e. **[ʕ] final roots**

[saʕ]	[saʕa]	'cow'	[bɛ:ʕ]	[bɛ:ʕa]	'sale'
[o:dkaʕ]	[o:dkaʕa]	'dried meat'	[bo:ʕ]	[bo:ʕa]	'throat'
[sɪlɪʕ]	[sɪlɪʕa]	'hardship'	[sɪlɪʕ]	[sɪlɪʕa]	'hardship'
[ba:ʕ]	[ba:ʕa]	'length'			

After a guttural consonant velar consonants are deleted. This is shown in the rule below.

(14)

```
C               C̶
|               |
Lower Oral    Upper Oral
                |
              Dorsal
```

There are no observed instances where a velar consonant occurs adjacent to a guttural consonant root internally either. Thus, we conclude that this is a universally observed phonotactic phenomenon of the language.

It is crucial that the velar deletion rule applies after the spirantization rule. We will show in chapter 4 that the spirantization rule ignores /q/ in certain environments. Given that the spirantization rule can ignore /q/ and target /q/, we need to order the rules such that after the masculine gender affix is deleted the uvular stop does not undergo spirantization even though it surfaces in a syllable onset position after a vowel. Shown below are the two possible orders for the spirantization rule and the deletion rule. Only one of these ordering combinations makes correct predictions about the surface forms. The rule ordering is shown by linear order from left to right.

(15)a.	*root+def.*		*spirantization rule*		*velar deletion rule*	
	[lu:q+ga]	→	[luq+γa]	→	[luq+a]	'the corner'
b.	*root+def.*		*velar deletion rule*		*spirantization rule*	
	[lu:q+ga]	→	[luq+a]	→	*[luʁa]	'the corner'

In (15)a. the the uvular stop does not spirantize because it is not in syllable initial position when the spirantization rule applies. In (15)b. the uvular stop is in syllable initial position and after a vowel when the spirantization rule applies. Thus, (15)b. predicts that the uvular stop surfaces as a spirant. This is unattested. Therefore, the rules need to be ordered as in (15)a. in order to make correct predictions about the surface form.

2.2.5 Velar Debuccalization

Debuccalization is only relevant to masculine nouns. Debuccalization is a phenomenon where a segment undergoes a loss of place features. After short, non-high and non-low vowels [e, o] the masculine suffix surfaces as [-ha]. These vocoids are the complementary set to the set of vocoids mentioned with respect to the masculine suffix in the spirantization section. Like with the feminine nouns, when a root with a non-high final vowel [e, o] takes the definite suffix, the root final vowel alternates. These facts are ignored for the moment and are discussed in chapter 3. Shown below is a list of masculine nouns that show the debuccalized gender affix.

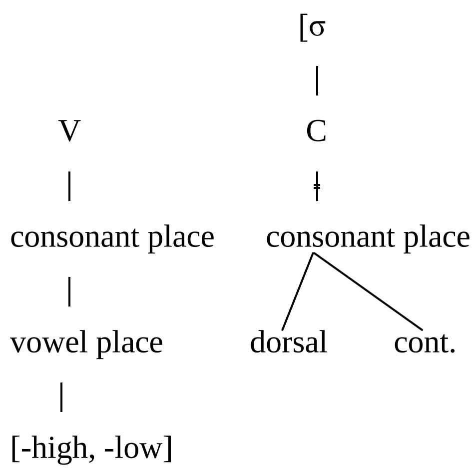
	bare N	*definite N*		*bare N*	*definite N*	
(16)a.	**[e] final roots**					
	[buste]	[bustaha]	'blanket'	[ʕambe]	[ʕambaha]	'mango'
	[tuke]	[tukaha]	'crow'	[ibše]	[ibšaha]	'vendor'
	[gaɾnaʁe]	[gaɾnaʁaha]	'judge'	[gabaldaje]	[gabaldajaha]	'sunflower'
	[fuɾe]	[fuɾaha]	'key'	[a:je]	[a:jeha]	'future, destiny'
b.	**[o] final roots**					
	[a:jo]	[a:jaha]	'future, destiny'	[a:bo]	[a:baha]	'father'

Finally, debuccalization does not occur after the long low vowel [a:]. The data below show roots that end in [a:].

	bare N	*definite N*	
(17)	[arda:]	[aɾda:-γa]	'the door'
	[baqbaqa:]	[baqbaqa:-γa]	'the parrot'
	[gaβija:]	[gaβija:-γa]	'the poet'

The only observed underlying root-final low vowel is [a:]. Given that the only root-final long vowel is a low vowel, there is no data to suggest whether debuccalization does not apply after [a:] because [a:] is a low vowel or a long vowel. In chapter three when we discuss vowel harmony the difference between [a:] and [a] root finally will be crucial. For now, we postpone this discussion. We write the debuccalization rule so that it applies to non-high, non-low vowels and we treat vowel length as a coincidental fact. The rule is formalized below.

(18)



The debuccalization rule states that a velar fricative is delinked from its place feature when it occurs in the onset in a syllable and follows a non-high, non-low vowel. The resulting segment is an [h]. The same considerations of syllable positioning discussed above with the spirantization rule are relevant with the debuccalization rule.

Finally, with respect to rule ordering, this rule is fed by the spirantization rule. If this rule were to occur before the spirantization rule, there would need to be some account of how, with just a loss of place, an unaspirated stop, /g/, becomes a continuant [h]. With the continuant [γ] produced by the previously occuring spirantization rule , the continuant manner of production is already accounted for.

2.2.6 Coalescence

Coalescence is only relevant to feminine nouns. When the feminine gender affix comes after a root final [l] the cluster [ld] surfaces as [š]. The following list shows this pattern.

	bare N	*definite N*		*bare N*	*definite N*	
(19)	[ʕawl]	[ʕawša]	'antelope'	[ʕala:l]	[ʕala:ša]	'stomach'
	[gaða:l]	[gaða:ša]	'back'	[kal]	[kaša]	'pestle'
	[bɛ:l]	[bɛ:ša]	'loss'	[ul]	[uša]	'stick'
	[ɖɪmbɪl]	[ɖɪmbɪša]	'spark flash'	[musqul]	[musquša]	'woman'
	[ʕalo:l]	[ʕaloša]	'weakness'	[ɪl]	[ɪša]	'spring of water'

This alternation is completely predictable and occurs with any [ld] consonant cluster.

There are no roots with [ld] internal clusters. Therefore, there is no data to suggest whether this rule is limited to a suffix boundary or whether the rule applies universally. We order the coalesence rule prior to the devoicing rule because there is one occurrence of a word internal [lt]. The root with an [lt] cluster is shown below.

(20) [galti] 'immigrant'

If the devoicing rule applies prior to coalescence rule then we are required to limit the coalescence rule to suffix boundaries. Ordering the coalescence rule prior to the devoicing rule allows us to ignore this root entirely.

2.2.7 Degemination of Homorganic Stops

Degemination is relevant to both the masculine and feminine gender affixes. Feminine nouns will be discussed first and masculine nouns will be discussed second.

When the feminine definite suffix is added to a root that ends in a [d], there is a geminate consonant cluster /dd/ underlyingly, but only a singleton [d] surfaces. The following list shows this pattern.

	bare N	*definite N*		*bare N*	*definite N*	
(21)	[do:d]	[do:da]	'argument'	[ča:lijad]	[ča:lijada]	'community'
	[umad]	[umada]	'community'	[ɪɾɾɪd]	[ɪɾɾɪda]	'door'

[bɛ:d]	[bɛ:da]	'egg'	[čeli:lad]	[čelilada]	'bomb'
[čowhaɾad]	[čohaɾada]	'gem'	[čalħad]	[čalħada]	'water jar'
[bad]	[bada]	'sea'	[bɛd]	[bɛda]	'safety, well-being'
[kɛbɛd]	[kɛbɛda]	'mat'			

When the masculine definite suffix is added to a root that ends in a [g], a geminate consonant cluster [gg] is created, but only a singleton [g] surfaces. The following list shows this pattern.

	bare N	*definite N*		*bare N*	*definite N*	
(22)	[bɛ:g]	[bɛ:ga]	'measure of grain'	[tog]	[toga]	'dry river bed'
				[to:g]	[to:ga]	'shower'
	[ʕa:g]	[ʕa:ga]	'hard plastic'	[bog]	[boga]	'page'

To accurately predict these surface forms there must be a degemination rule. We know from chapter 1 that there are geminate sonorants, so the degemination rule must be written to specifically target only oral stops. The rule is formalized below.

(23)	C	$\cancel{C}$
	|	|
	consonant place	consonant place
	|	|
	α place	α place
	|	|
	-continuant	-continuant

The ordering of this rule is crucial to predicting the correct surface forms. The spirantization rule must occur before the degemination rule. The singleton stop remaining after the degemination rule does not spirantize. If the degemination rule applies prior to the spirantization rule, we would incorrectly predict that the singleton stop remaining after the degemination rule applies would undergo spirantization. Shown below are the two possible rule orderings.

(24)	a.	*root+def.*		*spirantization*		*degemination*	
		[ɪɾɾɪd+da]	→	[ɪɾɾɪd+da]	→	[ɪɾɾɪd+a]	'the door'

[bog+ga]	→	[bog+ga]	→	[bog+a]	'the page'

b.	*root+def.*		*degemination*		*spirantization*	
	[ɪɾɾɪd+da]	→	[ɪɾɾɪd+a]	→	*[ɪɾɾɪð+a]	'the door'
	[bog+ga]	→	[bog+a]	→	*[boɣ+a]	'the page'

In (24a) the consonant clusters prevent the singelton [d] or [g] from spirantizing. The reason that the singleton stops do not spirantize is that they are not in an intervocalic position when the spirantization rule applies. In (24b) the degemination rule applies first and the singleton stops are in an intervocalic position when the spirantization rule applies. Therefore the singleton stops undergo the spirantization rule. The forms in (24b) are unattested, and therefore, the rules need to be ordered like (24a) to make correct predictions about the surface form.

Finally, the degemination rule is ordered before the devoicing rule. This ordering impacts the formalization of the degemination rule. The devoicing rule targets voiced stops that follow a morpheme boundary. In order to make correct predictions about suffix intial devoicing the degemination rule must delete the second stop of the consonant cluster—i.e. the gender affix must be deleted and not the root final stop.

2.2.8 Devoicing

Devoicing is relevant to both of the masculine and feminine gender affixes. Feminine singular nouns are discussed first and masculine singular nouns are discussed second. A voiced stop at a suffix boundary, devoices.

At a suffix boundary and after upper oral consonants the feminine definite suffix surfaces as [-ta]. Shown below is a list of feminine nouns that illustrate the suffix devoicing.

		bare N	*definite N*		*bare N*	*definite N*	
(25)	a.	**[ɾ] final roots**					
		[ħoːɾ]	[ħoːɾta]	'bubble'	[bɪɾ]	[bɪɾta]	'iron'
		[mɛːɾ]	[mɛːɾta]	'enclosure'	[habaɾ]	[habaɾta]	'old woman'
		[baɾ]	[baɾta]	'freckle'	[bɛːɾ]	[bɛːɾta]	'farm, garden'
	b.	**[n] final roots**					
		[ukun]	[ukunta]	'egg'	[luqun]	[luqunta]	'neck'
		[bɛːn]	[bɛːnta]	'lie'	[ħoːn]	[ħoːnta]	'wasp'
		[bɪšɪn]	[bɪšɪnta]	'lip'	[dɪβɪn]	[dɪβɪnta]	'cheek, buttock'

[čabɖan] [čabɖanta] 'dried meat'

c. **[f] final roots**

[laʕa:f]	[laʕa:fta]	'bait'	[čɪlɪf]	[čɪlɪfta]	'tree bark'

d. **[s] final roots**

[kiβis]	[kiβista]	'bread, caanjero'

e. **[b] final roots**

[galab]	[galabta]	'afternoon'	[kab]	[kabta]	'shoe'
[la:b]	[la:bta]	'chest'	[ħaβu:b]	[ħaβu:bta]	'cereal grain
[toħob]	[toħobta]	'fish scale'			

f. **[g] final roots**

[dɛg]	[dɛgta]	'ear'	[ħog]	[ħogta]	'secret'
[lug]	[lugta]	'leg'			

These data document the feminine suffix surfacing as [-ta] at a suffix boundary.

