# THEORETICAL ISSUES IN COMPARATIVE ETHIO-SEMITIC PHONOLOGY AND MORPHOLOGY

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September 1997

A THESIS SUBMITTED TO THE

FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILLMENT OF

THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

0-612-37017-8

# Abstract

This thesis explores three fundamental issues in the phonology and morphology of Ethiopian Semitic languages: mobile morphology, reduplication and epenthesis. In each chapter I draw on comparative evidence from different Ethiopian Semitic languages, an approach which provides greater insight into how the languages vary with respect to these three issues, and how the issues themselves are best analyzed.

The first issue is that of 'mobile morphology' a term I coin to describe the ability of a particular morphological category to be realized on various segments within a stem. The two major types in the South Ethio-Semitic languages are palatalization and labialization. I develop an analysis of palatalization in five different languages which relies on a hierarchy of preferred targets, along with a number of constraints regulating the appearance of palatalization within the stem.

Ethio-Semitic languages have several different types of reduplication. I draw a distinction between phonological and morphological reduplication and argue that phonological reduplication should be viewed as copying rather long-distance geminate structures created by spreading. I also examine the interaction of reduplication with mobile morphology and I present an analysis of double reduplication, showing how languages will avoid the creation of double reduplication relationships.

I develop an analysis of epenthesis which contrasts the behaviour of one set of languages which epenthesize following final consonant clusters with other languages which epenthesize between consonant clusters. I show that while all Ethio-Semitic languages follow the same general pattern, this may be overridden by templatic constraints and more importantly, by sonority considerations holding of adjacent syllables in coda-onset sequences. This last observation is important because it shows that while languages may on the whole violate heterosyllabic contact constraints, in particular circumstances, the constraints will be obeyed, giving rise to an emergence of the unmarked scenario.

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....and in memory of Yeshoalem Mane

# Résumé

Cette thèse s'adresse à trois problèmes fondamentaux dans la phonologie et la morphologie des langues éthio-sémitiques: la morphologie mobile, la reduplication et l'épenthèse. S'inspirant des données de plusieurs langues éthio-sémitiques différentes, chaque chapitre adopte une approche comparative, ce qui aide à éclaircir la variation qui existe entre des langues en fonction des trois problèmes identifiés, et ce qui mène aussi à des solutions plus satisfaisantes.

La 'morphologie mobile' consiste en la réalisation d'une catégorie morphologique sur un des plusieurs segments dans un radical donné. Les deux types principaux qui se trouvent dans les langues ethio-sémitiques méridionaux sont la palatalisation et la labialisation. Je développe une analyse de la palatalisation dans cinq langues différentes qui se base sur une hierarchie de cibles possibles, ainsi que sur un nombre de contraintes qui déterminent la réalisation de la palatalisation à l'intérieur du radical.

Les langues éthio-sémitiques possèdent deux types de reduplication. Je propose une distinction entre la reduplication phonologique d'une part et la reduplication morphologique d'autre part. Je fournis des arguments en faveur d'une analyse de la reduplication phonologique en termes du mécanisme de copie au lieu de celui de la propogation qui sert à créer des structures de géminées à longue-distance. Je présente aussi une analyse de la reduplication double qui démontre comment les langues cherchent à éviter la création des relations de reduplication double.

Je développe une analyse de l'épenthèse qui établit un contraste entre deux groupes de langues: celles dont l'épenthèse apparaît *après* une suite consonantique finale et celles dont la voyelle épenthétique apparaît *entre* les deux dernières consonnes. Toutes les langues éthio-sémitiques suivent le même système général d'épenthèse, mais ce système est sujet à des modifications dûes soit à des contraintes gabaritiques soit à une contrainte de sonorité qui obtient entre une suite de consonnes appartenant à des syllables adjacentes. Cette dernière contrainte est importante dans le sens qu'une langue peut en manifester plusieures violations mais dans des circonstances précises, l'épenthèse peut quand même y obéir, ce qui donne lieu à une situation d'apparition de traits non-marqués (emergence of the unmarked).

# Acknowledgments

The dissertation acknowledgments allow you to thank everyone who ever said a kind word to you during all your time as a graduate student. That list might be as long as there are pages in this dissertation, so let me try and cut it down a little, but not a lot because I finally get to write something that no one's going to edit.

**My advisor**

First, I extend my deep gratitude to my advisor, Glyne Piggott, who was both supportive and critical. Thank you for being patient with me and for reading through reams of incomprehensible rambling which would have been filtered out in your office if I'd only been there. And thanks for allowing me to be your first (and maybe your last?) e-mail advisee.

**McGill department**

The other professors at McGill helped in diverse ways. Heather Goad is a tough critic, and a great editor. And she 'knows her stuff'. I am particularly grateful to her for so much support in my first few years at McGill, in advice on everything from abstracts to low vowels to my personal life. Thanks to Michel Paradis for offering summer courses for me to teach. I am grateful to the whole department for comments on my evaluation paper - see, it got published! Finally, thanks to Lise and Linda for somehow keeping track of me.

**Other ling departments**

I had the extraordinary benefit (thanks to the Canadian government and its taxpayers) of being a visitor in two different linguistics departments in the US. I spent a very fruitful semester at the University of Massachusetts, Amherst in the Spring of 1995. Thanks to John McCarthy for generosity of time and insight and for teaching such an inspiring seminar. John Kingston introduced me to phonetics with a zillion overheads and made sense of all the graphs and muscular diagrams. The students at UMass, as anyone knows who spends any time there, are a great bunch. It was fun to discuss phonology in and out of class, and they also throw good parties. Although I wasn't a very present figure, the University of California at Berkeley was my home away from home in the final pre-teaching year. I benefited from discussions with Sharon Inkelas, Juliette Blevins, Orhan Orgun, Susanne Gahl, Andy Dolbey and Ronald Sprouse. Paul Kiparsky's seminar at Stanford was impressive and worth the drive down the 280. Many thanks also to the Santa Cruz professors, Jaye Padgett, Junko Itô and Armin Mester, for the interest they showed in having me visit and present my work. Finally, thanks to those Eritreans and Ethiopians who helped me with my dissertation research in the Bay Area: Woldeselassie Tesfay (Tigre), Yemane Habtezgi (Tigrinya) and Abdi Mohammed Idris (Harari).

**My mentors and first teachers**

Various other linguists contributed to my 'formation' as a phonologist and commented on other papers and embryonic parts of this dissertation. I would especially like to thank Jean-François Prunet, Jean Lowenstamm, Keren Rice and Elan Dresher. Some of these people also said the right things about me when it was time to hunt for a job or apply for fellowships. For that, I will always be grateful. Special thanks to Keren for making the Linguistics Department at the University of Toronto yet another home away from home (where is home anyway?) during the summer of '96, and for giving me much support and advice over the years.

**My colleagues**

I am indebted to the linguistics faculty at UCSD, first for hiring me, and second for creating such a wonderful work environment. I thank you all for your gentle prods and encouragement to finish this thing.

**My saviours**

During my wandering summer of '96, various people put me up: thank you to Mum and Dad, Dave and Lori, Elisabeth, Tim and Isabelle and especially Gerald, and Jacques and Jennifer in Montreal for giving me places to lay my head and my computer (sometimes with my head on my computer) in June and July.

**My Ethiopian connections**

In the fall of 1994, I spent three glorious months in another sunny place - Ethiopia, my other adopted country, to do fieldwork on Gurage. If anyone is looking for reasons to travel or reasons to get me talking for hours, ask me about Ethiopia. While I was there, I met a lot of people, all of whom displayed the generous hospitality and good nature that Ethiopians have a special flair for. Special mention to my Ethiopian 'father' Yeshoalem Mane and his wife Askal and their family and extended household - Salsi, Heran, Yeshi, Nunush, Daniel, Weynwa, and Abara. These kind people took me into their house, without ever having met me, and made me a part of their family. እግዚአብሔር ይስጥልኝ once again. I join the family in mourning the passing of Yeshoalem in January, 1997.

Tadesse Sefer worked with me almost every day as research assistant, guide, translator and advisor. He was conscientious, patient and a wonderful person to hang out with from day to day. Thank you, Tadiye, for being such a great friend, for your unfailing belief in me, and for sending me so many letters, cards and musika over the last few years. I would also like to thank Denise Perrett, who provided a place to stay and always had a warm smile. Thanks also to my consultants, Bereda Namaga, Melese Woldemikael, Sisay Niga, Feleka Daju, Befkadu Argaw, Seifu Alemu, Fantu Woldemesker and Nassir Ibrahim. Abraham Petros and his wife Yewibdar Besir were generous hosts in the Gurage countryside, as were Yewibdar's parents and Tadesse's family. I would also like to thank the linguists in

Addis for welcoming me into their community: Denise Perrett, Kebede Hordofa, Moges Yegizu, Klaus Wedekind, Alemayehu Haile, Azeb Amha, Daniel Aberra, Tesfay Tewolde, Aklilu Yilma and Zelealem Leyew. They are inspiring for the work they do under less than ideal conditions. Teklehaimanot Argaw kept an eye on me and threw a farewell party; I am sad to think it was the last time I would see him. I thank his family for their kindness, as well as Aster Woldemariam, Mulu, Tenkir Tereda, Tafesse, Tegistu Petros, Alemu Petros and friends, Cherenet and Wassan, Hailu Jacob, Kidist Hailu and the Halefom boys. You were all wonderful and I miss you. And finally, back home, a big hug to Dessalegn Mammo in Toronto for helping me out with Ezha verbs, connections, phone numbers and *duriye*ness.

**The Montrealers**

My fellow students at McGill, although I haven't been around much recently, were super. I'd especially like to thank the following people for beer at the right times, friendly words and gripe-sharing: Cindy Brown, John Matthews, Tony Pi, Philippe Prevost, Dongdong Chen, Dominique Rodier, Gerald Rosenau, Masanori Nakamura, Alan Libert, Rama Narasimhan, Alix Seif, Jennifer Ormston, Nat Stone, Amanda Miller, Mengistu Amberber, Takako Kawasaki, Silvina Montrul, Ileana Paul and anyone else I've forgotten who should be here. Special thanks to OT Stewart and Frances for putting a little bit of Africa in me, and to Roumyana Slabakova and her lovely family, Zlatko, Bistra and Kamen, who are the warmest people imaginable - thank you so much for all your friendship and support. Other people in Montreal who deserve thanks: Ali Idrissi, Fathi Said and Lula, Marie Tigkos, and Jacques Lamarche (for long discussions of the verb *aller* and Gurage object markers over espresso - there *is* a connection..), and the Ethiopian UQAMers: Degif Petros, Berhanu Chamora and Girma Halefom for many discussions, work or otherwise, and for your continuing friendship. A special thank you, Degif, for encouragement, debate, a lot of e-mail, for patiently answering many of my questions and for your love and friendship - it means a lot to me. I have shared a lot of beer and Chinese/Thai/Malaysian food over the years with Joe Pater in many different places, from McGill to UMass to Berkeley. A great big thanks, Joe, for my dissertation mug (it got a lot of use), for supportive e-mail and long chats, and for going through it all with me. Good luck in Edmonton and congratulations!

**My California (and other) buddies**

The dissertation year(s) is supposed to be tough, but who knew just how. That is all fading now, thanks to the support of great friends. First and foremost, my housemates on Russell St., Diana Fisher, Allison Delauer and Jeff Ward, saved my sanity and I cannot thank them enough for listening to me, supporting me, cajoling me, laughing with me, drinking and dancing with me, eating my cookies and sticking by me (sometimes with disapproving looks) no matter what stupid thing I did next. In sum, being wonderful friends. Our fun(?) in the sun and lack of sailing will always be remembered! Speaking of fun in the sun, thanks, Derek, for boosting my ego and reminding me of how much I like the outdoors. Thanks, Walter, for funny postcards, and a budding e-mail friendship. Also thanks to Solomon, for 'have you finished yet?' phone calls and new Amharic words. I was very happy to have my Canadian connection in Santa Cruz to escape to from time to time: Rachel Walker, Geoff Duke and Andrew Carnie put me up on countless occasions and always made leaving hard (especially once they lived in the 'mansion'). Various other people listened to my gripes over e-mail and in person including Tony Bures, Michael Johnston and Kathleen Hubbard. Special thanks to Yemane Habtezgi for being my 'buddy' and for giving the soundest advice anyone could. የቐንዮለይ.

**My long-distance operator**

And to John, thank you for making me a stronger person, making me aware of all of my facets and admiring many of them, giving me endless pep talks, being proud of me, and for showing me that a struggle is sometimes worth it. And thanks for setting such an admirable example of how to be disciplined and never procrastinate - an example I have given up trying to follow (because it's not good for you!).

**My long-time friends**

And finally those old friends who still seem pleased to see me when I show up from some new corner of the world. They've given up trying to keep track of me, but once a year or so, we meet and catch up. Thanks for being patient, and not giving up entirely: Andrew Taylor (a big hug for everything over the years, especially those crazy postcards from Europe and car advice), Janine Mayall, Terry Chapman, Alison West, and Carole and Ron Turner. Kara Moscoe has shown me that e-mail is therapy - thanks so much for writing your heart out. Nasiombe Mutonyi has been a truly supportive friend. Thanks for always being there for me, through thick and thick, with unwavering love. A very, very special thank you to Elisabeth Joly for being such a superlative friend and psychologue (Je suis docteure, asteur, moi aussi!).

**My family**

To my family, Mum and Dad, Tim, Isabelle, Dave and Lori. Over the years I've learned that having a family like you is a rare and precious thing. Thank you for all the support (financial and otherwise) over so many years and especially during my annus horribilus.

**My financial support**

I am deeply appreciative of the funding I received to complete my Doctorate. SSHRCC fellowship 752-92-1496 from the Government of Canada and Research Grants from the McGill Faculty of Graduate Studies and Research allowed me to eat well, dress warmly, attend conferences, travel to faraway places and make the absolute best of my four years as a PhD student.

**My predecessors**

Finally, I would like to acknowledge the countless manuscripts, articles, books and dictionaries by Ethio-Semitic scholars, without which I would never have embarked on nor completed this study or most of my other work. Two people in particular merit being singled out: Professor Wolf Leslau, who stands alone in the amount of data and descriptions of Ethio-Semitic that he has written for over 50 years, particularly for the Gurage languages, and Robert Hetzron, whose book *The Gunnän-Gurage Languages* as well as his numerous articles, have been constant guides. I feel immensely fortunate to have had the opportunity to get to know Robert shortly before he died this year. I would like to acknowledge the research, encouragement, and also the enthusiasm of the UQAM group who first got me started: Jean Lowenstamm, Jean-François Prunet, Girma Halefom, the late Girmay Berhane, Degif Petros and Berhanu Chamora. Thank you for sharing your manuscripts and your knowledge with me. Some of the other Ethio-Semitic researchers whose work I have consulted include Jean-Pierre Angoujard, Lionel Bender, Gene Buckley, Marcel Cohen, Michel Denais, Hailu Fulass, Gideon Goldenberg, Grover Hudson, Orin Gensler, Ernst-August Gutt, Habte-Mariam Marcos and Shlomo Raz.

## Language Consultant Acknowledgments

I acknowledge with deep gratitude my language consultants. They are not to be held responsible for any errors which may occur in this dissertation

| | | | |
|---|---|---|---|
| **Chaha** | Degif Petros | **Ezha** | Sisay Niga |
| | Tadesse Sefer | | Dessalegn Mammo |
| | Woldemarian Fujie | | |
| **Inor** | Berhanu Chamora | **Gyeta** | Feleka Daju |
| **Muher** | Bereda Namaga | **Harari** | Abdi Mohammed Idris |
| | Melese Woldemikael | | |
| | Befkadu Argaw | **Tigre** | Woldeselassie Tesfay |
| | Seifu Alemu | | Mussie Bakit |
| | Fantu Woldemesker | | |
| **Tigrinya** | Yemane Habtezgi | | |
| | Bashir Idris | | |
| | Alem Woldemariam | | |
| | Beraki Woldeabzghi | | |

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# Chapter 1
# Introduction

This dissertation examines several theoretical issues in Ethiopian Semitic languages from a comparative perspective. The topics I have selected are Mobile Morphology, Reduplication and Epenthesis. These represent the most interesting and probably the most studied of the phonological and morphological issues in these languages. Nevertheless, approaching them from a comparative viewpoint gives new insight not only into how the languages differ, but also into the nature of the theoretical issues themselves. The dissertation is couched within Optimality Theory (Prince & Smolensky 1993, McCarthy & Prince 1993a, 1995).

## 1.1 The Issues

Mobile morphology, or the realization of a morphological category on one of any number of segments within the word, is one of the most intriguing problems in South Ethio-Semitic languages. I give an in-depth analysis of the behaviour of one suffix whose realization both across and within this group of languages is extremely complex and touches on issues pertaining to markedness, locality, the internal structure of segments and the whole concept of 'floating' affixes. Another important issue which arises from this kind of morphology is the idea of 'morphemic expression' through allomorphy. I show how allomorphy may actually aid in the realization of a morphological category.

Reduplication is interesting for a number of reasons. In Ethio-Semitic, only root segments are reduplicated, serving one of two functions: phonological copying whose sole purpose is to fulfill a template, and morphological reduplication which fills the more standard morphemic role. I will argue that what were formerly known as 'long-distance geminates' should be abandoned in favour of reduplicative copying. This eliminates several problems associated with the derivational tool of Tier Conflation, interaction with segmental changes, and the differences between true and long-distance geminates. I also examine restrictions on 'double reduplications'.

The final issue is that of epenthesis. Three Ethio-Semitic languages are unusual in that they resolve final consonant clusters by epenthesizing *after* the consonants and not between them. I show how this process interacts with templatic constraints, at least in one of the languages. I also examine the role of 'directionality' and the issue of intersyllabic sonority. I show that while Ethio-Semitic languages on the whole do not appear to care about the sonority relationships between a coda and a following onset, in certain languages, epenthesis which is independently required, will occur in positions to avoid bad sonority contours between coda and onset.

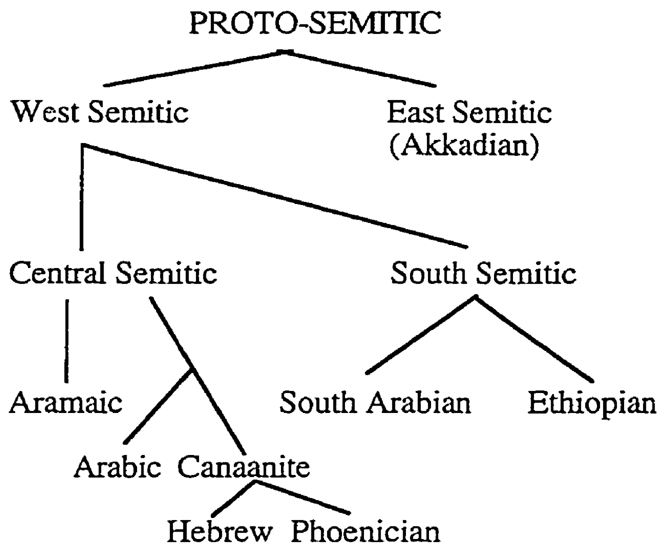
## 1.2 Ethio-Semitic languages

Before embarking on a detailed study of the three topics, I will give a general overview of the structure of Ethiopian Semitic and its place within the larger Semitic family. Semitic languages belong to the Afroasiatic family, which also comprises Coptic, Berber, Chadic, Cushitic, Omotic and according to Hetzron (1980), Beja, spoken in Eritrea. The most well-known and intensely studied living Semitic languages are, of course, Arabic and Hebrew. But the majority of present-day Semitic languages are spoken in Ethiopia and Eritrea, and these languages present the greatest diversity.

The Semitic family is divided into various branches, of which Ethiopian Semitic is included in the Southern branch. Hetzron (1974) gives the following classification of

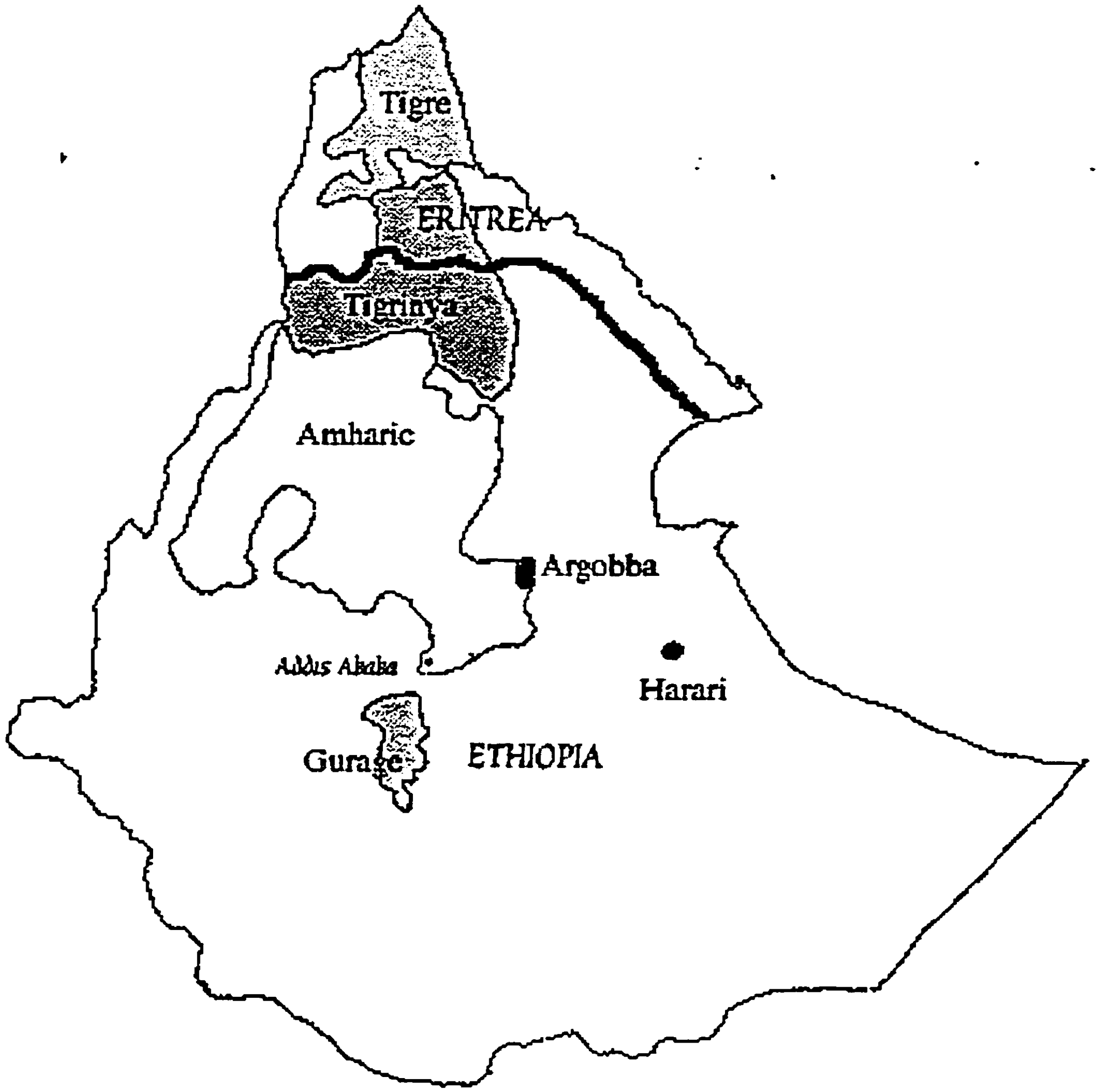
Semitic, where South-Arabian refers to the languages spoken in Yemen: Soqotri, Mehri, Harsusi and Jibbali:

(1)



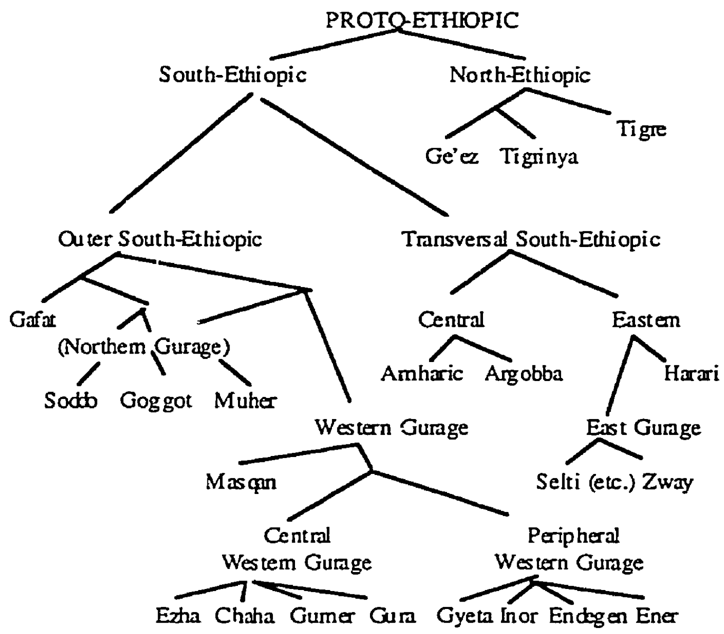

Within Ethiopia and Eritrea, there are four main language families: Semitic, Cushitic, Nilotic (Nilo-Saharan) and Omotic. There is also the language, Beja, sometimes classified as Cushitic, but now recognized by some researchers as a separate branch of Afro-Asiatic (Hetzron 1980). Nilotic and Omotic comprise many of the minority languages of Ethiopia and are spoken in the south-west part of the country (Bender et.al 1976). Members of the Cushitic family include Somali, Afar, and the widely-spoken Oromo (formerly known as Galla). The Semitic languages are: Ge'ez, Tigre, Tigrinya, Amharic, Argobba, Gafat, Harari, East Gurage, Western Gurage and North Gurage. Each of the Gurage groups include several dialects (Leslau 1969b): Chaha Ezha, Inor, Endegeň, Gyeta, Muher, Masqan (Western Gurage), Gogot, Soddo (aka Aymelell, Kəstanəňňa) (North Gurage) and Selti, Wolane, Zway (East Gurage). Ge'ez is no longer spoken, but remains the liturgical language of the Ethiopian Orthodox Church. Ge'ez, along with Tigre and Tigrinya form the North Ethio-Semitic group. Tigre is spoken in northern Eritrea, and Tigrinya in central Eritrea, and in the province of Tigray in northeastern Ethiopia. The rest of the languages form the South Ethio-Semitic branch. Amharic is spoken in the central and southern highlands of Ethiopia and in the capital city of Addis Ababa. Amharic has traditionally dominated Ethiopia as the language of the Emperors since at least the 14th century (Marcus 1994:19), and even following the downfall of the last Emperor Haile Selassie, continued to enjoy the role of official language of Ethiopia.[1] As a result it is spoken as a second language by a large portion of the population, even though the most widely spoken first language is probably the Cushitic language, Oromo. Argobba is spoken in a few scattered regions in Ankober north of Addis Ababa, but is a dying language. Gafat was spoken in Gojjam, but has died out within this century (see Leslau 1956). Harari (also known as Ge Sinan by its speakers or as Adare/Adarinya) is spoken in the walled city of Harar in eastern Ethiopia. Finally, the Gurage languages are spoken in a small region southwest of Addis Ababa, surrounded by Cushitic-speaking areas. The following map illustrates the major regions where the Ethio-Semitic languages are found:

[1] While Amharic is still the working language of Ethiopia, its dominant role since the fall of the government of Mengistu Haile Mariam in 1991 is less entrenched. The EPRDF government (Ethiopian People's Revolutionary Democratic Front) under Meles Zenawi has instituted a policy of regional autonomy based on ethnic and linguistic lines, allowing each region to decide on the language of local government and instruction in schools.


Tigre
ERITREA
Tigrinya
Amharic
Argobba
Addis Ababa
Harari
Gurage
ETHIOPIA

Our knowledge of Ethio-Semitic, especially the languages with relatively small numbers of speakers, such as Gurage, has been greatly advanced due to the pioneering work of Marcel Cohen (1931), Wolf Leslau (1936, 1941, 1979, 1992, 1995 to name just a few) and Robert Hetzron. Hetzron's (1977) classification of Ethio-Semitic is shown below:

(3)




Some of the detailed Gurage classifications may be questioned, as the dialect continuum is difficult to divide. For example, I classify Muher as a Western Gurage dialect, as does Leslau (1969). While some authors present a different classification of the South Ethio-Semitic languages (Ullendorf 1955), the arguments in Hetzron (1972, 1977) are detailed and persuasive, and the overall picture in (3) is generally accurate. Importantly, Hetzron notes the label 'Gurage' is a geographical term rather than a genetic linguistic term, East Gurage being more closely related to Harari.

I will concentrate my attention on Western Gurage (Chaha and Muher), as well as Harari, Tigrinya, Tigre and Amharic, leaving aside the dying or dead languages Argobba, Gafat and Ge'ez. I have also left aside East Gurage, as there is little detailed information available, apart from the work of Ernst-August Gutt, and I have not worked with any East Gurage consultants. I have also not dealt with Peripheral Western Gurage (my own work on Gyeta was too scant to be of substantial interest), but for those interested in recent descriptive and theoretical work on Inor, see Chamora (1996, 1997), Prunet (1996a,b) and Prunet and Chamora (1995). The data will be drawn both from primary sources, and from consultation with native speakers.

## 1.3 Phonological preliminaries

The general phonemic inventory of Ethio-Semitic is given below. The vowel system is a seven vowel system, although some languages, such as Western Gurage, have the open vowels [ɛ] and [ɔ], normally a combination of /a/ with [i/y] or [u/w] respectively. The vowel /ɨ/ is epenthetic in all languages except Harari, which employs [i], although [ɨ] may occur in closed syllables. The vowel [ä] is often transcribed as [ə] or [ʌ], although in Leslau's work [ə] represents the high central [ɨ]. This mid-central vowel is often fronted in North Ethio-Semitic:

(4) Vowels

| | | |
|---|---|---|
| i | ɨ | u |
| e | ä | o |
| (ɛ) | a | (ɔ) |

The combined consonant system is given below. The full set of guttural sounds (ʕ h ʔ ħ) are only found in the modern languages in Tigre and Tigrinya, although Harari has /ʔ h ħ/. The other languages may have a single glottal sound, either [h] (Amharic) or [ʔ] Peripheral Western Gurage. The velar fricative [x] is often realized as [h]. In Central Western Gurage

[l] is rare and tends to occur in borrowed words, as do [p] or [p'] in all languages, in words such as 'pappas', 'Petros' or 'Ethiopia' (from Greek). The [ň] is not found in certain languages, such as Chaha. The ejective series are found in all languages, with the exception of [s'] which is not found in Gurage, Harari, or Argobba.[2]

(5) Consonants

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| (p) | b | t | d | č | ǰ | k | g | ʕ | ʔ |
| f | β | s | z | š | ž | x | | ħ | h |
| | | | | | | $k^w$ | $g^w$ | | |
| | | | | | | $x^w$ | | | |
| (p') | | t' | | č' | | q | $q^w$ | | |
| | | s' | | | | | | | |
| m | | | n | ň | | | | | |
| | | | l | | | | | | |
| | | | r | | | | | | |
| w | | | | y | | | | | |

The palatoalveolars are found in all languages except Ge'ez. The labialized velars are found in all languages except Tigre, but Western Gurage also has a series of labialized labials ($p^w$, $b^w$, $f^w$, $m^w$ - and $ʔ^w$ in Peripheral Western Gurage; Gafat has $b^w$), as well as palatalized velars ($k^y$, $g^y$, $x^y$). Prunet and Petros (1996) argue that all of these secondarily articulated consonants are derived in Western Gurage.

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[2] Transcription follows the North American-IPA system with the following Ethiocentricities: ä = mid-central vowel (ə). q = velar ejective (k').

### 1.3.1 Syllable structure

The two main syllable types are CV and CVC in Ethio-Semitic. In word-initial position, onsetless syllables are permitted, but vowel hiatus is strictly excluded, being resolved by vowel fusion, or by epenthetic glides or glottal consonants. In word-final position in some languages (such as Gurage), CVCC syllables are permitted. Unlike Arabic, however, there are restrictions on the sonority sequence of consonants allowed to occupy these two final positions (see Chapter 4). In Tigrinya, Gafat, Harari and Tigre CVCC syllables are not attested, although Raz (1980:10-11) states that in Tigre, the actualization of the epenthetic vowel [ɨ] is often weak enough to give the impression of consonant clusters, particularly with the flap [r]: [kars] 'inside'.

### 1.3.2 Stress

The stress system of Ethio-Semitic has not been investigated in any detail. Most phonological descriptions state that stress is non-salient or that it follows intonational phrasing. More specific descriptions are as follows. Dillmann (1907:110) states that Ge'ez is quantity-sensitive, with long vowels and closed syllables attracting stress. Final short vowels or closed syllables do not bear stress, and in a sequence of two long vowels, the penultimate one will attract stress. However, he states that while stress appears to favour the penultimate, this is far from a stead-fast rule. Bergsträsser (1928) concurs, but also declares that stress is dependent on sonority. Raz (1983:7) states that 'stress is non-distinctive and shifts easily from one syllable to another' in Tigre, but that there appears to be a 'stress-timed' intonational rhythm. My own recordings of Tigrinya suggest that final syllables carry higher pitch, but there is no consistent stress pattern. Leslau (1995:44) says that Amharic has an almost even distribution of stress on each syllable, but that the final syllable is not stressed. Other conditioning factors are morpheme boundaries and gemination. Bergstässer (1928) declares that stress is dependent on sonority in Amharic, and in disagreement with Leslau, picks the first syllable as the favoured head. Hetzron (1970) discusses Inor stress and vowel length, and declares that closed final syllables or final -i and -e are stressed, otherwise the penult is stressed. In Chaha, it seems as if the penultimate syllable is favoured. In conclusion, Ethio-Semitic stress awaits a more thorough investigation.

## 1.4 The structure of the Ethio-Semitic verb

Most of the work in this dissertation and indeed the large majority of research on Ethio-Semitic concentrates on the verb. Nominal morphology is fairly limited in the South Ethio-Semitic languages, although richer in the North Ethio-Semitic languages (see Tewolde 1994 on Tigrinya). The North Ethio-Semitic languages boast broken plurals, for which see Ségéral (1995) on Ge'ez, Angoujard & Denais (1989) on Tigrinya and Palmer (1962) on Tigre.

Ethio-Semitic languages have subject-object-verb word order, except for Ge'ez, and to a limited extent Tigre, which are primarily verb-subject-object. The verb consists of a basic stem, comprising the root and aspectual vowels. Subject affixes are suffixal in the perfective, but a combination of prefixes and suffixes in the non-perfective (imperfective or jussive). Object markers are suffixed following the subject markers and show case distinctions (accusative, malfactive, benefactive). In the Gurage languages, tense markers (or main verb markers - Hetzron 1977) are found in the final position of the verb stem following object suffixes. Negative markers are prefixed, and derivational affixes such as passive, reciprocal or causative are prefixed directly to the verb stem between the subject markers and the stem. This gives the overall structure as follows:

(6) Neg-- Subj-- Caus-Pass/Recip-- Verb Stem --Subj --Obj --Tense

In addition, there may be particles, auxiliaries and complementizers added to the ends of the basic stem.