Next, we look at masculine singular nouns. The masculine definite suffix surfaces as [-ka] at a suffix boundary after an upper oral consonant. Shown below are masculine nouns that illustrate the suffix devoicing.

(26) a. **[ɾ] final roots**

bare N	*definite N*		*bare N*	*definite N*	
[ʔambaɾ]	[ʔambaɾka]	'amber'	[ka:ɾ]	[ka:ɾka]	'sharp pain'
[haβa:ɾ]	[haβa:ɾka]	'curse'	[ǰowɾ]	[ǰowɾka]	'injustice'
[daɾ]	[daɾka]	'clothes'	[uɾ]	[uɾka]	'smell/stink'
[ɪlħiɾ]	[ɪlħiɾka]	'curtain'	[mɪɾɪɾ]	[mɪɾɪɾka]	'rust'
[awɾ]	[awɾka]	'pack camel'	[sambaʕɾa:ɾ]	[sambaʕɾa:ɾka]	'tip of the nose'
[abtiɾ]	[abtiɾka]	'ancestry'			
[qarqar]	[qarqarka]	'shoulder'			

b. **[l] final roots**

[sal]	[salka]	'base'	[gal]	[galka]	'pond'

[dal]	[dalka]	'country'	[kol]	[kolka]	'praise'
[ʕol]	[ʕolka]	'enemy'	[ɛ:l]	[ɛ:lka]	'misery'
[lo:l]	[lo:lka]	'latitude'	[fa:l]	[fa:lka]	'omen'
[ɖɛħta:l]	[ɖɛħta:lka]	'interlude'	[masal]	[masalka]	'funnel'
[tol]	[tolka]	'kinsperson'	[taɾgal]	[taɾgalka]	'pair of pants'
[no:l]	[no:lka]	'livestock (camels, cattle, goats)'	[hil]	[hilka]	'bundle, pile'
			[suħul]	[suħulka]	'elbow'
[bakol]	[bakolka]	'red soil'			

c. **[n] final roots**

[muɾan]	[muɾanka]	'argument'	[kaβan]	[kaβanka]	'guitar'
[tun]	[tunka]	'nape'	[bana:n]	[bana:nka]	'field'
[fa:n]	[fa:nka]	'boast'	[nɪn]	[nɪnka]	'man'
[ma:lɪn]	[ma:lɪnka]	'day'	[čɪsʕɪn]	[čɪsʕɪnka]	'provisions'

d. **[f] final roots**

[laʕi:f]	[laʕi:fka]	'feeble person'	[bu:f]	[bu:fka]	'umbilical cord'
[ɾa:f]	[ɾa:fka]	'hoof'			

e. **[s] final roots**

[bas]	[baska]	'bus'	[lɑbɪs]	[labiska]	'suit'
[bo:s]	[bo:ska]	'property'	[ɛ:ħis]	[ɛ:ħiska]	'favor'
[ge:s]	[ge:ska]	'edge, side'	[afaɾgɛs]	[afaɾgɛska]	'quadrilateral'
[kɛbɪs]	[kɛbɪska]	'plaster'			

f. **[š] final roots**

[ħo:š]	[ħo:ška]	'gray hair'

g. **[b] final roots**

[kutub]	[kutubka]	'Qur'an'	[lo:lɪb]	[lo:lɪbka]	'screw, drill'
[lab]	[labka]	'male'	[wa:b]	[wa:bka]	'small hut'
[uðub]	[uðubka]	'pole'	[qoðob]	[qoðobka]	'article, paragraph'

h. **[d] final roots**

[ɾa:d]	[ɾa:dka]	'footprint'	[ča:d]	[ča:dka]	'type, kind'
[la:d]	[la:dka]	'kick'	[kod]	[kodka]	'sanctuary'

i. **[ɖ] final roots**

[ko:ɖ]	[ko:ɖka]	'coat'	[ʕaɪɖ]	[ʕaɪɖka]	'poor person'

These data document the masculine suffix surfacing as [-ka] at suffix boundary.

The devoicing rule delinks the voice specifications for a suffix initial voiced stop when it occurs at a suffix boundary. The formalization of the rule is shown below.

(27) + C

consonant place laryngeal

[- cont.] Voiced

At first glance this rule may seem too general or overly powerful given the above data. However, the rules that precede this rule bleed it considerably. After the spirantization rule, the debuccalization rule, the velar deletion rule, and the degemination rule the voiced stops that occur after vocoids and lower oral consonants become continuants or are deleted. The voiced stops that remain as potential targets occur in an environment that can be described as being either after an upper oral consonant or after a morpheme boundary. The formalization of the rule does not need to specify both conditions because the two conditions at this point in the sequence of rules are mutually entailed.

Of the two choices, we must specify that the rule targets stops that occur after a morpheme boundary because there are data that show that voiced stops occuring after upper oral consonants do not devoice. The following list shows these examples.

(28)	[čab**ɖ**anta]	'the dried meat'
	[ʔam**b**aɾka]	'the amber'
	[sam**b**aʕɾa:ɾka]	'the tip of the nose'
	[taɾ**g**alka]	'the pair of pants'
	[afaɾ**g**ɛska]	'the quadrilateral'
	[gal**b**o]	'days'

If the devoicing rule were written such that voiced stops devoice after upper oral consonants,then the rule would predict the following unattested forms.

(29)	*[čab**ʈ**anta]	'the dried meat'
	*[ʔam**p**aɾka]	'the amber'
	*[sam**p**aʕɾaːɾka]	'the tip of the nose'
	*[taɾ**k**alka]	'the pair of pants'
	*[afaɾ**k**ɛska]	'the quadrilateral'
	*[gal**p**o]	'days'

Therefore, the rule must be written such that voiced stops devoice at a suffix boundary.

2.2.9 Alternation of [m] and [n]

When an /m/ is in final position in a syllable it becomes an [n]. The alternation is apparent when comparing bare form roots that end in an [n] and their plural forms. Shown below:

	bare N	*plural N*			*bare N*	*plural N*		
(30)a	**/-o/ plural paradigm**							
	[bɪšɪn]	[bɪšɪmo]	/bɪšɪm/	'lip'	[loqun]	[luqumo]	/luqum/	'neck'
	[ukun]	[ukumo]	/ukum/	'egg'	[ħoːn]	[ħoːmo]	/ħoːm/	'wasp'
	[tun]	[tumo]	/tum/	'nape'				
b	**reduplication plural paradigm**							
	[qun]	[quman]	/qum/	'tonsil'				

The underlying form of the root final consonant for all of these examples is an /m/. When the plural [-o] suffix is attached to the root, the /m/ becomes an onset by a syllabification rule. One cannot write a rule that derives an [m] from an underlying /n/, because there are nouns with a word final /n/ that do not change in the plural. These nouns are shown in the list below.

	bare N	*plural N*			*bare N*	*plural N*		
(31)	[kaβan]	[kaβano]	/kaban/	'guitar'	[čabdɖan]	[čabdɖano]	/čabdɖan/	'dried meat'
	[bana:n]	[bana:no]	/bana:n/	'field'				

These examples do not have an alternation with [m] in the plural, yet they have equivalent surrounding environments. Therefore, writing a rule that derives an [m] from an [n] would be impossible.

2.3 Summary

The following list is a concise summary of the preceding pages. This summary describes the rules in terms of their impact on the surface forms. The rules are ordered in this section according to the rule ordering argued for above. The rule ordering is repeated below.

(32)
I. Consonant Cluster Separation
II. Velar Deletion
III. Velar Debuccalization
IV. Spirantization
V. Coalescence
VI. Degemination
VII. Devoicing
VIII. syllable final /m/→[n]

(33) *Consonant Cluster Separation*

consonant clusters are separated by an epenthetic vowel at the end of syllables

bare N	*definite N*	
[ga.lab]	[gal.bo]	'afternoon'
[dɪ.βɪn]	[dɪb.no]	'cheek, buttock'
[ma:.lɪn]	[ma:l.mo]	'day'

(34) *Spirantization*

a. feminine nouns:

/-da/ between vocoids, ignoring gutturals, surfaces as [-ða].

bare N	*definite N*	
[asmo]	[asmaða]	'curse'
[ej]	[ejða]	'bitch'

b. masculine nouns:

/-ga/ between vocoids, after high vocoids and long vowels, surfaces as [-γa].

bare N	*definite N*	
[ʕasɾi]	[ʕasɾiγa]	'era'
[anqaw]	[anqawγa]	'ankle'
[arda:]	[arda:γa]	'courtyard'

(35) *Velar Deletion*

masculine nouns: /-ga/ following a guttural consonant surfaces as [-a].

bare N	*definite N*	
[sılıʕ]	[sılıʕa]	'hardship'
[to:χ]	[to:χa]	'boast'
[salaħ]	[salaħa]	'flat rock'
[da:h]	[da:ha]	'curtain'

(36) *Velar Debuccalization*

masculine nouns: /-ga/ between vocoids, after a short non-high vowel, surfaces as [-ha]

bare N	*definite N*	
[tuke]	[tukaha]	'crow'
[a:bo]	[a:baha]	'father'

(37) *Coalescence*

feminine nouns: root final [l] with the feminine gender affix [d] surfaces as [š]

bare N	*definite N*	
[gaða:l]	[gaða:ša]	'back'
[kal]	[kaša]	'pestle'
[ɪl]	[ɪša]	'spring of water'
[ʕawl]	[ʕawša]	'antelope'

(38) *Degemination*

a. feminine nouns: the consonant cluster [dd] surfaces as [d]

bare N	*definite N*	
[do:d]	[do:da]	'argument'
[umad]	[umada]	'community'
[bɛ:d]	[bɛ:da]	'egg'
[čowhaɾad]	[čohaɾada]	'gem'

b. masculine nouns: the consonant cluster /gg/ surfaces as [g]

bare N	*definite N*	
[ʕa:g]	[ʕa:ga]	'hard plastic'
[tog]	[toga]	'dry river bed'
[bog]	[boga]	'page'

(39) *Devoicing*

a. feminine nouns /-da/ surfaces as [-ta] at a suffix boundary (after an upper-oral consonant)

bare N	*definite N*	
[ħo:ɾ]	[ħo:ɾta]	'bubble'

[ukun]	[ukunta]	'egg'
[galab]	[galabta]	'afternoon'

b. masculine nouns: /-ga/ surfaces as [-ka] at a suffix boundary (after an upper-oral consonant)

bare N	*definite N*	
[ʔambaɾ]	[ʔambaɾka]	'amber'
[ma:lɪn]	[ma:lɪnka]	'day'
[lab]	[labka]	'male'
[ʕol]	[ʕolka]	'enemy'

(40) *Alternation of [m] and [n]*

/m/ surfaces as [n] at the end of syllables

bare N	*definite N*	
[bɪšɪn]	[bɪšɪmo]	'lip'
[ukun]	[ukumo]	'egg'

2.4 Motivation of Underlying Forms

To conclude this chapter we discuss the motivation for assuming that the underlying forms of the gender marking affixes are voiced stops. To do this we demonstrate how alternative analyses are inadequate. There are two alternative analyses to consider. First, the underlying form of the gender affixes could be archiphonemes. Second, the underlying form of the gender affixes could be voiceless stops, are /-t/ and /-k/. Only two sets of data are relevant to this discussion. One, the data where the gender marking affixes surface as fricatives are relevant; which is accounted for above by a spirantization rule. Two, the data where the gender marking consonants of the suffixes surface as voiceless stops is relevant; which is accounted for above by a devoicing rule. Reviewing these two sets of data under alternative analyses will be sufficient to motivate the claim that the underlying forms of the gender affixes are /-d/ and /-g/.

2.4.1 Archiphoneme Hypothesis

The first alternative analysis assumes that the underlying forms of the gender affixes are archiphonemes. More specifically, the feminine gender affix is a consonant specified as a dental but underspecified for manner of articulation and voicing; and the masculine gender affix is a consonant specified as a velar but underspecificed for manner of articulation and voicing. The claim is that the underlying forms of the gender affixes are /t or d/ and /k or g/. This claim introduces archiphonemes which are objects that are express a disjunction between two possible claims that already exist as competing hypotheses concerning the underlying forms of the affixes. Thus, by claiming that there are archiphonemes one extends the theoretical ontology by reifying ignorance about the underlying form. What makes this worse is that as a consequence of this claim the forms of these affixes cannot by definition be experienced, even though they interact with segments we can experience. An underlying /d/ or /t/ theory will have certain abstract consequences, but all elements invoked are experiencible segments.