The verb in Semitic, as is well-known, is constructed around a consonantal root normally consisting of three or four consonants. Interdigitated between the consonants are vowels generally representing the aspect or tense of the verb. An example from Amharic is shown below for the root √sbr 'break'. Subject affixes and auxiliaries are separated from the main stem by hyphens, and verbs are always given in the 3ms unless otherwise indicated. The vowel [ɨ] is epenthetic:[3]

(7)

| | | |
|---|---|---|
| a. | **säbbär**-ä | he broke |
| b. | yɨ-**säbr**-al | he breaks, he will break |
| c. | **sɨbär** | break! |

In Ethio-Semitic languages, verbs are divided into lexical classes, labelled as 'Types' (Cohen 1931). There are four basic types of surface triliterals: A, B, C, and D. Types refer to the different patterns in which the consonants and vowels of the verb stem are arranged, i.e. a vowel between the first two consonants, gemination of the penultimate consonant. An illustration of Types A, B and C is given from Ezha (Western Gurage). The two forms of the Type A jussive in Gurage reflect a (rough) transitive/intransitive distinction also found in Ge'ez:

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[3] Leslau (1995) considers some instances of [ɨ] as non-epenthetic in Amharic, and Prunet (1996b) proposes that not all [ɨ] are equal phonologically: some are truly epenthetic whereas others represent the interpretation of templatic positions. The epenthetic vowel is [i] in Harari, sometimes realized as [ɨ] in closed syllables.

(8)

| | Perfective | Imperfective | Jussive | |
|---|---|---|---|---|
| A | säbbär-ä | yɨ-säbɨr | yä-sbɨr | 'break' |
| | bäddär-ä | yɨ-bädɨr | yä-bdär | 'precede' |
| B | šäkkät-ä | yɨ-šäkkɨt | yä-säkkɨt | 'repair' |
| C | bannär-ä | yɨ-bannɨr | yä-barɨr | 'demolish' |

I will discuss each of these Types in more detail. For illustration, I will be using verbs which have only 'sound' consonants, ie. do not contain glides. In many of the South Ethio-Semitic languages, particularly Gurage, glides are realized as vowels or as palatalization or labialization of other root consonants. As a result these 'weak' roots tend to have only two phonetic consonants. For arguments that weak roots have the normal three or four consonants underlyingly, see Rose (1992), Petros (1993), Prunet (1996a), Chamora (1997).

### 1.4.1 Type A

Type A is the basic triliteral type and is characterized by the presence of gemination of the penultimate consonant, and a vowel [ä] between the first two consonants in imperfective and between the last two in the jussive (Western Gurage maintains a Proto-Ethio-Semitic distinction between intransitive (CCäC) and transitive (CCC) jussives). In the North Ethio-Semitic languages, Type A verbs have no penultimate gemination in the perfective, but geminate in the imperfective unless there are subject suffixes, as shown by Tigrinya and Tigre:

(9)

| | Perfective | Imperfective | Jussive | |
|---|---|---|---|---|
| Tigrinya | säbär-ä | yɨ-säbbɨr | yɨ-sbär | 'break' |
| | | yɨ-säbr-u (3mp) | | |
| Tigre | säbr-ä | lɨ-säbbɨr | lɨ-sbär | |
| | | lɨ-säbr-o (3mp) | | |

In contrast, in the South Ethio-Semitic languages, Type A verbs have gemination in the perfective but lack it in the imperfective, as shown by Amharic and Muher (Western Gurage):

(10)

| | Perfective | Imperfective | Jussive | |
|---|---|---|---|---|
| Amharic | säbbär-ä | yɨ-säbr-al | yɨ-sbär | 'break' |
| Muher | säbbär-ä | yɨ-säbr-u | yä-sbɨr | |

Some South Ethio-Semitic languages have no gemination in the verb (although gemination does occur in the language). This is the case of Harari and partly true in East Gurage, which shows 'random' gemination (Hetzron 1972:44, Leslau 1951):

(11)

| | Perfective | Imperfective | Jussive |
|---|---|---|---|
| Harari | säbär-ä | yɨ-säbr-(i) | yä-sbär |

In some Western Gurage dialects (Chaha, Inor, Gyeta, Gumer), geminates were devoiced and then simplified, leaving stem alternations where related dialects have geminates (see Leslau 1948, Hetzron 1977, McCarthy 1986b, Petros 1993, in preparation, Rose 1992). Endegeñ has inconsistent gemination, but the other Gurage dialects (Soddo, Goggot, Muher, Masqan and Ezha) maintain gemination. Thus, Type A is mainly recognized through the position and type of the vowels and by gemination if the language allows it.

### 1.4.2. Type B

In the North Ethio-Semitic languages, Type B has gemination of the penultimate consonant throughout the paradigm:

| (12) | | Perfective | Imperfective | Jussive | |
|---|---|---|---|---|---|
| | Tigrinya | bäddäl-ä | yɨ-bɨddɨl | yɨ-bäddɨl | 'hurt' |
| | Tigre | mäzzän-ä | lɨ-mäzzɨn | lɨ-mäzzɨn | 'weigh' |

In the South Ethio-Semitic languages, the situation is more complicated. In Harari and Gurage, there is often a front vowel, either [i] or [e] between the first two consonants of the root, and gemination of the penultimate root consonant in all forms if the language has gemination. In Ge'ez, an [e] appeared in the same position in the imperfective.

| (13) | | Perfective | Imperfective | Jussive | |
|---|---|---|---|---|---|
| | Harari | sedäq-ä | yi-sidq-(i) | yä-sedq-(i) | 'split' |
| | Chaha | mesär-ä | yi-mesɨr | yä-mäsɨr | 'resemble' |

In Western Gurage, Type B verbs are characterized by palatalization of the initial consonant if a coronal obstruent or a velar, otherwise palatalization of the penultimate consonant if velar.[4] If neither of these conditions are met, the front vowel appears in the non-geminating languages (see above in (13) for Chaha) (and also Endegeň), but no palatal element in the geminating languages:

[4] Inor has the front vowel with velars, too. Chamora (1997:100) maintains this is a $C^{y}e$ sequence.

(14)

| | | Perfective | Imperfective | Jussive | |
|---|---|---|---|---|---|
| | Muher | šäkkät-ä | yɨ-šäkkɨt | yä-säkkɨt | 'repair' |
| | | g$^{y}$äddäm-ä | yɨ-g$^{y}$äddɨm | yä-gäddɨm | 'sell on credit' |
| | | lägg$^{y}$äm-ä | yɨ-lägg$^{y}$ɨm | yä-läggɨm | 'mount a horse' |
| | | mätt'är-ä | yɨ-mätt'ɨr | yä-mätt'ɨr | 'choose' |

In Amharic, Type B verbs tend to have an initial palatalized coronal. Thus, in South Ethio-Semitic, Type B features gemination throughout, and a palatal element normally in the first syllable.

### 1.4.3 Type C

Type C in all the languages has a vowel [a] between the first two consonants. Gemination varies. In the South Ethio-Semitic languages, there is gemination in the perfective and imperfective, but in the North Ethio-Semitic languages there is no gemination (Argobba apparently has gemination in all forms - Hetzron 1972:28):

(15)

| | | Perfective | Imperfective | Jussive | |
|---|---|---|---|---|---|
| | Tigrinya | baräx-ä | yɨ-barɨx | yɨ-barɨx | 'bless' |
| | Tigre | katäb-ä | lɨ-katɨb | lɨ-katɨb | 'vaccinate' |
| | Harari | magäd-ä | yi-magd-(i) | yä-magd-(i) | 'burn' |
| | Amharic | galläb-ä | yɨ-gallɨb | yɨ-galb | 'gallop' |
| | Muher | dammät'-ä | yɨ-dammɨt' | yä damt' | 'card cotton' |
| | Ezha | bannär-ä | yɨ-bannɨr | yä-barɨr | 'demolish' |

### 1.4.4 Type D

Type D is relatively rare. It was noted by Leslau (1958) for Harari and Petros (1993) for Chaha. Type D is characterized by a labialized consonant in the initial position and a vowel [ä] between the first two consonants in the jussive in Chaha/Ezha. In Harari, the rounding is realized on adjacent vowels:

(16)

| | Perfective | Imperfective | Jussive | |
|---|---|---|---|---|
| Harari | borädä | yu-burdi | yä-bordi | 'arrive' |
| Ezha | $q^w$ännäsä | yɨ-$q^w$ännɨs | yä-$q^w$ärs | 'break off a piece' |

### 1.4.5. Quadriliterals

Roots consisting of four consonants are conjugated as follows. Once again, there is a difference in gemination between the North Ethio-Semitic languages and the South Ethio-Semitic geminating languages. In the South Ethio-Semitic, gemination occurs in the perfective and imperfective:

(17)

| | Perfective | Imperfective | Jussive | |
|---|---|---|---|---|
| Tigrinya | mäskärä | yɨ-mɨskɨr | yɨ-mäskɨr | 'testify' |
| Tigre | tärgäm-a | lɨ-tärgɨm | lɨ-tärgɨm | 'translate' |
| | | | | |
| Harari | misäkär-a | yi-msäkr-(i) | yä-msäkr-(i) | 'testify' |
| Amharic | dänäggät'ä | yɨ-dänäggɨt' | yɨ-dängɨt' | 'be scared' |
| Muher | mɨsäkkär-ä | yɨ-msäkkɨr | yä-mäskɨr | 'testify' |

### 1.4.6 Other stem changes

Addition of other prefixes such as the reflexive /t(ä)-/, causative /a-/ or negation /al-/ or /an-/ can cause changes within the verb stem, usually in the quality or position of other /ä/ vowels or gemination:

| (18) | | **Imperfective** | **Imperfective /t(ä)-/** | |
|---|---|---|---|---|
| | Harari | yi-gläbt'-(i) | yi-t-giläbät' | 'turn over' |
| | Ezha | yɨ-säbɨr | yɨ-t-säbbär | 'break' |
| | | **Affirmative** | **Negative** | |
| | Ezha | säbbär-ä | an-säbär-ä | 'break' |
| | | mɨsäkkär-ä | an-mäskär-ä | 'testify' |

There are other quadriradical verbs which result from the reduplication of biliteral roots. These usually take the same form as regular quadriliterals: *bɨsäbbäs-* 'be rotten' (Muher). There is also a form of internal reduplication, known as the 'frequentative' which copies the penultimate root consonant, ex. *säbbär-* --> *sɨbäbbär-*. These forms will be dealt with in chapter 3.

This completes the brief introduction into the main verb types and conjugation patterns of Ethio-Semitic. Many of these issues will be elaborated on in chapters 3 and 4.

## 1.5. Theoretical Background

This dissertation explores the issues of reduplication, epenthesis and mobile morphology within the general theoretical framework of Optimality Theory (Prince & Smolensky 1993, McCarthy & Prince 1993a, McCarthy & Prince 1995). It does not constitute an argument per se for Optimality Theory or for extending the applications or boundaries of the theory, but rather seeks to show how some recalcitrant problems as well as some new data can be more fruitfully and explanatorily analyzed within this framework than in previous accounts.

Optimality Theory (OT) places the emphasis on the well-formedness of output forms and the faithful relation between the input and the output. To this end, it is viewed as a non-derivational framework, since there are no intermediary derivational stages between the input and the output, although reference may be made to morphological structure to capture the notion of lexical levels (Orgun 1994, 1996b). OT is a constraint-based theory, and builds on other constraint-based models such as TCRS (Theory of Constraints and Repair Strategies) (Paradis 1988), Declarative Phonology (Scobbie 1991) and even government phonology (Kaye, Lowenstamm & Vergnaud 1990). It differs from these theories in two important respects: constraints may be violated and ranked (TCRS also allows constraints to be violated, but they are repaired during the course of the derivation), and candidates are evalutated in parallel.

The OT grammar consists of three components: GEN, EVAL and CON, a set of constraints. GEN contains those components of grammar which are universal primitives, such as feature theory or syllable structure, and it supplies an input form with a range of possible output candidates. The constraints are violable, assumed to be universal, and are ranked on a language-particular basis. EVAL assesses the candidates as to how well they satisfy the constraint system. Language differences lie in the way in which constraints are ranked. For a given input, that candidate which best satisfies the constraint system will be the correct output. Constraints are arranged in tableaus from left to right, with higher ranked constraints at the left. Candidates are listed on the side. For example, suppose a language requires binary syllabic feet, but in an odd syllable word, this constraint cannot be satisfied. There are two options: allow a syllable to be unincorporated into a foot, or allow a non-binary foot. Two constraints are involved:

(19)

| | |
|---|---|
| **Foot Binarity** | Feet are binary at the relevant level (syllable, mora) |
| **Parse Syllable** | Syllables are parsed by feet |

If Parse Syllable is ranked above Foot Binarity, a non-binary foot will result. If the ranking is reversed, a syllable will remain unfooted. In the following tableau, Parse Syllable is ranked above Foot Binarity. The input is in the upper left box, and possible candidates are listed in the column below. A violation of a constraint is indicated by an asterisk. Evaluation of the constraint system proceeds from left to right. In the first column, candidate (20a) violates Parse-Syllable but candidate (20b) does not. Therefore, candidate (20a) is eliminated from contention, indicated by the exclamation point, a 'fatal' violation. Since (20b) is declared the output candidate on the basis of the first constraint, the other constraint, Foot Binarity plays no role, even though candidate (20b) does violate it. Its irrelevance is indicated by shading:

(20)

| bakolit | Parse-Syllable | Foot Binarity |
|---|---|---|
| a. (báko)lit | *! | |
| ☞ b. (bako)(lít) | | |

Sometimes, the ranking between constraints may be indeterminate, which is indicated by a dotted line between them.

In the original manuscripts on OT, Prince & Smolensky (1993) proposed the notion of Containment, which required that all input material must be contained in output candidates. In other words, nothing was deleted, but it could be 'unparsed'. Recent developments have abandoned this idea in favour of the theory of Correspondence, which regulates the faithfulness of the output to the input. While previously, OT focused on the output, with little reference to the input, Correspondence Theory assesses the relationship of the input to the output, and also of a base to its reduplicant. Output-output correspondences are also proposed (Benua 1995). Correspondence is defined as follows (McCarthy & Prince 1995:262):

(21) **Correspondence**

Given two strings S1 and S2, correspondence is a relation $\Re$ from the elements of S1 to those of S2. Elements $\alpha \in$ S1 and $\beta \in$ S2 are referred to as correspondents of one another when $\alpha\Re\beta$

GEN supplies correspondence relations between S1 and S2 as a candidate-pair. Some typical correspondence constraints are listed below, with their basic effect listed in parentheses

(22)

| | |
|---|---|
| **MAX** | Every element of S1 has a correspondent in S2 (replaces PARSE)<br>(No deletion) |
| **DEP** | Every element of S2 has a correspondent in S1 (replaces FILL)<br>(No epenthesis) |

| | |
|---|---|
| **IDENT(F)** | Correspondent segments have identical values for the feature F<br>(No featural changes) |
| **LINEARITY** | S1 is consistent with the precedence structure of S2 and vice versa<br>(No metathesis, no fusion) |
| **INTEGRITY** | No element of S1 has multiple correspondents in S2<br>(No breaking) |
| **ANCHOR** | Any element at the designated periphery of S1 has a correspondent at the designated periphery of S2.<br>(Alignment of morphological and prosodic categories) |

Another major component of OT is Generalized Alignment (McCarthy & Prince 1993b), which aligns prosodic and morphological categories or two prosodic categories as follows:

(23) **Align-R (Foot, PWd)** The right edge of every foot is aligned with the right edge of some prosodic word.

This formulation captures the fact that feet gather at the right edge of a prosodic word, effectively mimicking the rule of right-to-left foot construction. Alignment of prosodic and morphological categories has been replaced in Correspondence theory with Anchor, which regulates input and output or output and output, rather than just output, as Alignment does.

## 1.6 Conclusion

This completes the summary of Ethio-Semitic languages and the theoretical framework in which analyses of the languages will be presented. The remainder of the dissertation is divided into three chapters, each dealing with a single main issue: mobile morphology, reduplication and epenthesis. I leave aside the complicated issue of templates, although there is some discussion in chapter 3.

# Chapter 2
# Mobile Morphology

## 2.1 Introduction

Within the Gurage languages, certain morphophonological processes of labialization and palatalization within verb stems have come to signify, either alone, or in combination with suffixation, morphological categories. Former suffixes such as /-i/ or /-u/ which originally triggered these processes have eroded, leaving the stem alternations to convey morphological information. A typical example is that of the 3rd masculine singular accusative light object marker in Chaha[1], which is the suffix /-n/ combined with labialization of a rightmost labial or velar stem consonant, as illustrated in (1):

(1) käfätä-m 'he opened' $\text{käf}^{w}$ätä-**n**-m 'he opened it'

In this chapter, I will document and analyze the different kinds of secondary articulation which convey morphological information in this manner. I will concentrate primarily on the 2nd person singular feminine non-perfective subject marker which is realized as palatalization or vowel fronting, and I will compare the Western Gurage patterns to parallel processes in Amharic and Harari, which maintain the original suffix, as well as to Soddo. Because these kinds of segmental alternations were analyzed in past literature as involving 'floating features' or floating segments (McCarthy 1983, Lieber 1987, 1988, Rose 1994a,b, Zoll 1994, 1996), they are often referred to as 'floating affixes'. However, I will

[1] Light object markers are those which appear with singular subject markers except the 2sf. Heavy object markers appear with plural forms, the impersonal and the 2sf. The terminology and the initial observation of this distinction are due to Polotsky (1938). See also Hetzron (1977) Petros (in preparation) and Rose (1995b, 1996c). In many cases, there is a clear relationship between the two types, i.e. Heavy 2ms [-kä] vs. Light 2ms [-xä], but the 3ms heavy object marker is /-i/. See section 2.4 for more details.

adopt the more theory-neutral term *'mobile morphology'.* The 'mobility' of these morphemes is manifested by their ability to appear in different positions within a stem depending on the quality of the stem segments. I will examine a number of different mobile morphemes, which have different manifestations across the languages, in some cases affecting vowels as well as consonants, and in some cases only anchoring on specific hosts, at the right edge of the stem. I will develop a unified account of these morphemes within Optimality Theory, based on ranked constraints pertaining to the segmental anchors to which the morphemes attach, as well as to more familiar locality constraints. These constraints interact with others to maintain not only the featural makeup of the underlying stem, but also the morphological unity the stem expresses. Subtle dialect differences and variation will be modeled by minimal constraint ranking differences.

This chapter is organized as follows. I will begin by examining the simple case of labialization in Chaha as shown in (1). In section 2.3. I will discuss the variant realizations of the 2nd person singular feminine subject suffix across the Ethio-Semitic languages. This section incorporates a discussion of many issues, such as dialect variation, definition of potential anchors based on markedness, preservation of vowel identity, consonant harmony and the issue of what constitutes a morphological expression. I will then examine cases such as the Impersonal verb form in Western Gurage, which displays both palatalization and labialization. Finally I conclude with a survey of potential mobile morphemes.

## 2.2 3rd masculine singular accusative object marker - Chaha

In Chaha, the standard Central Western Gurage dialect, the simplest featural morphology is seen with the 3rd masculine singular light accusative object marker, as illustrated in (1). The affix consists of a suffix /-n/ and labialization of a rightmost velar or labial stem consonant.[2] Coronal consonants are never labialized in the language. This affix is identical in perfective, imperfective and jussive forms for a given subject. Some illustrative imperfective examples are given in (2). In (2a,b), the labialization appears on the rightmost stem consonant. Labialization can migrate as far as the penultimate (2c) or antepenultimate (2d) root consonant. Finally in (2e), when no labial or velar consonant is found, labialization does not occur, and the suffix /-n/ alone expresses the object agreement.

| (2) | without object | with object | |
|---|---|---|---|
| a. | tɨ-kätɨf | tɨ-kätf$^{w}$-n | 'you chop (it)' |
| b. | tɨ-därg | tɨ-därg$^{w}$-n | 'you hit (it)' |
| c. | tɨ-käft | tɨ-käf$^{w}$t-n | 'you open (it)' |
| d. | tɨ-gädɨd | tɨ-g$^{w}$ädɨd-n | 'you pierce (it)' |
| e. | tɨ-sädɨd | tɨ-sädɨd-n | 'you chase (it)' |

This morpheme has been analyzed in past generative literature, beginning with McCarthy (1983), Rose (1992, 1994b), Archangeli & Pulleyblank (1994) and more recently within the Optimality Theory framework in Akinlabi (1996) and Zoll (1994, 1996). All of these analyses assume an underlying floating feature suffix, such as [+round], which associates from right to left or aligns with the right edge. In the autosegmental analysis, targets are defined as labials and velars. In the OT analyses, non-hosts are singled out by feature cooccurence constraints and an Alignment constraint aligns the feature with the 'right-edge of the stem', where we can take stem to indicate the verb stem with subject affixes which directly precedes the object marker (final tense markers which appear following the object marker are not considered). An example is illustrated in (3) from Akinlabi (1996) for the perfective form <u>näk$^{w}$äsän</u> 'he bit it'.[3] A constraint on the realization of the morphemic

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[2] While labialization usually affects a root consonant, if a subject suffix intervenes, its consonant may be labialized: ex. /käfät -xä -$^{W}$...n -m/ --> [käfätx$^{W}$änɨm] 'you (ms.) opened it' and not *[käf$^{W}$ätxänɨm].
[3] Akinlabi gives the stem with no final tense suffix /-m/.

feature is also proposed: Parse [+round]. This constraint will incur a violation if the [+round] feature is not present in the output. Since Align refers to the output only, it is assumed not to be violated (i.e. non-applicable) if the feature is not realized at all in the ouput:

(3)

| näkäs-ä-[+round]n | *COR/LAB | Parse [+round] | Align [+round] |
|---|---|---|---|
| a. näkäs$^w$än | *! | | |
| b. näkäsän | | *! | |
| ☞ c. näk$^w$äsän | | | |

Akinlabi (1996) rules out association of [+round] to coronals by a feature-cooccurence constraint (*COR/LAB). Since there is an absolute prohibition on labialized coronals within all of Ethio-Semitic, it is reasonable to assume that this is an undominated constraint.

A problem crops up immediately with respect to round vowels. None of the previous treatments of this suffix consider this possibility, but since round vowels do occur in Chaha, and other mobile affixes do affect vowels (see section 2.3.4), the possibility that the [+round] feature might associate to a vowel must be considered. Since only labialized coronals are ruled out by the *COR/LAB constraint in the analysis in Akinlabi (1996), this analysis predicts that the [+round] feature might show up on vowels, particularly if the stem ends in a vowel. In fact, the 3ms perfective form that Akinlabi chooses to illustrate the process does end in a vowel, the 3ms subject marker /-ä/. Unless some provision is introduced to deal with vowels, the analysis predicts that the stem vowel should be rounded as it is the best aligned position:

(4)

| näzäz-ä- [+round] n | *COR/LAB | Parse [+round] | Align [+round] |
|---|---|---|---|
| a. näzäz$^{w}$-ä-n | *! | | * |
| b. näzäz-ä-n | | *! | |
| ☞ *c. näzäz-o-n | | | |

Even excluding the final subject marker, verb stems which end in vowels behave the same way as those that are consonant-final. If no consonantal anchor is found, the [+round] feature is not realized (5c,d):

(5)

| | without object | with object | |
|---|---|---|---|
| a. | tɨ-βäq$^{y}$ɨr | tɨ-wäq$^{y}$ɨr-n | 'you brew (it)' |
| b. | tɨ-käβa | tɨ-käwa-n | 'you bend (it)' |
| c. | tɨ-räsa | tɨ-räsa-n | 'you pick (it) up' |
| d. | tɨ-dät' | tɨ-dät'-n | 'you trample on (it)' |

There are two ways of solving this problem. First, a constraint could be invoked against round vowels, or against altering the underlying features of the vowel with respect to the feature [+round]. The other option would be to make the alignment constraint specify the anchors as consonants.