Therefore we view the archiphoneme analysis as theoretically unsound and we reject it.

2.4.2 Underlyingly Voiceless Hypothesis

The second alternative hypothesis assumes that the gender marking consonants of the definite suffixes are underlyingly voiceless stops, /-ta/ and /-ka/. This assumption is attractive because there are observed manifestations of /-ta/ and /-ka/. The suffixes surface as /-ta/ and /-ka/ after upper oral consonants. The data in the following list show this.

(41)a	[ħoːɾ]	[ħoːɾta]	'bubble'
	[ukun]	[ukunta]	'egg'
	[galab]	[galabta]	'afternoon'
b	[ʔambaɾ]	[ʔambaɾka]	'amber'
	[maːlɪn]	[maːlɪnka]	'day'
	[lab]	[labka]	'male'
	[ʕol]	[ʕolka]	'enemy'

No rule is required to account for these data. These data result from the concatenation of the root and the suffix. These forms make this analysis attractive; and most teaching grammars rely on the abundance of these forms to claim that the gender affixes are aspirated stops.

Next we look at data where the surface form of the definite suffixes are fricatives, [-ða] and [-ɣa]. These data are shown in the list below.

(42)a. [asmo] [asmaða] 'curse'

[ej] [ejða] 'bitch'

b. [ʕasɾi] [ʕasɾiγa] 'era'

[anqaw] [anqawγa] 'ankle'

[arda:] [arda:γa] 'courtyard'

To get these surface forms from underlying voiceless stops, two changes in form must be accounted for. Both voicing and manner of articulation change from the underlying form to the surface form. There is no mechanism that allows the voicing feature and the continuant production feature to spread together. To posit one in order to solve this problem would be abusive to the theory. Therefore, to account for these two changes, a sequence of two rules is required. We will call these rules Rule A and Rule B. Rule A is a voicing rule that voices a stop at a suffix boundary. Rule B is a spirantization rule.

Rule A must be limited to a suffix boundary because there are intervocalic voiceless stops word interally. Roots with internal voiceless stops are shown below.

(43) [ukun] 'egg' [ɾo:ti] 'bread'

[tuke] 'crow' [aʁal] 'home'

We conclude that the voicing rule cannot apply root internally; and we want rule A to only apply after vowels. We allow, as we did previously, that the gutturals are ignored by this rule. Therefore, this rule must apply to any voiceless stop that occurs at a suffix boundary after a vowel . Rule A is formalized below.

(44) V + C

consonant place

Laryng

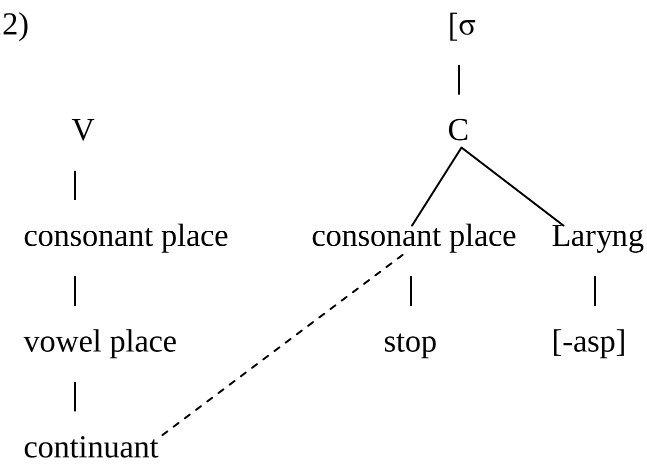
stop

ǂ

[-voice] [+voice]

Rule B is a spirantization rule that spirantizes intervocalic unaspirated stops. This rule is formally no different than the rule presented in example (12). The formalization of the rule is repeated again below.

(12)



The rule order is the almost the same as the theory defended earlier in this chapter. The consonant cluster separation rule applies first. Then under this theory rule A, the voicing rule, applies. Rule A feeds rule B. Rule B, the spirantization rule applies. The rule order after the spirantization rule is identical to the rule order presented earlier in this chapter, except that the devoicing rule is removed, for obvious reasons.

2.4.3 Comparing the Hypotheses

The difference between underlyingly unaspirated /d, g/ and underlyingly aspirated /t, k/ in broad description is the difference between having a relatively late ordered suffix initial devoicing rule, or having a relatively early ordered suffix initial voicing rule. Discriminating these two analyses is difficult for two reasons. First, in no form do the gender affixes surface unchanged with respect to voicing. Whichever underlying form one assumes, there are voiced and voiceless surface forms. This makes the discussion of comparative hypotheses necessarily abstract. Second, both accounts make correct predictions about the surface forms. It is not the case that either hypothesis fails to predict some subset of the surface forms.

The underlyingly voiceless hypothesis is said to be incorrect because the way in which the voicing and spirantization rules must be written and ordered. The objection is with the triggering environment of the two rules. The environment specified for the two rules is essentially the same. This repetition of a rule environment is undesirable. This is not in and of itself a discrediting fact; however, it is a discrediting fact when there is a competing hypothesis that does not entail this theoretical clumsiness. The underlyingly voiced hypothesis does not have any such undesirable consequences. Therefore, we reject the underlyingly voiceless hypothesis.

Chapter 3 Vowel Harmony

3.0 Introduction

This chapter discusses in detail the vowel harmony phenomena of Somali that were set aside in chapter 2. Data in this chapter come from nominal forms. The two speakers consulted for this work have two very different versions of vowel harmony. We present both versions of vowel harmony in this chapter. We also present a brief account of standard written Somali to put these versions of vowel harmony into context.

First, we introduce the morphological forms relevant to vowel harmony. Second, we present the vowel harmony phenomenon that the two speakers have in common through data from the definite forms of nouns. Third, we present the two differing versions of vowel harmony through data from the possessive personal pronoun suffixes. Fourth we briefly present an account of standard written Somali.

3.1 Introduction to the forms relevant to the examples

The definite suffixes were introduced in the last chapter. Chapter 2 section 1 outlines the underlying forms of the definite suffixes. Chapter 2 section 2 "Spirantization" and "Velar Debuccalization" discuss forms relevant to vowel harmony. Data in this chapter come from the definite suffix data previously presented as well as from possessive personal pronoun suffixes. The three possessive personal pronoun suffixes that will be discussed in this chapter are shown below.

(1) /-i:sa/ 'his'
/-e:da/ 'her'
/-o:da/ 'their'

Possessive personal pronoun suffixes have the same initial gender affix that the definite suffixes have, /-d/ (feminine) and /-g/ (masculine). The gender of the noun determines which gender affix these suffixes take. The possessive pronominal suffixes with the gender affixes are shown below.

(2)a. feminine possessive personal pronoun suffixes
/-di:sa/ 'his'
/-de:da/ 'her'
/-do:da/ 'their'

b. masculine possessive personal pronoun suffixes

/-gi:sa/	'his'
/-ge:da/	'her'
/-go:da/	'their'

The possessive personal pronoun suffix forms are crucial to understanding the nature of vowel harmony in Somali. The suffixes /-i:sa/ 'his', /-e:da/ 'hers', /-oda/ 'theirs' provide the variety of vowels in a suffix that are needed in order to test the possibilities of right-left vowel harmony.

3.2 Rule Ordering

All of the rules presented in this chapter occur after the rules in the preceding chapter. Where rule order is relevant a discussion will follow the formalization of the rule.

3.3 Definite Suffix

In the last chapter in section 2.2 on spirantization and the section on velar debuccalization vowel harmony was alluded to. These facts are revisited, and this time the focus of the discussion is the vowel alternations. In the definite forms the two speakers do not differ.

When a feminine noun that ends in a non high vowel [e, o] takes the definite suffix, the final vowel alternates. The list below shows this vowel alternation.

	bare N	*definite N*		*bare N*	*definite N*	
(3) a.	**[o] final roots**					
	[asmo]	[asm**a**ða]	'curse'	[ɖunkašo]	[ɖunkaš**a**ða]	'kiss'
	[čiho]	[čih**a**ða]	'direction'	[ʕunto]	[ʕunt**a**ða]	'food'
	[bamba:no]	[bamba:n**a**ða]	'bomb'	[ħo:lo]	[ħo:l**a**ha]	'cattle, wealth'
	[a:jo]	[a:j**a**ða]	'stepmother'	[ʕa:no]	[ʕa:n**a**ha]	'milk'
	[bɛla:jo]	[bɛla:j**a**ða]	'calamity'	[bowðo]	[bowð**a**ða]	'thigh'
	[ʕunto]	[ʕunt**a**ða]	'food'	[ħiɾmo]	[ħiɾm**a**ða]	'bundle, package'
	[dɛwoʕo]	[dɛwoʕ**a**ða]	'jackel'	[ba:βaʕo]	[ba:βaʕ**a**ða]	'palm of a hand'
b.	**[i] final roots**					
	[afti]	[aftiða]	'referendum'	[da:fi]	[da:fiða]	'type of grain'

[ʕɪdi]	[ʕɪdiða]	'fingernail'	[mɪndi]	[mɪndiða]	'knife'

There are no observed feminine nouns that end with [e]. The data in (3)a. show that a root final [o] in the definite form becomes [a]. The data in (3)b. show that a root final [i] does not change. This pattern is likewise observed with masculine nouns that end with a non-high vowel. From chapter 2 we expect the masculine suffix here to surface as [-ha]. The list includes [a:je] 'future' and [a:jo] 'future' which are variant pronunciations of the same word. The list below shows the vowel alternation.

	bare N	*definite N*		*bare N*	*definite N*	
(4) a.	**[e] final roots**					
	[buste]	[bust**a**ha]	'blanket'	[ʕambe]	[ʕamb**a**ha]	'mango'
	[tuke]	[tuk**a**ha]	'crow'	[ibše]	[ibš**a**ha]	'vendor'
	[gaɾnaʁe]	[gaɾnaʁ**a**ha]	'judge'	[gabaldaje]	[gabaldaj**a**ha]	'sunflower'
	[fuɾe]	[fuɾ**a**ha]	'key'	[a:je]	[a:j**a**ha]	'future, destiny'
b.	**[o] final roots**					
	[a:bo]	[a:b**a**ha]	'father'	[a:jo]	[a:j**a**ha]	'future, destiny'
	[a:] final roots					
c.	[arda:]	[aɾda:-γa]	'the door'	[baqbaqa:]	[baqbaqa:-γa]	'the parrot'
	[gaβija:]	[gaβija:-γa]	'the poet'			
d.	**[i] final roots**					
	[ʕasɾi]	[ʕasɾiγa]	'age, era'	[ɾati]	[ɾatiγa]	'fem. camel'
	[ɾo:ti]	[ɾo:tiγa]	'bread'	[duqsi]	[duqsiγa]	'fly, insect'
	[diβi]	[diβiγa]	bull, ox'	[galti]	[galtiγa]	'immigrant'
	[dɛmbi]	[dɛmbiγa]	'transgression'	[ʕa:ɾi]	[ʕa:ɾiγa]	'low tide'
	[gɛβi]	[gɛβiγa]	'dock, pier'	[oɾgi]	[oɾgiγa]	'male goat'
	[ʕa:ɾi]	[ʕa:ɾiγa]	'low tide'	[fara:nti]	[fara:ntiγa]	'ring'
	[maɾu:di]	[maɾu:diγa]	'elephant'	[dowli]	[dowliγa]	'well rope'
	[ači]	[ačiγa]	'upper caste'	[guɾi]	[guɾiγa]	'home, settlement'

The root final [o, e] become [a] with the masculine nouns. Root final [i, a:] is unchanged when the definite suffix follows.

The data from the definite suffixes have two possible interpretations. One, a root final non-high vowel always becomes [a] through a vowel reduction rule. Two, a root final non-high vowel harmonizes entirely to a vowel in the next syllable to the right. When looking only at the definite forms of nouns these theories are indistinguishable.

In the next section we present the two speakers' different versions of vowel harmony. With each personal possessive pronoun suffix we present the same speaker first. We call the speakers Speaker 1 and Speaker 2. For ease of indexing the examples, each remaining example number in this chapter is followed by a subscript 1 or a subscript 2 that indicates whether the example comes from Speaker 1 or Speaker 2.

3.4 Personal Possessive Pronoun Suffixes

3.4.1 /i:sa/ 'his'

The next sets of data come from the personal possessive pronoun suffixes. Each personal possessive pronoun suffix will be discussed individually. We begin by looking at the suffix /i:sa/ 'his' with feminine nouns and masculine nouns.

First, we look at the /-i:sa/ suffix with Speaker 1.

The following list shows the vowel alternation data for the feminine /-di:sa/ 'his' suffix. In the following list [a:jɪ-ði:s] is a proper transcription. There are other nouns in this chapter that drop the suffix final [a]. This phenomenon will be discussed in a note on forms at the end of this chapter.

	his N	*bare N*		*his N*	*bare N*	
$(5)_1$a	**consonant final roots**					
.	[bɛ:ɾ-ti:sa]	[bɛ:ɾ]	'farm'	[kab-ti:sa]	[kab]	'shoe'
b.	**[o] final roots**					
	[ʕuntɪ-ði:sa]	[ʕunto]	'food'	[a:jɪ-ði:s]	[a:jo]	'stepmother'
	[bowðɪ-ði:sa]	[bowðo]	'thigh'			
c.	**[i] final roots**					
	[ʕɪdiði:sa]	[ʕɪdi]	'fingernail'			

The data in (5)a. show that no harmony occurs when the target vowel is not at the morpheme boundary. The data in (5)b. show right-left vowel harmony. An [o] becomes an [i, ɪ] preceding an [i:]. The data in (5)c. show that an [i] preceding an [i:] does not change.

Next we look at the masculine /gi:sa/ 'his' suffix. This list shows the vowel alternations for this suffix.

	his N	*bare N*		*his N*	*bare*	
(6)$_1$a.	**[o] final roots**					
	[kaβi-hi:sa]	[kaβo]	'shoes'	[ʕa:ni-hi:sa]	[ʕa:no]	'milk'
	[bɛ:ɾi-hi:sa]	[bɛ:ɾo]	'farms'	[ħo:li-hi:sa]	[ħo:lo]	'cattle, wealth'
b.	**[e] final roots**					
	[busti-hi:sa]	[buste]	'blanket'	[ʕambi-hi:sa]	[ʕambe]	'mango'
	[furi-hi:sa]	[fure]	'key'	[gabaldaji-hi:sa]	[gabaldaje]	'sunflower'
	[gaɾnaʁi-hi:sa]	[garnaʁe]	'judge'	[ibši-hi:sa]	[ibše]	'vendor'
	[tuki-hi:sa]	[tuke]	'crow'			
c.	**[i] final roots**					
	[diβi-γi:sa]	[diβi]	'bull, ox'	[fara:nti-γi:sa]	[fara:nti]	'ring'
	[ʕasɾi-γi:sa]	[ʕasɾi]	'age, era'	[dowli-γi:sa]	[dowli]	'well rope'
d.	**long vowel final roots**					
	[arda:-γi:sa]	[arda:]	'courtyard'	[gaβija:-γi:sa]	[gaβija:]	'poet'
	[baqbaʁa:-γi:sa]	[baqbaʁa:]	'parrot'			
e.	**vocoid final roots**					
	[anqaw-γi:sa]	[anqaw]	'ankle'	[awow-γi:s]	[awow]	'grandfather'
	[ʕaðaw-γi:sa]	[ʕaðaw]	'enemy'	[low-γi:sa]	[low]	'knee'
	[ej-γi:sa]	[ej]	'dog'	[oðej-γi:sa]	[oðej]	'father, husband'

The data in (6)a-b. show right-left vowel harmony. The vowels [o e] become an [i] preceding an [i:]. The data in (6)c. show root final [i] surfaces as [i] preceding an [i:]. The data in (6)d. show that [a:] is unaffected by vowel harmony. The data in (6)e. show that glides [j, w] behave as consonants and are unaffected by harmony.

Next, we look at the /i:sa/ suffix with Speaker 2.

The following list shows the root final vowel alternation for the feminine /-di:sa/ 'his' suffix.

	his N	*bare N*		*his N*	*bare N*	
(7)$_2$	**[o] final roots**					
	[ho:ja-ði:s]	[ho:jo]	'mother'	[a:ja-ði:s]	[a:jo]	'step mother'
	[ʕunta-ði:sa]	[ʕunto]	'food'	[ba:baʕa-ði:sa]	[ba:baʕo]	'palm of hand'
	[čiha-ði:sa]	[čiho]	'direction'			

The data in (7) show that vowel reduction occurs, but vowel harmony does not occur. Root final [o] surfaces as [a].

The next list shows the root final vowel alternation for the masculine /-gi:sa/ 'his' suffix.

	his N	*bare N*		*his N*	*bare N*	
(8)$_2$a.	**[o] final roots**					
	[bɛ:ɾa-hi:sa]	[bɛ:ɾo]	'farms'	[ʕa:nahi:sa]	[ʕa:no]	'milk'
b.	**[e] final roots**					
	[busta-hi:sa]	[buste]	'blanket'			
c.	**[i] final roots**					
	[diβi-γi:sa]	[diβi]	'bull, ox'			
d.	**long vowel final roots**					
	[aɾda:-γi:sa]	[aɾda:]	'courtyard'	[gaβija:-γi:sa]	[gaβija:]	'poet'
e.	**vocoid final roots**					
	[anqaw-γi:sa]	[anqaw]	'ankle'	[ej-γi:sa]	[ej]	'dog'

The data in (8) show that vowel reduction occurs, but vowel harmony does not occur. Root final final [o, e] surfaces as [a]. Speaker 2 would sometimes produce a much fronter sounding [a] or variantly an [e] preceding the suffix vowel [i] across an [h]. This suggests that there is a weak tendency to harmonize in frontness across [h].

3.4.2 /e:da/ 'her'

Next, we look at the suffix /e:da/ 'her' with feminine and masculine nouns.

First we look Speaker 1. The following list shows the vowel alternation data for the /-de:da/ 'her' suffix.

	her N	*bare N*		*her N*	*bare N*	
(9)$_1$a.	**consonant final roots**					
	[kab-te:ða]	[kab]	'shoe'	[bɛ:ɾ-te:ða]	[bɛ:ɾ]	'farm'
b.	**[o] final roots**					
	[a:je-ðe:d]	[a:jo]	'stepmother'	[bowðe-ðe:ða]	[bowðo]	'thigh'
	[ʕunte-ðe:ða]	[ʕunto]	'food'			
c.	**[i] final roots**					
	[ʕɪdi-ðe:ða]	[ʕɪdi]	'fingernail'			

The data in (9)a. show that no harmony occurs when the target vowel does not occur at a morpheme boundary. The data in (9)b. show right-left vowel harmony. A root final [o] becomes an [e] when it precedes an [o]. The data in (9)c. show that root final [i] does not harmonize with [e].

The next set of data show the /-ge:da/ 'her' suffix with masculine nouns.

	her N	*bare N*		*her N*	*bare N*	
(10)$_1$a.	**[o] final roots**					
	[a:je-he:ða]	[a:jo]	'future, destiny'	[bɛ:ɾe-he:ða]	[bɛ:ɾo]	'farms'
	[kabe-he:ða]	[kaβo]	'shoes'	[ʕa:ne-he:ða]	[ʕa:no]	'milk'
	[ħo:le-he:ða]	[ħo:lo]	'cattle, wealth'			
b.	**[e] final roots**					
	[buste-he:ða]	[buste]	'blanket'	[tuke-he:ða]	[tuke]	'crow'
	[fure-he:ða]	[fure]	'key'	[ʕambe-he:ða]	[ʕambe]	'mango'
	[gaɾnaʁe-he:ða]	[gaɾnaʁe]	'judge'	[gabaldaje-he:ða]	[gabaldaje]	'sunflower'

[ibše-he:ða]	[ibše]	'vendor'			

c. **[i] final roots**

[diβi-γe:ða]	[diβi]	'bull, ox'	[fara:nti-γe:ða]	[fara:nti]	'ring'
[ʕasɾi-γe:ða]	[ʕasɾi]	'age, era'	[dowli-γe:ða]	[dowli]	'well rope'

d. **vocoid final roots**

[ejγe:ða]	[ej]	'bitch'	[awow-γe:d]	[awow]	'grandfather'
[anqaw-γe:ða]	[anqaw]	'ankle'	[low-γe:sa]	[low]	'knee'
[ʕaðaw-γe:ða]	[ʕaðaw]	'enemy'	[oðej-γe:ða]	[oðej]	'father, husband'

e. **long vowel final roots**

[arda:-γe:ða]	[arda:]	'courtyard'	[gaβija:-γe:ða]	[gaβija:]	'poet'
[baqbaʁa:-γe:ða]	[baqbaʁa:]	'parrot'			

The data in (10)a. show that a root final [o] becomes an [e] when it precedes an [o]. The data in (10)b. show that root final [e] surfaces as [e] when it precedes an [e]. No disharmony rule applies. The data in (10)c. that root final [i] does not harmonize with [e]. The data in (10)d. show that glides behave as consonants and are not affected by harmony. The data in (10)e. show that long vowels are impervious to harmony.

Next we look at Speaker 2.

The following list shows the vowel alternation for the feminine /-de:da/, 'hers', suffix.

(11)$_2$ **[o] final roots**

his N	*bare N*		*his N*	*bare N*	
[ho:ja-ðe:d]	[ho:jo]	'mother'	[a:ja-ðe:d]	[a:jo]	'step mother'
[ʕunta-ðe:ða]	[ʕunto]	'food'	[ba:baʕa-ðe:ða]	[ba:baʕo]	'palm of a hand'
[čiha-ðe:ða]	[čiho]	'direction'			

The data in (11) show that vowel reduction occurs, but vowel harmony does not occur. Root final [o] surfaces as [a].

The following list shows the vowel alternation for the masculine /-ge:da/ 'his' suffix.

	his N	*bare N*		*his N*	*bare N*	
(12)₂a.	**[o] final roots**					
	[bɛːɾa-heːða]	[bɛːɾo]	'farms'	[ʕaːnaheːða]	[ʕaːno]	'milk'
b.	**[e] final roots**					
	[busta-heːða]	[buste]	'blanket'			
c.	**[i] final roots**					
	[diβi-ɣeːða]	[diβi]	'bull, ox'			
d.	**long vowel final roots**					
	[aɾdaː-ɣeːða]	[aɾdaː]	'courtyard'	[gaβijaː-ɣeːða]	[gaβijaː]	'poet'
e.	**vocoid final roots**					
	[anqaw-ɣeːða]	[anqaw]	'ankle'	[ej-ɣeːða]	[ej]	'dog'

The data in (12) show that vowel reduction occurs, but vowel harmony does not occur. Root final final [o, e] surfaces as [a]. Again, Speaker 2 would sometimes produce a much fronter sounding [a] or variantly an [e] preceding the suffix vowel [e] across an [h]. This suggests that there is a weak tendency to harmonize in frontness across [h].

3.4.3 /oːda/ 'their'

Next we look at the suffix /oːda/ 'their' with feminine and masculine nouns.

First we look at Speaker 1. The following list shows the vowel alternation data for the feminine /-doda/ 'their' suffix.

	their N	*bare N*		*their N*	*bare N*	
(13)₁a.	**consonant final roots**					
	[kab-toːða]	[kab]	'shoe'	[bɛːɾ-toːða]	[bɛːɾ]	'farm'

b. **[o] final roots**

[a:jo-ðo:d]	[a:jo]	'stepmother	[bowðoðo:ða]	[bowðo]	'thigh'
[ʕunto-ðo:ða]	[ʕunto]	'food'			

c. **[i] final roots**

[ʕɪdi-ðo:ða]	[ʕɪdi]	'fingernail'

The data in (13)a. show that no harmony occurs when the target vowel does not occur at a morpheme boundary. The data in (13)b. show right-left vowel harmony. A root final [o] surfaces as [o] when it precedes an [o]. The data in (13)c. show that [i] does not harmonize with [o].