The first method of solving the round vowel problem is shown in (6). A constraint prohibiting round vowels is introduced alongside the *COR/LAB constraint, and by ranking it above Parse [+round] and Align [+round], the correct candidate is chosen:

(6)

| näzäz-ä-[+round] n | *COR/LAB | No Round V | Parse [+round] | Align [+round] |
|---|---|---|---|---|
| a. näzäz$^{w}$-ä-n | *! | | | * |
| b. näzäz-o-n | | *! | | |
| ☞ c. näzäz-ä-n | | | * | |

A potential problem with a constraint against round vowels is that central vowels are commonly rounded in the environment of labialized consonants. To account for this fact, a constraint requiring that an adjacent consonant and vowel share the [+round] feature would have to be ranked over the general constraint against round vowels. Despite this potential problem, there is some motivation for ruling out non-central vowels. Round vowels and front vowels constitute the peripheral vowels in the vowel space as represented in the traditional vowel triangle, and I will argue in §2.3.4.6.1 that there is a preference for central vowels over peripheral vowels in Ethio-Semitic, which I capture with a general constraint No Peripheral Vowels. This constraint can subsume the No Round Vowels constraint. Although there are no other cases of round vowels being avoided, front vowels are often avoided in other cases of mobile morphology. I will further show in 2.3.4.3 that peripheral vowels are produced only when there is no other means to express the morpheme in question. In the case of the 3ms object marker discussed above, the suffix /-n/ expresses sufficiently the 3ms object, so there is no need to create a rounded vowel to express the morphosyntactic features of a 3ms object.

The second option to deal with round vowels would be to have the alignment constraint refer specifically to consonant anchors as in the following formulation:

(7) **Align-R ([+round] Right, Stem consonants, Right)**

'Align the right edge of the [+round] affix with the right edge of the string of stem consonants'

One criticism of this approach might be that 'stem consonants' do not constitute a legitimate morphological category, but rather part of a category. Unfortunately, with this particular affix, we cannot make reference to the 'root' as a morphological category since the [+round] affix does show up on non-root consonants. Even if this formulation were accepted, this kind of constraint faces another hurdle: there is no formal method of assessing how many violations of Align would be incurred by a candidate that had the [+round] feature on a vowel. For example, consider the following candidates, where the [+round] is realized as a full vowel [u] (8b), lodged onto a vowel (8c) or is not realized (8d):

(8)

| näzäz-ä-[+round] n | *COR/LAB | Align R Stem Cons. | Parse [+round] |
|---|---|---|---|
| a. näzäz$^w$-ä-n | *! | | |
| b. näzäz-ä-un | | *! | |
| c. näzäz-o-n | | *! | |
| ☞ d. näzäz-ä-n | | | * |

The correct candidate is selected, but only if one interprets Align as vacuously satisfied if there is no [+round] feature to refer to. This is the general assumption in Akinlabi (1996) and Zoll (1994), but Align merely requires that designated edges coincide; there is nothing in the formal statement of Align which determines what if any violations occur when one of the designated categories is missing in the output. This is a problem specific to Align and not provided for by the general theory of EVAL, which only compares candidates for violations. Furthermore, as Zoll (1996:102) correctly points out, there is nothing in the definition of Align which assumes that violations have to be multiple and gradient. It is stipulated in McCarthy & Prince (1993b) that constraints on representation can be violated minimally. If Align were interpreted categorically, i.e. are the categories aligned, yes or no, then there would be no way of deciding between candidates (8c-d) unless another constraint were invoked, such as No Round Vowels. This problem with a gradient interpretation of Align will be explored further in section 2.3. In conclusion, the postulation of a constraint on round or peripheral vowels seems the optimal way to solve the problem of preventing the 3ms object marker from associating to vowels.

The analysis presented here differs from that of Zoll (1994, 1996) and Akinlabi (1996) in that I consider the possibility of the feature [+round] affecting stem vowels as well as consonants. The issue of the round vowels did not arise in the autosegmental approach of McCarthy (1983), where vowels and consonants were arrayed on separate tiers, and the [+round] feature associated to the consonantal tier only. However, I show in Rose (1994a) that tier separation of this kind cannot be maintained at the point in the derivation where mobile morphology takes place. In chapter 3, I will reject tier separation as well as long-distance geminates entirely. McCarthy specified labials and velars as hosts for the [+round] suffix, so in some sense, his analysis resembles the second proposal where a set of consonantal hosts are specified. In the following sections, I will be assuming that 'floating affixes' like the 3ms object marker are not features but full segments. The motivation for such a position is not obvious for the 3ms object marker, so I reserve discussion until §2.6 when the palatalization cases have been examined in detail.

## 2.3. 2nd singular non-perfective feminine subject marker

I now turn to the 2nd person singular feminine non-perfective subject marker. This marker is particularly interesting because it has a range of surface realizations in all the Ethio-Semitic languages. In the Northern languages, Tigre and Tigrinya, the non-perfective 2nd singular feminine subject marker is a simple suffix /-i/, as illustrated below for Tigrinya:[4]

(9) **Tigrinya**

| | 2sgmasc. | 2sgfem. | |
|---|---|---|---|
| a. | tɨ-säbbɨr | tɨ-säbr-i | 'you break' |
| b. | tɨ-bɨddɨl | tɨ-bɨddɨl-i | 'you hurt' |

In Harari and Amharic, the /-i/ triggers palatalization of a final alveolar consonant. In Harari, non-final alveolars may also be palatalized, and in some cases, two consonants in a stem will be affected. In the Gurage languages, the former /*-i/ suffix has disappeared, but leaves in its wake palatalization and/or vowel fronting of stem segments. In Soddo, a Northern Gurage language, there is both palatalization and vowel fronting. In the Western Gurage dialects such as Chaha and Muher, palatalization occurs preferentially, with vowel-fronting as a last resort option. I first examine the relatively straightfoward case of Amharic, which forms the intermediary stage between the North Ethio-Semitic languages like Tigrinya, and Harari and Gurage.

[4] Gemination does not occur in Type A verbs followed by all subject suffixes in the Tigrinya verb paradigm, not just the 2sf. ex. tɨ-säbr-u 'you (pl.masc.) break'. See Berhane (1991) and Rose (1995a) for a possible explanation.

### 2.3.1 Amharic

In Amharic, the 2sf suffix is also /-i/, and following coronal-final stems, the /-i/ palatalizes the immediately preceding alveolar consonant, excluding /r/ (10c-f)[5]. The examples in (10) are in the imperative, from Leslau (1995:14):

| (10) | **Amharic** | 2sg masc | 2sg fem | |
|---|---|---|---|---|
| | a. | dɨgäm | dɨgäm**i** 'repeat!' | |
| | b. | sɨdäb | sɨdäb**i** | 'curse!' |
| | c. | lɨbäs | lɨbä**š**(i) 'get dressed!' | |
| | d. | wɨsäd | wɨsä**ǰ**(i) | 'take!' |
| | e. | kifäl | kifä**y**(i) | 'pay!' |
| | f. | lämmɨn | lämmɨ**ňň**(i) | 'beg!' |

The /-i/ is often dropped altogether following the palatalized forms, so the feminine of lɨbäs may be either lɨbä**ši** or lɨbä**š**. This is particularly true in the Wollo dialect of Amharic (Leslau 1995:14). There are three other cases of final palatalization of this type in Amharic, in which the triggering vowel or glide is normally absorbed: the gerund (/käfɨtt-e/ --> [käfɨčče] 'having opened'), the active participle (/aras-i/ --> [araš] 'one who ploughs') and the instrumental (/mäkfät-(i)ya/ --> [mäkfäča] 'key'). I will assume that these can be analyzed in the same way as the 2sf subject marker.

A conventional analysis of the 2sf facts would posit a morphophonological rule of palatalization triggered by the 2sf suffix /-i/. The representation of palatalization has been a much debated topic in recent years, particularly in the feature geometry literature (Lahiri & Evers 1991, Hume 1992) but whether the palatalization feature is represented with a feature

[5] The same is true in Harari, but since Harari involves additional complications such as long-distance palatalization and double palatalization, I will analyze it in section 2.3.2.

[front], V-Place Coronal or [+high], all proposals assume a rule spreading the feature responsible for palatalization from the vowel to the consonant.[6]

Within Optimality Theory, one analysis holds that local spreading rules of this type should be replaced with Linkage constraints (Itô & Mester 1995, McCarthy & Prince 1995) which simply require that a consonant be palatal before a front vowel, where it is understood that CV linkage disfavours non-palatal consonants before front vowels:

(11) **CV LINKAGE** Consonants are palatal before front vowels

Palatalization of consonants other than alveolars (with the exception of /r/) would be ruled out by undominated feature cooccurence constraints (No palatalized velars, No palatalized labials). This kind of constraint does not explain the complementary distribution of palatal consonants - that they do not appear before back vowels, and being simply a statement of the output, it has little to say about locality or intervening segments. It will prove problematic for Harari where palatalization may take place at a distance. In order to capture the Amharic facts, I propose instead an Anchor constraint, where the second string is defined as the root or elements which correspond to the root (i.e. reduplicants):[7]

---

[6] Another possibility is available in Gestural phonology (Browman & Goldstein 1989) where gestures are not spread but extended to overlap other gestures. The Tongue Blade would extend from the vowel over the gesture for the consonant. This analysis faces problems in accounting for Harari, where 'frontable' vowels intervene between the palatalized consonant and the vocalic suffix.

[7] In Gurage, there are root segments which are vocalic in nature and realized as [a]. Prunet (1996b) argues that these segments are underlyingly pharyngeal consonants which undergo absolute neutralization to appear as [a]. I will treat them as vocalic root segments. These same [a] root segments are found in Amharic, so strictly speaking, the root is not purely consonantal in these languages. In this case, one could modify the constraint in (12) to refer to root consonants only. But, with a word-final /-i/ suffix, the final [a] is dropped in any case and so would not appear in the output as a potential anchor for palatalization: sɨma 'listen!' (2ms) vs. sɨmi 'listen!' (2sf) or gɨza 'buy' (2sm) vs. gɨži 'buy' (2sf).

(12) **Anchor (2sf R - Root R)**

Any input 2sf -i has a correspondent at the right edge of the output root

I assume that the 'root' in the output may be the input consonants as well as any reduplicative correspondents of the input root consonants. As mentioned in chapter 1, Anchor constraints are the Correspondence version of Alignment constraints. Since the root consonants constitute a morpheme in Semitic, reference can be made to them as a coherent morphological category despite their discontinous realization. Anchor constraints closely resemble the association constraints of autosegmental phonology when dealing with autonomous elements which map onto segments. However, the applicability of Anchor is wider - it can refer to grouping of syllables into feet towards one edge, infixation, and in the way I will be using it, to refer to the realization of certain characteristics of one sound on another sound, essentially putting the two sounds in correspondence. Like Align, the formulation of Anchor provides no means of assessing violations as minimally gradient or categorical. Anchor requires a specific element at the designated periphery of String 1 to have a correspondent at the designated periphery of String 2. Unlike Align, Anchor is clearly violated if there is <u>no</u> correspondent in the output (McCarthy & Prince (1995:297), but the constraint has nothing to say about whether there are minimal violations if there <u>is</u> a correspondent, but the corresponding element does not coincide with the edge. The formulation of the constraint implies a strict binary interpretation, and it should return a single categorical violation. In the same manner that we determine whether an input element has an output correspondent or not, we can assess whether the first string has a correspondent in the second string, yes or no. Before exploring the issue of Alignment and Anchor further, I will show how the categorical interpretation of Anchor produces a successful analysis for Amharic.