The next set of data show the /-go:da/ 'their' suffix with masculine nouns. The following list shows the vowel alternation data for the /-goda/ 'their' suffix.

	their N	*bare N*		*their N*	*bare N*	
(14)[1]a.	**[o] final roots**					
	[kaboho:ða]	[kabo]	'shoes'	[a:joho:ða]	[a:jo]	'future, destiny'
	[bɛ:ɾoho:ða]	[bɛ:ɾo]	'farms'	[ħo:loho:ða]	[ħo:lo]	'cattle, wealth'
	[ʕa:noho:ða]	[ʕa:no]	'milk'			

b. **[e] final roots**

[busto-ho:ða]	[buste]	'blanket'	[ʕambo-ho:ða]	[ʕambe]	'mango'
[furo-ho:ða]	[fure]	'key'	[gabaldajo-ho:ða]	[gabaldaje]	'sunflower'
[gaɾnaʁo-ho:ða]	[gaɾnaʁe]	'judge'	[ibšo-ho:ða]	[ibše]	'vendor'
[tuko-ho:ða]	[tuke]	'crow'			

c. **[i] final roots**

[diβi-γo:ða]	[diβi]	'bull, ox'	[fara:nti-γo:ða]	[fara:nti]	'ring'
[ʕasɾi-γo:ða]	[ʕasɾi]	'age, era'	[dowli-γo:ða]	[dowli]	'well rope'

d. **long vowel final roots**

[arda:-γo:ða]	[arda:]	'courtyard'	[gaβija:-γo:ða]	[gaβija:]	'poet'
[baqbaʁa:-γo:ða]	[baqbaʁa:]	'parrot'			

e. **vocoid final roots**

[ʕaðaw-ɣo:ða]	[ʕaðaw]	'enemy'	[awow-ɣo:d]	[awow]	'grandfather'
[ej-ɣo:ða]	[ej]	'dog'	[low-ɣo:ða]	[low]	'knee'
[oðej-ɣo:ða]	[oðej]	'father, husband'			

The data in (14)a. show righ-left vowel harmony. Root final [e] becomes an [o] when it precedes an [o]. The data in (14)b. show that [o] surfaces as [o] when it follows [o]. The data in (14)c. show that high vowels do not harmonize in rounding. The data in (14)d. show that long vowels do not harmonize in rounding. The data in (14)e. show that glides behave as consonants and are unaffected by harmony.

Next we look at Speaker 2.

The following list shows the vowel alternation for the feminine /do:da/, 'their', suffix.

(15)$_2$ **[o] final roots**

his N	*bare N*		*his N*	*bare N*	
[ho:ja-ðo:d]	[ho:jo]	'mother'	[a:ja-ðo:d]	[a:jo]	'step mother'
[ʕunta-ðo:ða]	[ʕunto]	'food'	[ba:baʕa-ðo:ða]	[ba:baʕo]	'palm of hand'
[čiha-ðo:ða]	[čiho]	'direction'			

The data in (15) show that vowel reduction occurs, but vowel harmony does not occur. Root final [o] surfaces as [a].

The following list shows the vowel alternation for the masculine /-go:da/ 'their' suffix.

(16)$_2$a. **[o] final roots**

his N	*bare N*		*his N*	*bare N*	
[bɛ:ɾa-ho:ða]	[bɛ:ɾo]	'farms'	[ʕa:naho:ða]	[ʕa:no]	'milk'

b. **[e] final roots**

[busta-ho:ða]	[buste]	'blanket'

c. **[i] final roots**

[diβi-ɣo:ða]	[diβi]	'bull, ox'

d. **long vowel final roots**

[aɾda:-ɣo:ða]	[aɾda:]	'courtyard'	[gaβija:-ɣo:ða]	[gaβija:]	'poet'

e. **vocoid final roots**

[anqaw-ɣo:ða]	[anqaw]	'ankle'	[ej-ɣo:ða]	[ej]	'dog'

The data in (16) show that vowel reduction occurs, but vowel harmony does not occur. Root final final [o, e] surfaces as [a].

3.4.4 Cases Where Speaker 1 does not Harmonize

Speaker 1's production of the personal possessive pronoun suffixes suggest that a root final vowel always harmonizes to a following vowel. However, the data in the following list show that there is a case when a root final vowel is not subject to vowel harmony.

(17)a [čiho] 'direction'
[čiha-ða] 'the direction'
[čiha-ði:sa] 'his direction'
[čiha-ðe:ða] 'her direction'
[čiha-ðo:ða] 'their direction'

b. [ba:βaʕo] 'palm'
[ba:βaʕa-ða] 'the palm'
[ba:βaʕa-ði:sa] 'his palm'
[ba:βaʕa-ðe:ða] 'her palm'

The root final vowel is an [o] and the [a] preceding the suffixes is derived. So the root final vowel lowers to an [a] but does not harmonize. The the target vowel does not undergo harmony because it directly follows a guttural consonant. In the data above for Speaker 1 no other forms have a guttural consonant directly preceding the root final vowel.

3.4.5 A Final Note on Forms

In my data in this chapter the suffix final [a] is dropped when the suffix attachs to a noun that denotes a family member (i.e. mother, father, grandfather, etc.). These data are shown below.

	her N	*bare N*	
(22)	[a:jeðe:d]	[a:jo]	'stepmother'
	[awowɣe:d]	[awow]	'grandfather'

This final [a] is a definiteness marker. Saeed 1999, in his discussion on possessives, discusses the phenomenon of dropping this definiteness marker. Specifically, he says the following about the loss of the final definiteness marker.

(23) "The possessive determiners occur without the article *ka/ta* to mark a semantic distinction similar to the distinction betweenalienable and inalienable possession found in many languages: possessives without suffixed articles are used with nouns for family members, parts of the body, and by extension for close friends."

(Saeed, 1999. p.115)

Following this note on the loss of the final [a], he goes on to discuss the phrasal consequences of the loss of the definiteness marker. We will not address any of these details. For the purposes here, it is sufficient to state that the loss of suffix final [a] is not a speech error, is an attested phenomenon, and is predictable for the most part.

3.5 An Account of Speaker 1's Vowel Harmony

Speaker 1's vowel harmony is explainable by two rules. There is a general vowel reduction rule and a total harmony rule. The reduction rule in (18) feeds the harmony rule in (19). These two rules can only be observed as distinct phenomena when the target vowel directly follows a guttural consonant as shown in (17) above. The target vowels in the data in (17) directly follow a guttural consonant. Therefore, we must write the rule in (19) such that it does not apply to vowels that follow gutturals consonants. The vowel reduction rule and total harmony rule are stated below.

(18) V +

|

[-high] [low]

(19) C V + V

| | |

Upper Oral [low] α

The rule in (18) states that a non-high vowel becomes a low vowel when it directly precedes a suffix boundary. The rule in (19) states that a low vowel harmonizes only when it follows an upper oral consonant. The distinction between Upper Oral and Lower Oral consonants will be made in chapter 4. The Greek letter alpha is used as a place holder for vowel quality in this rule. The particular form of the spreading vowel is irrelevant to the formalization of the rule. The morphology of the suffix determines what alpha can possibly be. The data in this chapter include cases where the alpha vowel is [i, e, a, o]

It must be noted that the vowel harmony rule in (19) only applies to short vowels. The rule in (18) feeds (19) by making all non-high vowels become the low vowel [a]. If the harmony rule applies to a root final vowel [a] and the long vowel [a:] does not harmonize, then we must conclude that the salient feature blocking the harmony rule is vowel length and not vowel quality. In the following list we show roots that end in long non-high vowels that do not harmonize.

(20)a.	[gaβija:-γi:sa]	'his poet'
	[gaβija:-γe:ða]	'her poet'
	[gaβija:-γoða]	'their poet'
b.	[baqbaqa:-γi:sa]	'his parrot'
	[baqbaqa:-γe:ða]	'her parrot
	[baqbaqa:-γoða]	'their parrot'
c.	[aɾda:-γi:sa]	'his courtyard'
	[aɾda:-γe:ða]	'her courtyard'
	[aɾda:-γoða]	'their courtyard'

We conclude that only short vowels harmonize.

3.6 An Account of Speaker 2's Harmony

Speaker 2's vowel harmony is explainable by a single rule, a general vowel reduction rule. The reduction rule in (21) is identical to the reduction rule in (20). The vowel reduction rule is stated below.

(21) V +

[-high] [low]

Speaker 2 had some tendency to front a low vowel in the presence of another front vowel across [h]. However, because this pattern was not robust or reproducible we only mention it as an aside.

3.7 Comparing Speaker 1 and Speaker 2 With Written Somali

To conclude this chapter we present a brief account of written Somali. An account of written Somali will help contextualize the two different vowel harmony patterns presented in this chapter. The vowel harmonies displayed by my two speakers are unattested in all accounts of Somali. Furthermore, in a cursory search of terms in Google, the vowel harmonies of my two speakers are not documented. This data relies on the assumption that vowel harmony is manifest in the orthography. A thorough study of Somali dialects is required before we are able to make any strong claims.

Written Somali shows vowel lowering of [e, o] to [a] root finally preceding a suffix and total harmony across gutturals. We rely on Saeed 1999, and Orwin 1995 for our description of written Somali.

The data in Saeed show that root final non-high vowels reduce whenever there is a suffix attached to the root and that vowel harmony only occurs across gutturals. The data below are from Saeed 1999. He uses the remote definite article to show vowel harmony. The remote definite article differs from the definite suffix shown in chapter 2 in the vowel of the suffix; the vowel is [i:] and not [a]. The remote definite suffix is phonologically the same as the other definite suffix in all other respects.

	bareN	*definite N*	*remote def. N*	
(22)[3]	a.bare	bara-ha	bari-hii	'teacher'
	dawo	dawa-da	dawa-dii[4]	'medicine'
	maalmo	maalma-ha	maalmi-hii	'days'
	aqallo	aqalla-da	aqalla-dii	'houses'

b.	aabbe	'father'	hooyo	'mother'
	aabba-haa	'your father'	hooya-daa	'your mother'
	aabbi-hiis	'his father'	hooya-diis	'his mother'
	aabe-heed	'her father'	hooya-deed	'her mother'
	aabbo-hood	'their father'	hooya-dood	'their mother'

Saeed 1999 accounts for these data in the following way.

(23) "[…] the changes in the stem final vowel in the masculine *h* series assimilates to the vowel in the suffix: *e* → *a* before *a* or *aa*, *e* → *i* before *ii*, and *e* → *o* before *oo*. the changes in the feminine *d* series constitute a single rule, stem final *o* → *a* before any suffix. As mentioned above, final *i* vowels are unaffected by these rules."

(Saeed, 1999. p.31)

To describe the data in (22) in terms of the kind of account given earlier in this chapter, we need a rule that lowers non-high vowels root finally and preceding a suffix and we need a total harmony rule that only applies across a guttural. We account for Saeed's data with the following rules.

(24) V +

[-high] [low]

---

3 These data are not transcriptions.

4 Saeed gives the incorrect gloss "the teacher" for this form. We have corrected it.

(25)[5] V Q + V
| | |
| guttural |
[-high] α

Finally, we present data from written accounts of the language that show that trans-guttural vowel harmony occurs in a wider array of environments. The data in (26) show vowel harmony occuring with the focus and question particles across the [ħ] consonant.

(26)[6]a.	maħ-	*question marking root*
	maħ-a:n	'what' *1^{st} singular clitic subject pronoun*
	muħ-u:	'what' *3^{rd} masculine singular clitic subject pronoun*
	maħ-a:nnu	*'what' 1^{st} plural exclusive clitic subject pronoun*
b.	wa:ħ	*nominal focus word*
	waħ-a:n	*focused 1^{st} singular clitic pronoun*
	wuħ-u:	*focused 3^{rd} masculine singular clitic pronoun*
	waħ-a:nnu	*focused 1^{st} plural exclusive clitic pronoun*

The data in (26)a.-b. show that the root vowel of the masculine particles *muħu:* and *wuħu:* undergo total harmony across *ħ*.

[5] This formalization will be discussed further in chapter 4.

[6] The data in (26) are not transcriptions. We have changed the transcription of the written account in using [ħ] instead of the orthographic standard *c*. (26)a. is from Orwin 1995, (26)b. is from Saeed1999.

Chapter 4 The Gutturals

4.0 Introduction

In this chapter we first describe the behavior of gutturals in Somali and briefly, look at the behavior of gutturals in other languages. Next, we demonstrate that previous accounts of guttural consonants cannot explain the full array of attested behavior. Finally, we offer a solution that accounts for the guttural consonants' behavior.

4.1 Patterns of Guttural Behavior

The guttural consonants are [q, χ, ʁ, ʔ, h, ʕ, ħ]. There are three kinds of behavior that guttural consonants display cross-linguistically. A theory of guttural consonants needs to be able to account for all of these kinds of behavior by the formation of rules. The following are a list of the parametric options for rule formation with respect to the guttural consonants.

First, a rule needs to be able to ignore all consonants, including the gutturals. Second, a rule needs to be able to ignore just the guttural consonants. Three, a rule needs to be able to speficically require guttural consonants.

Steriade's 1987 account of gutturals (laryngeals in her work) only accounts for [h, ʔ] being ignored by harmony rules. McCarthy's 1989 article on Semitic gutturals acknowledges the range of guttural behavior in that he goes into depth on why rules need to be able to refer to a class of guttural consonants but he only briefly addresses the trans-guttural harmony phenomena. His account shows that Steriade 1987 is an inadequate account of the guttural consonants with respect to the harmony phenomena, but he does not offer a satisfactory reparative explanation.

In Somali gutturals are ignored by the vowel harmony rules, as discussed in chapter 3. This shows the the second kind of guttural behavior, if we consider only written Somali's trans-guttural vowel harmony. Somali gutturals are ignored by the spirantization rule, formalized in chapter 2. This also shows the second kind of guttural behavior in that the gutturals are ignored by spirantization. Additionally, the spirantization rule targets unaspirated stops, which include [q]. This displays the third kind of guttural behavior. Finally, if we consider Speaker 1's version of vowel harmony, which applies across [ð] in addition to the guttural consonants, we also have evidence for the first kind of guttural behavior. Therefore, Somali provides an excellent testing ground for theories of guttural consonants. In this chapter we present an account of gutturals that can predict all three kinds of guttural behavior.

4.2 Somali Gutturals

4.2.1 Trans-guttural Vowel Harmony

Next, we turn to vowel harmony. Here we only focus on the written account of vowel harmony as described in Saeed 1999. The following are data that come from Saeed 1999 and Orwin 1995. These data show that there is total harmony across [h, ħ], and that harmony is blocked by a non-guttural consonant.

	bareN	*definite N*	*remote def. N*	
(5) [7] a.	bare	bara-ha	bari-hii	'teacher'
	dawo	dawa-da	dawa-dii[8]	'medicine'
	maalmo	maalma-ha	maalmi-hii	'days'
	aqallo	aqalla-da	aqalla-dii	'houses'

b.	aabbe	'father'	hooyo	'mother'
	aabbi-hiis	'his father'	hooya-diis	'his mother'
	aabbe-heed	'her father'	hooya-deed	'her mother'
	aabbo-hood	'their father'	hooya-dood	'their mother'

(6) a.	maħ-	*question marking root*	
	maħ-a:n	'what'	*1st singular clitic subject pronoun*
	muħ-u:	'what'	*3rd masculine singular clitic subject pronoun*
	maħ-a:nnu	*'what'*	*1st plural exclusive clitic subject pronoun*

b.	wa:ħ	*nominal focus word*
	waħ-a:n	*focused 1st singular clitic pronoun*
	wuħ-u:	*focused 3rd masculine singular clitic pronoun*
	waħ-a:nnu	*focused 1st plural exclusive clitic pronoun*

We account for these data with the following rule, first presented in chapter 3.

[7] The data in (5) come from Saeed 1999. The data in (6) see fn. 6.

[8] See fn. 4 above.

```
(7)        V      Q  +      V
           |      |         |
           |   guttural     |
        [low]               α
```

This rule, formalized in this manner, explicitly requires a guttural come between the vowels. This was useful for a description of the phenomenon in chapter 3, but we desire to rewrite the rule in order to discard the explicit requirement of a guttural consonant. The vowel harmony rule needs to be written so that it can ignore the guttural consonants.

4.2.1 Trans-guttural Spirantization

The data in this section come from feminine definite nominal forms. These data concern the nature of the guttural consonants and the spirantization rule introduced in chapter 2. The spirantization rule is repeated below.

```
(1)                                  [σ
                                      |
       V                              C
       |                            /   \
   consonant place       consonant place   Laryng
       |                           |          |
   vowel place                   stop       [-asp]
       |
   continuant
```

In considering the spirantization rule in (1), we first look at cases where the feminine gender affix [-d] does not spirantize after a consonant and we compare it to cases where it does spirantize after a consonant. We will see that when an intervening consonant is a guttural the feminine gender affix [-d] spirantizes.

The following data were first presented in chapter 2. These data show what happens when [d] follows a non-guttural consonant.

(2) [aɾ**d**a:] 'courtyard' [gabal**d**aje] 'sunflower'
[mɪn**d**i] 'knife'

No spirantization is observed in (2). Furthermore, the following forms are unattested.

(3)	*[aɾða:]	'courtyard'	*[gabalðaje]	'sunflower'
	*[mɪnði]	'knife'		

We compare the data in (2) and (3) to the following data where the feminine gender affix [-d] spirantizes across a guttural consonant.

(4)a.	[ʕɪla:q]	[ʕɪla:qða]	'argument'	[ʕuq]	[ʕuqða]	'incubation'
	[duq]	[duqa]	'elder'	[wɪɾɪq]	[wɪɾɪqða]	'lightening'
	[lu:q]	[lu:qða]	'melody'	[aχla:q]	[aχla:qða]	'behavior, manners'
	[daʁi:q]	[daʁi:qða]	'flour, meal'	[dɛ:q]	[dɛ:qða]	'donation, generosity'
	[ɪɾsa:q]	[ɪɾsa:qða]	'food'			
b.	[loʔ]	[loʔða]	'cattle'			
c.	[wasaχ]	[wasaχða]	'dirt'	[ta:ɾɪχ]	[ta:ɾɪχða]	'history'
d.	[bah]	[bahða]	'noble'			
e.	[laħ]	[laħða]	'ewe'	[laħo:ħ]	[laħo:ħða]	'fritter'
	[duħ]	[duħða]	'grease'	[bɪðɪħ]	[bɪðɪħða]	'left side'
	[ɛ:ħ]	[ɛ:ħða]	'favor'	[lɛ:ħ]	[lɛ:ħða]	'curdled milk'
	[ħoħ]	[ħoħða]	'colostrum'	[dɪħ]	[dɪħða]	'dry streambed'
f.	[saɾaʕ]	[saɾaʕða]	'groin'	[maʕ]	[maʕða]	'kiss, pucker'
	[čaʕ]	[čaʕða]	'scandal'	[baʕ]	[baʕða]	'soft plastic obj.'

These data show that the feminine gender affix surfaces as [-ð] after gutturals. We conclude that the spreading of the continuant feature must be non-local because the roots displayed in (4)a-b. end in a stop.

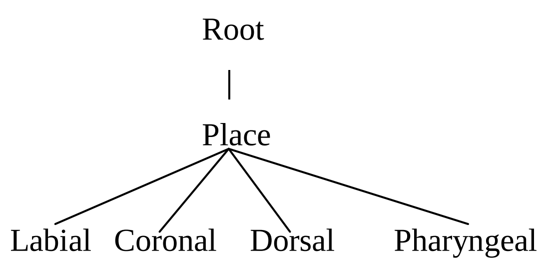
Given the data in (2), (3), and (4), the spirantization rule presented in (1) needs to be ammended such that it can ignore guttural consonants.

4.3 McCarthy's 1989 Account of Semitic Gutturals

McCarthy 1989 is concerned with positively identifying the gutturals as a class of consonants. We accept some of his arguments concerning what a theory of gutturals needs to be capable of, but we reject his theory because it fails to account for trans-guttural harmony data. In this section we paraphrase his claims. In the following section we will demonstrate how McCarthy 1989 cannot account for the Somali trans-guttural harmony.

McCarthy 1989 investigates a wide array of typological observations from Semitic languages which include, "cooccurrence restrictions, vowel lowering, avoidance of syllable final position, transparency to assimilation, and degemination,"(McCarthy, 1989 p.4). The arguments focus on the establishment of 'natural classhood' of gutturals and on the establishment of an articulator node for the guttural consonants. The feature hierarchy defended in McCarthy 1989 is restated below.

(8)



However, the arguments in McCarthy 1989 only support the more general claim that the guttural feature is a dependent of the place node. The arguments do not support the specific claim that 'pharyngeal' is a place of articulation node with the same dominating node as the labial node, the coronal node, and the dorsal node. We will address two of the arguments made in McCarthy 1989 which are relevant to this discussion, cooccurrence restrictions and vowel lowering. From McCarthy 1989 we take the conclusion that the guttural feature is dependent of place and that any theory claiming to account for the guttural consonants is burdened with agreeing with or dispelling these arguments.

4.3.1 Obligatory Contour Principle Argument

McCarthy demonstrates that guttural consonants obey the Obligatory Contour Principle (OCP). The OCP states that 'adjacent elements that are identical, with respect to some subset of language specific relevant features, are prohibited'. Within Semitic the restricted identical features refer to the articulator node and 'major class'. There are six cases of cooccurrence restriction in Semitic. Four of the cases can be accounted for by the four articulator nodes in McCarthy's account, labial, coronal, dorsal, and pharyngeal. The remaining two cases are accounted for by two 'major classes'. Here we are only interested in discussing the articulator nodes, and shall ignore major classes.

In Semitic, claims about adjacency restrictions only concern the consonants and so two consonants are said to be adjacent even when a vowel occurs between them on the surface.[9] After listing in several tables the occurrence tendencies of adjacent guttural consonants in several different types of Arabic roots McCarthy concludes the following.

(9) "Combining all the evidence, then, we see that there is a robust resistance to nearly all combinations of two gutturals in an Arabic root." (McCarthy, 1989. p.7)

He goes on to say the following specifically concerning guttural consonants and their relationship to other consonants.

(10) "The parallel between the gutturals and the other, better understood, consonants is therefore complete: segments belonging to the same major class and with the same place of articulation cannot cooccur in a root." (McCarthy, 1989. p.11)

This argues that the guttural node is a dependent of the place node

4.3.2 Vowel Lowering Argument

McCarthy additionally argues for the classhood of guttural consonants on the basis of regular vowel lowering effects triggered by guttural consonants. McCarthy's argumentation centers on an implication that guttural-vowel interactions are sufficiently similar to labial-vowel and coronal-vowel interactions. The latter claim is most clearly expressed in a footnote, which is repeated below.

(11) "To get some notion of the extent of the problem, consider some of the observed vowel/consonant interactions. Labials are associated with round vowels, velars and interdentals […] with back vowels, and alveolars with front vowels. To a great extent, these associations between place and vowel features are uninterpretable in current phonological feature theory, but they nevertheless are authentic generalizations." (McCarthy, 1989. p.17. n.14)

His argument that the guttural node is phonologically analogous to other nodes of articulation is clear enough, but his argument does not take the necessary second step of demonstrating where the guttural node should be put beneath the place node. Therefore, we accept his argument by analogy as a first step, but we desire to complete the theory by providing the additional, and necessary, argument for where to put the guttural node beneath the place node.

[9] That is to say that *CVCVC* can be analyzed as *CCC*.

From McCarthy's account of gutturals in Semitic, we want to maintain the claim that the guttural node is a dependent of the place node. In accepting McCarthy's argument that the guttural feature is a dependant of place we fundamentally reject all other theories that claim that gutturals are placeless, or unspecified. The major gutturals-as-unspecified theories include Steriade 1987 and Halle 1995.

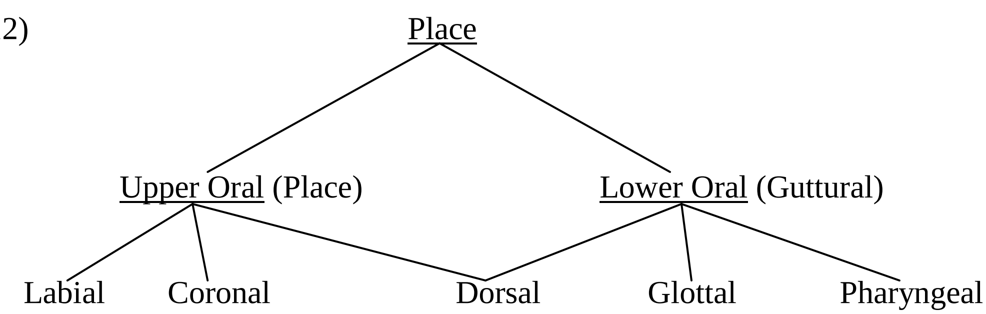
In the next section we present an improved guttural theory that can account for both McCarthy's Semitic phenomena and the Somali phenomena.