Two other constraints will be necessary to capture not just the basic case of palatalization, but also the variant pronunciations, where the triggering vowel is deleted. In order to distinguish the two pronunciations in Amharic, with or without the final /-i/, there must be a constraint Linearity (McCarthy & Prince 1995) which militates against complete fusion of the consonant and vowel:

(13) **Linearity** $S_1$ (input) reflects the precedence structure of $S_2$ (output) and vice versa

While other proposed constraints on fusion such a Multiple Correspondence (Lamontagne & Rice 1995) or Uniformity could be used here, they would not distinguish between the two Amharic forms with respect to the presence of /i/, i.e. l<u>ɨ</u>bäš vs. l<u>ɨ</u>bäši. With the simple case /s-i/ --> [ši], the /š/ has two correspondents, the [i] and the [s], since it contains features of both. Similarly, with the fusion /s-i/ --> [š], there is the same correspondence. But, only the fusion violates Linearity since the separate sequence of the input is not maintained in the output. On the other hand, maintaining both the /-i/ and the palatalized consonant violates Integrity:

(14) **Integrity** No element of $S_1$ (input) has multiple correspondents in $S_2$ (output)

In the output string [ši], both elements correspond to the input vowel /-i/, thus violating Integrity. By ranking Integrity and Linearity with respect to the Anchor-R constraint, the two pronunciations of Amharic can be accounted for. Work on variation in Optimality Theory has converged on the analysis that not crucially ranking relevant constraints will produce two possible outputs or variant pronunciations (Reynolds 1995, Reynolds & Nagy 1994). If Linearity and Integrity are unranked with respect to each other, the two variant pronunciations are produced. For Amharic, Anchor-R is ranked higher than either Linearity or Integrity. This is shown in (15):

(15) **Amharic**

| lbäs - i | Anchor-R | Linearity | Integrity |
|---|---|---|---|
| a. lɨbäsi | *! | | |
| ☞ b. lɨbäši | | | * |
| ☞ c. lɨbäš | | * | |

If one pronunciation begins to win out over another, a crucial ranking becomes established. For example, in Wollo Amharic, the suffix is routinely absent when there is palatalization, so candidate (15c) must be favoured. This would entail having Integrity outrank Linearity.

The constraint Linearity serves another function, to distinguish cases where the suffix may not palatalize the final consonant when it is not coronal (assuming high-ranked constraints against palatalized labials and dorsals and /r/). Each of the following outputs would violate Anchor-R equally since none of them have correspondence between the final /-i/ and the final root consonant /r/. Other constraints must select the winning candidate. Note that the [e] represents the fusion of /i/ and /ä/:

(16) /sɨkär-i/ --> a. sɨker
b. sɨkeri
c. šɨkäri
d. sɨkäri

The first candidate (16a) violates Linearity as the order of the /r/ and /i/ is reversed in the output. The second candidate violates Integrity as the 2sf /-i/ corresponds to two segments in the output. The third candidate also violates Integrity, whereas the fourth candidate violates neither Integrity nor Linearity. Since all outputs violate Anchor-R, the extra violations of Linearity and Integrity in the first three candidates eliminate them in favour of the candidate with no palatalization or vowel fronting:

(17)

| sɨkär - i | Anchor-R | Linearity | Integrity |
|---|---|---|---|
| a. siker | * | *! | |
| b. sɨkeri | * | | *! |
| c. šɨkeri | * | | *! |
| ☞ d. sɨkäri | * | | |

A constraint requiring the suffix to appear in the output ($MAX_{I\text{-}O}$) must also be considered, since a form in which the suffix is not present in the output would still incur a violation of Anchor-R:

(18)

| sɨkär - i | $MAX_{I\text{-}O}$ | Anchor-R |
|---|---|---|
| a. sɨkär | *! | |
| ☞ b. sɨkäri | | |

I will now compare the Anchor-R constraint with a more familiar Alignment theoretic account of mobile affixes (Zoll 1994b, Akinlabi 1996). The first difference is that Alignment in those accounts may be gradient, but Anchor in my treatment is categorical. Either there is a correspondent at the right edge in the output or there isn't. This is not the interpretation taken in McCarthy et al (1996) who assume the same kind of gradient interpretation of Anchor as assumed previously for Alignment. Zoll (1996) examines the formulation of Alignment in considerable detail and reaches the same conclusion re gradiency : 'ALIGN as stated fails to return the multiple violations required to distinguish between competing candidates, all of which violate ALIGN (p. 104).' The problem lies in the definition of Align which merely requires that edges are aligned, but has no formal mechanism for computing degrees of violation. Zoll goes on to show how Anchor suffers from the same problem. Her solution is to reformulate Align as another constraint NO INTERVENING, originally proposed by Ellison (1995), which returns a violation for each segment occurring between the edge and the element under consideration. Thus, with No Intervening used to capture gradient violations, I maintain the constraint Anchor, interpreted categorically.[8]

The second difference between gradient Alignment and Anchor is that Alignment may be satisfied if the input affix is not found in the output, but Anchor will be violated. This is due to the fact that Alignment assesses outputs only, whereas Anchor assesses the relationship between input and output. If the affix is not in the output, Alignment cannot be evaluated and the candidate therefore vacuously satisfies Alignment. This conception runs into problems when dealing with languages like Amharic, in particular the case where the /-i/ is not realized as an overt suffix. In Zoll (1994b) it was proposed that Align outranks Parse if the feature (or segment) is only realized on the word-final position, as she claims is true for Chaha 2sf[9] and would be true of the Amharic palatalization. If the suffix cannot appear as palatalization on the final consonant due to a feature cooccurrence constraint, then the ranking of Align over Parse predicts that the suffix is not realized. This is illustrated for Amharic in (19):

---

[8] Zoll (1996) replaces Anchor/Align with a constraint Coincide (p. 147) which is less restrictive than Align in that specification of the edges of each consitituent is not required.

[9] This is not the case for Chaha 2sf, as I will show in section 2.3.4, but her conclusions are based on erroneous descriptions from secondary sources.

(19) **Amharic**

| sɨkär - i | Align R | Parse -i |
|---|---|---|
| a. šɨkär | *!* | |
| ☞ b. *sɨkär | | * |

But, restriction of palatalization to word-final position is not correlated with failure of the affix to appear in Amharic. If the final consonant cannot be palatalized, the affix appears as a full segmental suffix. In Chaha, if the final consonant cannot be palatalized, the morpheme is realized elsewhere in the stem. Ranking Align over Parse (or MAX) in Amharic would incorrectly select a candidate with no expression of the morpheme. Disregarding Linearity and Integrity, the reverse ranking would predict initial palatalization, which is not a possible output either. If Alignment were instead seen as a Correspondence style constraint requiring the feature or segment in the Input to be aligned in the Output, then if the segment failed to appear in the output, the input-output correspondence would be violated. For example, /sɨkäri/ --> *[sɨkär] would not violate Align, but would necessarily violate Anchor, since the input category /-i/ has no correspondent in the output. If Align were not interpreted as gradient, both candidates in (19) would violate it and then other constraints such as Parse would decide between the candidates. I showed in (18) that $MAX_{I-O}$ is high-ranking enough to force the affix to be realized somewhere, such as in the form of an overt suffix.

There are indeed cases like those that Zoll (1994b) describes - final position or nothing. One such case is the impersonal verb form in Western Gurage and another is the Inor 2nd and 3rd person plural forms, which I will discuss in section 2.4. I will show however, that the morphological category itself is still realized elsewhere, which I claim is a prerequisite for Parse ($MAX_{I-O}$) violations to be tolerated in a winning candidate. In conclusion, the definition of the Anchor constraint leads directly to a categorical interpretation which has clear benefits over a gradient interpretation. In addition, Anchor will be violated if the suffix is not present in the output.

I will now compare the analysis I am advocating to a standard autosegmental approach to the kinds of alternations where there is no overt suffix, such as the object labialization (§2.1) or the Amharic case with no overt suffix. The main ingredients of my analysis are that the affix is a full segment, not a feature or a latent segment. A latent segment lacks a root node (Zoll 1994a,b, 1996) or some other means of association, such as an X-slot. The realization of the full segment [i] within the stem is driven by requirements on palatalization combined with constraints on multiple correspondence. A typical autosegmental analysis would instead posit a floating feature representing the morphological category as part of the input (McCarthy 1983, Lieber 1988). But, the optionality of the two types of Amharic pronunciation, with or without the final vowel, is not directly captured under an autosegmental analysis. In the one case, the input is a full suffix /-i/ and in the other only a feature [front]. The rules or constraints change from a spreading constraint for the full suffix, to an association constraint for the feature. The feature [front] must be left behind when the /-i/ is deleted to explain the residue of palatalization. Thus, for the same morpheme, there are two separate representations and two separate accompanying association conventions. On the one hand there is a full segment which requires a spreading rule (20), and on the other hand, a floating feature which requires an association rule (21).

```
(20)   /lɨbäs-i/          -->        [lɨbäši]
             |                            \ |
          [front]                      [front]

                    Spread [front]
```

Linking of a floating feature [front] is shown in (21):

(21) /lɨbäs-[front]/ ---> [lɨbäš]
                                    |
                               [front]

Associate [front]

Another possibility would be to invoke a latent segment instead of a floating feature. Under Zoll's (1994a,b) analysis, a latent segment is representationally different than a full segment because it lacks a root node. While Zoll argues that a latent segment and a floating feature are unified in that they lack a root node, a latent segment does differ in her theory in that it associates to an inserted root node rather than a segment already present in the input. In the Amharic case, if the suffix were latent, it should not have reason to palatalize the final consonant, unless by a separate rule or constraint. In conclusion, while all analyses must capture the requirement of palatalization (by rule or constraint), under my analysis presented above, all else is equal. The input remains the same, and the only difference between the two pronunciations in Amharic is with respect to whether the suffix vowel /-i/ has been fused with the final consonant or not, which occurs to minimize an Integrity violation. The constraints are the same, but with a minimal ranking difference.