4.4 Guttural Theory Proposal: Introduction of Cavity Nodes

The data above require that a guttural theory be able to contend with three distinct kinds of guttural behavior. First, all consonants, including the gutturals, are ignored by harmony rules. Second, only the gutturals are ignored by harmony rules. Three, gutturals are specified in the environment or as the target of a rule. In order to account for these behaviors we a new theory of guttural consonants is required. In this section we defend the introduction of a lower oral node.

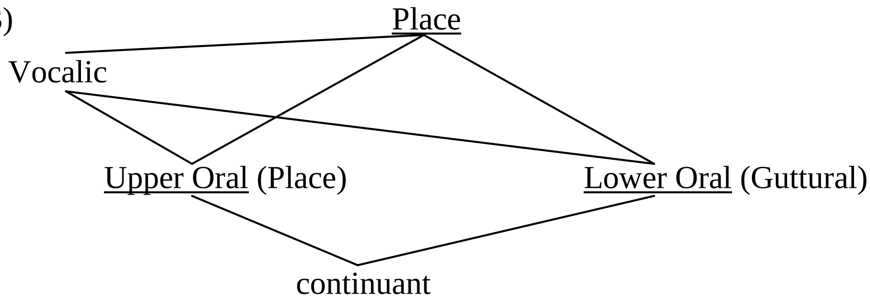
We begin by describing how the lower oral node fits into the feature hierarchy. The lower oral node is on the same tier as what Clements and Hume 1995 call the 'C-place' node. Dominating these two nodes is what we call the place node. Under this theory, Clements and Hume's place node is relabeled 'upper oral' and the guttural node is labled 'lower oral' and the mother of these two nodes is labeled as the 'place' node. The place node branches off of the root node. The new labels are underlined, the old labels are in parentheses.

(12)



We show in the following diagram where the vocalic nodes and the continuant nodes are assumed to be organized in this theory.

(13)



The placement of the continuant node follows the discussion of the *oral cavity node* in Clements and Hume 1995, § 3.3.3. The organization of the vocalic node is based on the assumption that the vocalic node is dominated by the place node and that the vocalic node dominates whatever the place node dominates. We assume that all vowels are specified for the upper oral feature. However, organizing the features in this way allows vowels to be specified as having a lower oral cavity feature. It is worth further research to determine whether this feature specification is useful in defining ATR vowels.

4.5 Lower Oral Node and the Three Patterns of Guttural Behavior

Next we demonstrate how the introduction of the lower oral node can account for all three guttural behaviors. When formalizing rules we shorten 'upper oral' to UO and 'lower oral' to LO.

4.5.1 Specifying Gutturals as a Class

McCarthy's theory can positively identify the gutturals as a class by claiming that all guttural consonants are specified for the pharyngeal articulator node.

First, guttural consonants can be specified in the environment of or as the target of a rule because all guttural consonants are specified for the lower oral cavity node. Shown below are two segments that are distinct based on the specification of the cavity node.

(14)a.	C	b.	C
	|		|
	Place		Place
	|		|
	LO		UO

(14a) defines all guttural consonants. This distinct cavity feature allows us to positively identify the guttural consonants as a class. McCarthy's theory can account for this by claiming that all gutturals are specified for the pharyngeal articulator node.

4.5.2 Unifying All Consonants

McCarthy's theory can account for vowel harmony across all consonants because consonants are unspecified for the vocalic node. We show that our guttural theory can do the same.

Second, all consonants, including the gutturals, can be ignored by harmony rules because a feature can spread on the plane defined by the vocalic node dominating the upper oral cavity node. Shown below is the total vowel harmony of Speaker 1 which is an example of this kind of transplanar rule.

```
(15)     V      +    C         V
         |           |         |
       Place       Place     Place
         |           |         |
       Vocalic       |       Vocalic
         |           |         |
         UO          UO        UO
         |                     |
       [low]                   α
```

The rule in (15) looks like there is line crossing. However, this is not line crossing. Line crossing is a theoretically forbidden phenomenon where a feature would have to skip over a more immediate target in order to spread. A more immediate target is defined as a segment specified for the tier or the plane that the spreading rule refers that occurs between the trigger and the target. In cases of line crossing a rule cannot apply because the spread of the feature would have to cross over association lines relevant to the trigger consonant, the target consonant, and the spreading feature.

In this rule the features spread on the plane with the edges defined as the vocalic node and the upper oral cavity node. The intervening consonant segment is not specified for the vocalic node and therefore is not adjacent to either vowel with respect to the vocalic-to-UO plane.

This transplanar spreading targets only vowels and ignores all consonants because all consonants are unspecified for the vocalic node. The place node that dominates both upper and lower oral cavity nodes allows us to positively identify all consonants as a class. McCarthy's theory can account for vowel harmony across all consonants because consonants are unspecified for the vocalic node.

4.5.3 Trans-guttural Rules

McCarthy's theory of the guttural consonants *cannot* account for the vowel harmony or the spirantization phenomenon.

We first show how his theory fails to account for the vowel harmony and the spirantization phenomenon. In his theory gutturals are defined by the pharyngeal articulator which is directly dominated by place, as shown in (8) above.

4.5.3.1 Vowel Harmony

In the following we show what the vowel harmony rule would look like using McCarthy 1989's theory.

```
(16)      V       Q         +  V
          |       |            |
        Place   Place        Place
          |       |            |
          |   Pharyngeal       |
        Voc.                  Voc
          |.-.-.-.-.-.-.-.-.-.-|
        [low]                  α
```

This rule is exactly like the the one in (7). Under McCarthy 1989 the account of the guttural feature cannot deal with this harmony phenomenon without specifically mentioning an intervening consonant.

Assuming there are distinct cavity nodes we can provide the following account of vowel harmony, which does not require us to accept a theoretically undesirable rule into our account.

(17) V + V

| |

Place Place

| |

Voc. Voc

| |

UO UO

| |

[low] α

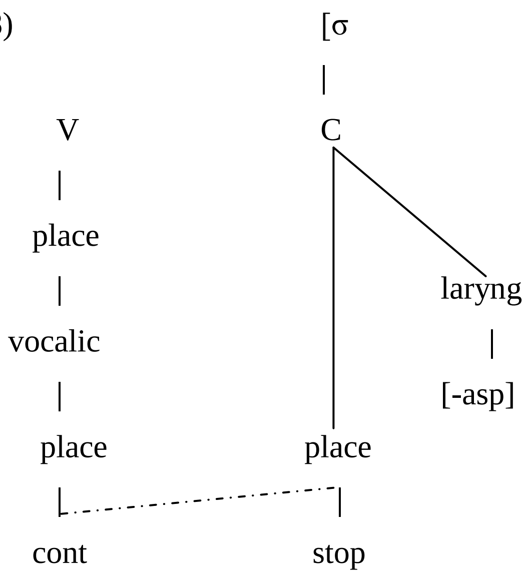
The spread on the plane defined by the upper oral cavity node dominating the vowel articulator features gives us the two parameters of the vowel harmony rule that we require. First, all upper oral consonants block this rule because they are specified for the upper oral node and would interfere with this plane. Second, all guttural consonants are ignored by this rule because they are not specified for the upper oral node and therefore are not in between the trigger vowel and the target vowel with respect to the upper oral node.

This rule predicts that adjacent vowels would also harmonize. However, there are no observed cases of adjacent vowels in Somali with which to test whether strictly adjacent vowels harmonize. The vocative suffix *–ow* might prove useful for testing this account.

4.5.3.2 Transguttural Spirantization

Next we show how McCarthy 1989's account of the gutturals fails to account for the spirantization rule. The following is what the spirantization rule would look like using his theory. We show this is not teneable.

(18)

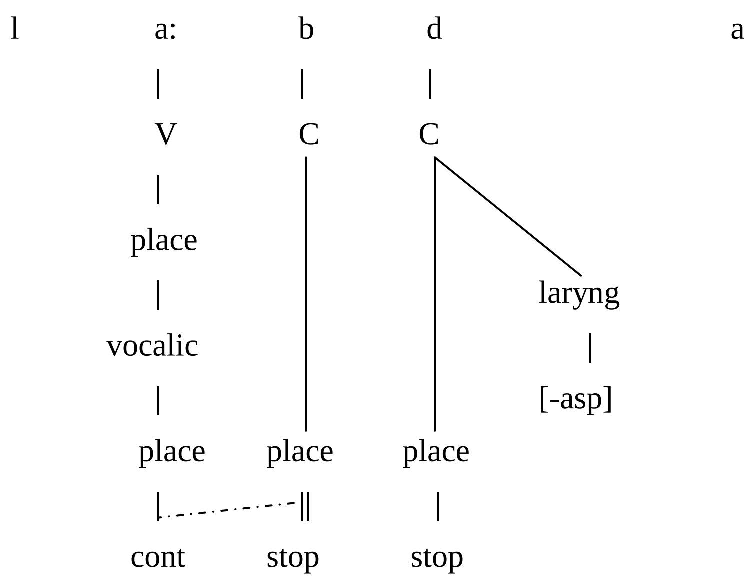


Formulating the rule this way assumes that the consonant place node and the place node dominated by vocalic node are on the same tier. This assumption is not in Clements and Hume 1995. The problem with this assumption is secondary to the fact that the rule does not make correct assumptions about Somali. We show this below.

Next, we examine the base case for the Somali spirantization rule. First, we look at what happens when an upper oral consonant occurs between the triggering vowel and the target consonant. In this case we do not want to predict spirantization. Second, we look at what happens when a lower oral consonant occurs between the triggering vowel and the target. In this case we do want to predeict spirantization.

First, we look at /la:b+da/ 'the chest'.

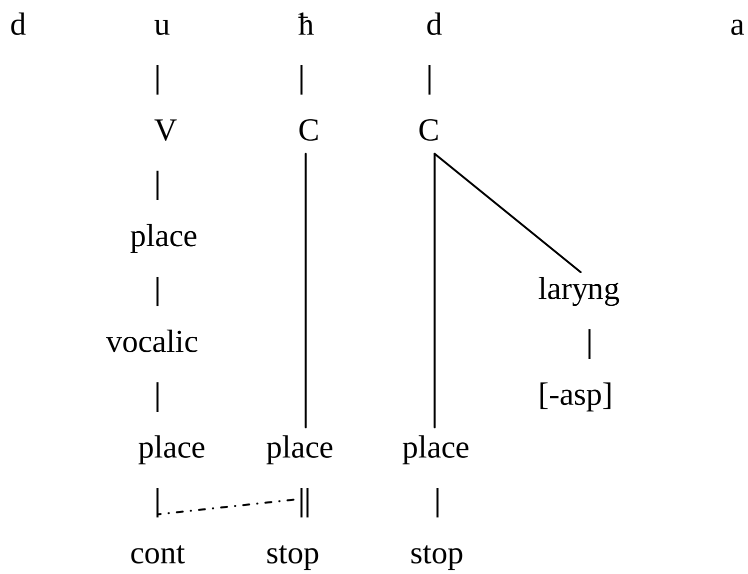
(19)



The rule is blocked by the line crossing constraint. The continuant feature spreads on the place-to-cont plane, and the only available target for this rule with respect to this plane is [b]. The consonant [b] is an unaspirated stop but is it in the onset in a syllable. Therefore the rule cannot apply and the rule correctly predicts [galbo].

Next we look at /duħ+da/ 'the grease'

(20)



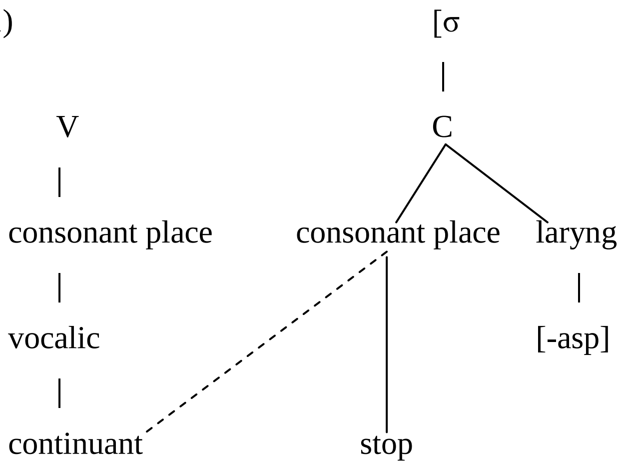
Again, the rule is blocked by the line crossing constraint. The continuant feature spreads on the place-to-continuant plane, and the only available target for this rule with respect to this plane is [ħ]. The consonant [ħ] is not an unaspirated stop nor is it in the onset in a syllable. Therefore the rule cannot apply and the rule incorrectly predicts *[duħda].

Under McCarthy's guttural theory, no intervening consonant can occur between the triggering vowel and the target consonant without blocking it.

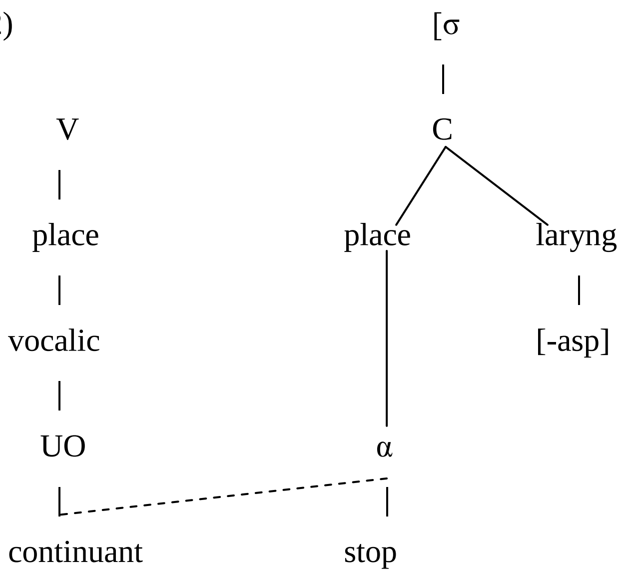
With the introduction of a lower oral node we can account for the Somali spirantization rule. The introduction of the cavity nodes allow us to define several additional planes to spread across: e.g. place-to-UO, place-to-LO, UO-to-cont, LO-to-cont.

Shown below in (21) is the spirantiation rule as presented in chapter 2. Shown in (22) is the spirantization rule reformulated in light of the introduction of the lower oral and upper oral cavity node distinciton.

(21)



(22)



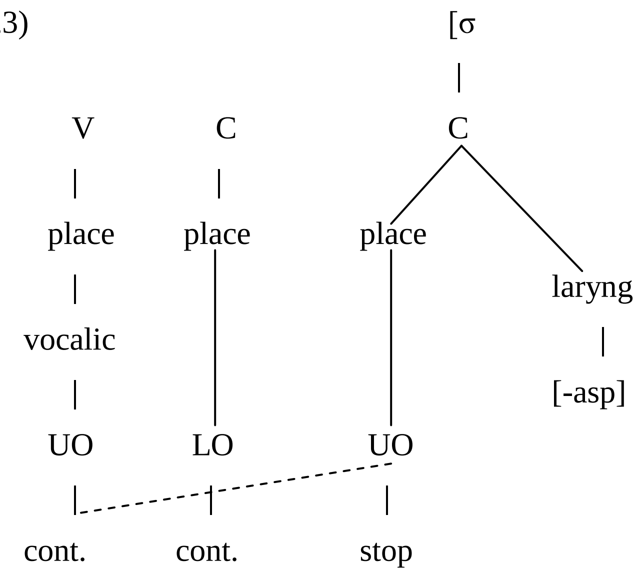
α = [UO, LO]

We use the Greek letter *α* to stand in for either the upper oral node or the lower oral node. This rule states that the continuant feature spreads to what dominates the continuant feature in the onset consonant.

The only difference between the (21) and (22) is the addition of the upper oral distinction. The spreading still occurs on the plane defined by a place node and the continuant feature node. The basic idea of the rule has not changed. In (22) we make it explicit that UO-to-continuant defines the left edge of the plane. This rule allows for spreading between planes, interplanar spreading, in addition to spreading on a single plane, transplanar spreading.

First, we show in (23) how this rule accounts for the cases where guttural consonants are ignored.

(23)

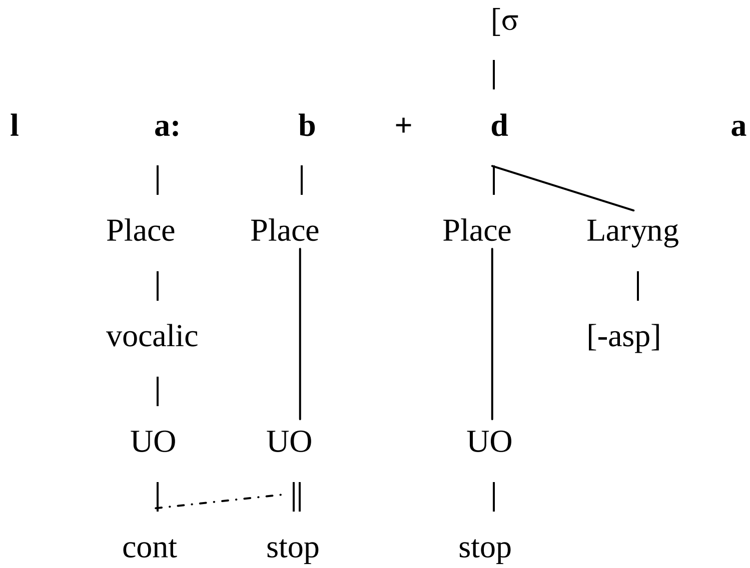


It looks like there is line crossing in (23). However, this is not line crossing. In this rule the feature continuant spreads on the plane with the edges defined as the upper oral node dominating the continuant feature node. The intervening consonant segment is not specified for the upper oral node and therefore is not adjacent to either the vowel or the consonant with respect to the upper oral node dominating the continuant feature plane.

4.5.3.3 The Uvular Consonant

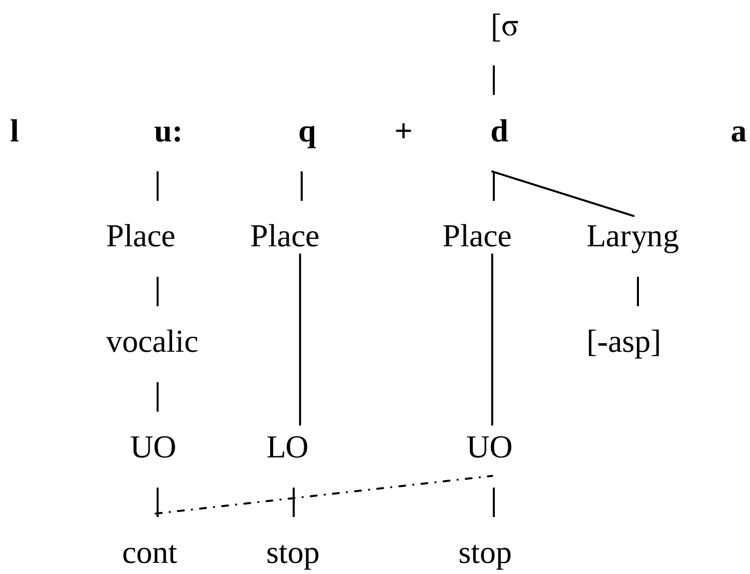
The way that the spirantization rule is formulated above it seems to eliminate [q] as a potential target of the spirantization rule given that the target is defined by the upper oral cavity node dominating the continuant node. We show here that [q] can both be targeted by and transparent to the spirantization rule. Below we show three cases. We display the workings of the rule for the words: /la:b+da/ 'the chest', /lu:q+da/ 'the melody', and /lu:q+o/ 'corners'. These words display all three cases where the spirantization rule is relevant to the uvular consonant. We use /la:b+da/ 'the chest' as a control to show when the rule is blocked. We use /lu:q+da/ 'the melody' to show when /q/ is transparent to a rule. We use /lu:q+o/ to show when /q/ is targeted by the rule.

(24)a. /la:b+da/ 'the chest'



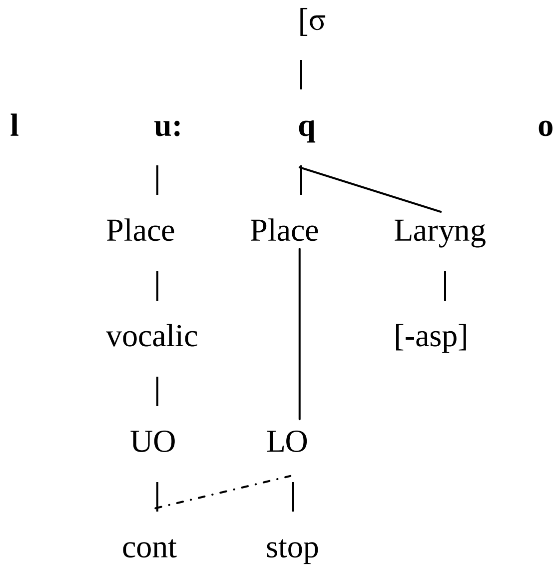
This violates line crossing and therefore the rule does not apply.

b. /lu:q+da/ 'corners'



The rule applies in this case because the continuant feature is spreading on the plane defined by the upper oral node dominating the continuant feature. The guttural consonant is not specified for the upper oral node and therefore is not adjacent to the spreading vowel with respect to upper oral dominating continuant plane.

c. /lu:q+o/ 'the chest'



The rule applies in this case because the continuant feature spreads from the plane defined by the upper oral node dominating the continuant feature to the plane defined by the lower oral node dominating the continuant node. When there is interplanar spreading the rule is blocked by a consonant specified for either plane. In the case of /lu:q+o/ ' we predict that the spirantization would be blocked by any consonant specified for upper oral or lower oral intevening between the vowel and /q/.

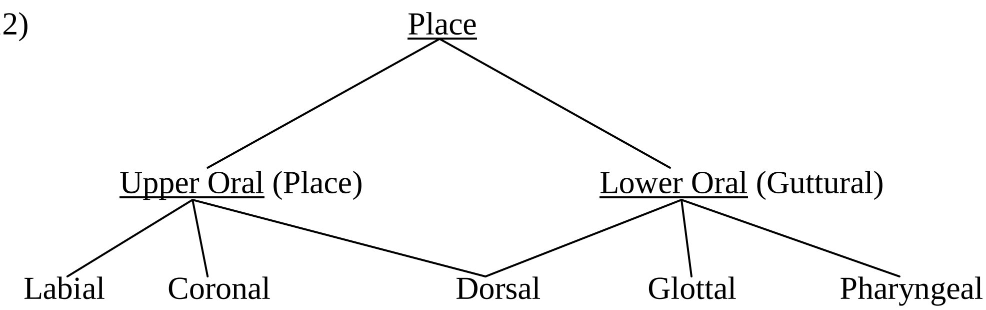
This does not conflict with the transparency of the guttural consonants in the case of the spirantization of upper oral consonants. When the rule targets upper oral consonants, there is not interplanar spreading and therefore the only plane relevant to blocking the rule is the plane defined by the upper oral node dominating continuant node.

4.6 Concluding Remarks

The account given here accounts for the harmony rules, while maintaining the claim that the guttural feature is a dependent of the Place node.

As has been presented above the upper oral node dominates the labial node, coronal node, and dorsal node. These daughter features of the upper oral node distinguish various places of articulation. The lower oral node must also dominate a set of features that allows a distinction among the various places of articulation for the guttural consonants. The proposed feature hierarchy is restated below.

(12)



The offered structure here for the dependents of the lower oral node is only intended to be suggestive in nature. The dependents of the lower oral node at the very least need to be able to distinguish between uvular, glottal, and pharyngeal consonants. Fleshing out the properties of the daughters of the lower oral node is beyond the scope of this thesis, but research in this vein is the next logical step in understanding the lower oral node and its relationship to the guttural consonants.

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