### 2.3.2 Harari

I now turn to Harari, in which the 2sf subject suffix is also /-i/. Like Amharic, it is overtly realized as a suffix, but there are no alternate pronunciations. Harari differs from Amharic in allowing non-final consonants to be palatalized. My data are drawn from Leslau (1958) and my own work with Abdi Mohammed Idris. Representative examples of the final /-i/ suffix are shown in (22) with imperative forms:

| (22) | | 2sg masc | 2sg fem | |
|---|---|---|---|---|
| | a. | č'imäq | č'imäqi | 'squeeze, wring!' |
| | b. | birär | biräri | 'fly!' |

As in Amharic, final alveolars are palatalized, with the exception of /r/ (23a-e). The lateral /l/ is palatalized to [y], but no final /-i/ appears (presumably an OCP effect) (23d). It is clear that the /l/ is palatalized for three reasons. First, there is no apriori reason why *kifäli would not be acceptable. Secondly, when /l/ is palatalized, it should show up as a palatal lateral or some other approximant. Harari has no [λ], so [y] is the next available palatal approximant, and thirdly, medial [l] is palatalized to [y]: /diläg-i/ --> [diyägi] 'work!'.

| (23) | | 2sg masc | 2sg fem | |
|---|---|---|---|---|
| | a. | kifät | kifäči | 'open!' |
| | b. | zimäd | zimäji | 'drag!' |
| | c. | rigät' | rigäč'i | 'kick!' |
| | d. | kifäl | kifäy | 'pay!' |
| | e. | libäs | libäši | 'dress!' |

So far, Harari appears to resemble Amharic. But, if the final consonant is not a coronal, palatalization may affect coronals in C2 position (24a-b) or C1 (24c-f):

| (24) | | <u>2sg masc</u> | <u>2sg fem</u> | |
|---|---|---|---|---|
| | a. | kitäb | kičäbi | 'write!' |
| | b. | sidäb | siǰäbi | 'insult!' |
| | c. | sɨxär | šɨxäri | 'be drunk!' |
| | d. | t'iräg | č'irägi | 'sweep!' |
| | e. | diräq | ǰiräqi | 'be dry!' |
| | f. | sibär | šibäri | 'break!' |

If the final consonant is a sonorant, /l/ or /n/, palatalization also affects an obstruent in penultimate position. If both the final consonant and the penultimate consonant are obstruents, only the final one is palatalized (25e). Palatalization of the second root consonant with final coronal obstruents may occur optionally: <u>bit'äši</u> and <u>bič'äši</u>. Leslau also reports palatalization of the first consonant in addition to the final one, but Abdi Idris rejects this, i.e. <u>nikäši</u> but not *<u>ñikäši</u>, <u>sijäbi</u> but not *<u>šijäbi</u>. In addition, if the initial consonant is a coronal obstruent and the medial or final one a coronal sonorant, only the sonorant is palatalized (25f-g). I have no verb which has the structure of a medial [l] or [n] and a final coronal obstruent.

| (25) | | <u>2sg masc</u> | <u>2sg fem</u> | | |
|---|---|---|---|---|---|
| | a. | xidän | xiǰäñi | | 'cover!' |
| | b. | fit'än | fič'äñi | | 'hurry!' |
| | c. | gidäl | gijäyi | | 'kill!' |
| | d. | nidäl | nijäyi | | 'make a hole!' |
| | | | | | |
| | e. | bit'äs | bit'äši | *bič'äši | 'rip!' |
| | f. | diläg | diyägi | *jiyägi | 'work!' |
| | g. | a-dagn-i | a-dagñ-i | *a-jagñ-i | 'hit!' |

Finally, as opposed to Gurage, but similar to Amharic, only the final consonant is required to be palatalized in a sequence of identical consonants (double palatalization may occur optionally):

| (26) | | 2sg masc | 2sg fem | |
|---|---|---|---|---|
| | a. | kisäs | kisäši | 'take to court' |
| | b. | sidäd | sidäji | 'chase away' |
| | c. | abnin | abniňi | 'sprinkle!' |

If no palatalizable consonants occur in the root, the difference between masculine and feminine is expressed only by the /-i/ suffix. Note that coronal sonorants in initial position may not be palatalized (27a):

| (27) | | 2sg masc | 2sg fem | |
|---|---|---|---|---|
| | a. | nikaʔ | nikaʔi | 'touch!' |
| | b. | niqaħ | niqaħi | 'be awake!' |

The same kind of palatalization is seen in the imperfective form in (28). In Harari, as opposed to the other Ethio-Semitic languages, the epenthetic vowel is [i] and not [ɨ], although [ɨ] occurs in closed syllables.[10] In the case of final consonant clusters, the epenthetic vowel appears following the cluster, as in Tigrinya (see chapter 4). Thus the final [i] in the masculine form of the verbs in (28) is an epenthetic vowel, due to the CäCC shape of the stem in the imperfective. The difference between the two [i] is apparent in that the epenthetic vowel in the 2sg masc. forms does not trigger palatalization:

[10] Cerulli (1936) considers this feature to be due to Cushitic influence from Oromo or Sidamo.

(28)

| | 2sg masc | 2sg fem | |
|---|---|---|---|
| a. | tikäfti | tikäfči | 'you open' |
| b. | tisäbri | tišäbri | 'you break' |
| c. | tiqädmi | tiqäǰmi | 'you advance' |
| d. | tisägdi | tisägǰi | 'you prostrate' |

In Harari, there are obviously restrictions on which consonants may host palatalization: only the coronals, with the exception of /r/.[11]

Palatalization is not restricted to just the final coronal, as it is in Amharic. We must then ask whether it might be considered a case of consonant harmony, as it is long-distance and there are forms in which two coronals may be palatalized as in (25). It has been observed that consonant harmony affecting place is restricted to coronal (Shaw 1991), although other consonantal harmonies for other non-place features do exist, such as voice harmony between sibilants in Berber (Elmedlaoui 1992). Flemming (1995b) proposes that this constraint on place harmony derives from the non-interference of coronal consonants with vowel articulations. Vowels involve use of the tongue body or lips, but coronals involve the tongue blade, not utilized by vowels. Therefore, aligning the coronal articulation of the consonant across other vowels and consonants will have no noticable acoustic effect on intervening segments. The Harari 'long-distance' palatalization would thus be seen as extending the palatal gesture over other consonants. There are several arguments against applying this kind of analysis to Harari. First, coronal harmony which involves s/š alternations excludes stops (Chumash, Tahltan), but in Harari, stops are palatalized to affricates. Second, in typical coronal harmonies, the trigger is always another

[11] While Leslau (1958) lists the palatoalveolars as phonemes of the language, an examination of their distribution may reveal them all to be derived from morphophonological processes such as the one above. This is the conclusion reached by Prunet & Petros (1996) for Chaha and Inor.

consonant. In the Harari case, it is clearly a vowel, the same kind of vowel which causes velar palatalization and vowel fronting in related languages, i.e. affecting other kinds of intervening consonants and vowels. Third, and most damaging to a consonant harmony analysis, double palatalization applies to an obstruent and a sonorant but not to two obstruents, and reduplicative forms do not show double palatalization: kisäs --> kisäši and not kišäši. If this were consonant harmony, these reduplicative forms would be the prime sites for harmony to occur, since they involve two identical obstruents, and the s/š alternation is the most widely attested consonant harmony, found in Chumash, Tahltan (Shaw 1991) and Berber (Elmedlaoui 1992). However, the *optional* palatalization bears the hallmarks of consonant harmony, with the exception of the sibilant generalization. If optional palatalization were triggered not by the vowel but by the consonant required to be palatalized, then it would count as an instance of consonant harmony. This could be analyzed as a separate constraint aligning the palatal feature or gesture of the consonant to other obstruents in the word. In this section, however, I will focus on the obligatory palatalization.

Harari has a requirement that the /-i/ correspond with a root segment, where correspond is understood to mean that the /-i/ anchors to a segment. If no coronal obstruents are present, then a coronal sonorant is palatalized, except in initial position. If the rightmost coronal obstruent is not final, a coronal sonorant in final position will also be palatalized. While it seems intuitive to treat the Harari examples with a single right edge constraint and feature cooccurrence constraints on palatalized labials or velars and front vowels, this will not capture the subtle mechanisms of the palatalization, which targets obstruents preferentially. The different behaviour of coronal obstruents and sonorants will be captured by a separate markedness constraint, which I will introduce in (35). The correspondence of the suffix with the root consonants will be captured by a general Anchor constraint which makes no reference to edges:

(29) **Anchor (2sf, root)**

For every 2sf /-i/, there is a correspondent in the root

This closely resembles the Coincide constraint of Zoll (1996) which requires that constituents coincide but does not specify edges.

Palatalizing non-coronal consonants is ruled out by feature cooccurrence constraints, NO $LAB^y$ (No palatalized labials) and NO $DOR^y$ (No palatalized dorsals), which I have collapsed into the following single constraint pertaining to peripheral consonants:

(30) **NO $PER^y$** No palatalized dorsals or labials

There must also be a constraint against palatalizing /r/. A case of final obstruent palatalization such as /kifäti/ --> [kifäči] satisfies Anchor and does not violate NO $PER^y$ as seen by the winning candidate (31c). A form with no palatalized consonant violates Anchor (31a) since the 2sf suffix does not correspond with any root segments, and a form with a palatalized labial violates the constraint on palatalized peripheral consonants:

(31)

| kifät -i | No $Per^y$ | Anchor |
|---|---|---|
| a. kifäti | | *! |
| b. $kif^y$äti | *! | |
| ☞ c. kifäči | | |

Non-final palatalization was not permitted in Amharic, but it is in Harari. In Amharic, the Anchor constraint referred specifically to the right word-edge. Consonants not at the word-edge were not palatalized. We are now in a position to revise this approach. Instead of having a more specific Anchor constraint for Amharic and a general one for Harari, we can incorporate a constraint on locality. In Amharic, non-final coronals cannot be palatalized because they are not adjacent to the suffix /-i/. This is expressed by the following Adjacency constraint (see Odden 1994, McCarthy 1996 on Adjacency):

(32) **Adjacency**

For each output segment corresponding to two input segments α and β, assess a violation for each α-element intervening between α and β which does not also correspond to β and vice versa.

Therefore, if α is the target, no other segments of the same category as α may intervene between α and β. The vice versa caveat may reverse the roles if β is the target - there may be no β elements which do not also correspond to α. A 2sf form such as [kičäbi] from /kitäb-i/ violates Adjacency. The palatalized [č] corresponds to both [t] and [i], but there is another root consonant ([b]) intervening between the [č] and the [i] which does not correspond to the vowel. Although reference is made to intervening consonants (α-elements), the position of the aspectual vowels is not predetermined in the input with respect to the root, so would be difficult to assess for Adjacency in any case. Thus, Adjacency is basically a locality constraint, requiring that other segments within a domain cannot be skipped. In fact, it closely resembles the non-OT Adjacency definition of Odden (1994:300): 'nodes α and β are adjacent iff they are on the same tier and no element on that tier intervenes between α and β'. The Adjacency constraint would be ranked over Anchor in Amharic, whereas it is ranked below Anchor in Harari to account for the fact that coronals can be palatalized in non-final position in Harari. No Per$^y$ rules out any peripheral consonants (labial or dorsal) with palatalization. In Harari, the non-final palatalized candidate is selected because it satisfies Anchor:

(33) **Harari**

| sidäb -i | No Per$^y$ | Anchor | Adjacency |
|---|---|---|---|
| a. sidäbi | | *! | |
| b. sidäb$^y$i | *! | | |
| ☞ c. siǰäbi | | | * |

In Amharic, the non-palatalized candidate wins out because it does not violate Adjacency:

(34) **Amharic**

| sdäb -i | No Per$^y$ | Adjacency | Anchor |
|---|---|---|---|
| ☞ a. sɨdäbi | | | * |
| b. sɨdäb$^y$i | *! | | |
| c. sɨǰäbi | | * ! | |

When there is a final sonorant and a medial obstruent, palatalization affects both consonants. Just palatalizing the final sonorant would satisfy Anchor and Adjacency. Why then is the obstruent palatalized as well? I propose that there is a preference for palatalizing obstruents over sonorants. This is captured by the following palatalization hierarchy:

(35) **Palatalization hierarchy**

Coronal obstruents > Coronal Sonorants > /r/, Dorsals > Labials

This hierarchy is based on the targets of palatalization within Ethio-Semitic, but also cross-linguistically. Coronals are more likely to be palatalized than other sounds, most likely due to ease of articulation (which would explain why labials are so low on the scale). The coronal sonorant /r/ is less likely to be palatalized than the other sonorants, but I have little evidence to decide its exact position in the scale with respect to dorsals and labials. Placing dorsals over labials is representative of Ethio-Semitic patterns, but this is harder to determine cross-linguistically without a statistical survey of palatalization processes, as opposed to frequency of secondarily-palatalized segments (i.e. with off-glides). As Lahiri & Evers (1991) point out, there are at least two different ways of palatalizing - shift of place of articulation (/s/ --> [š]) or secondary off-glide /t/ --> [$t^y$]. Both coronals and dorsals usually shift their primary place of articulation to palato-alveolar or palatal when palatalized (Ladefoged & Maddieson 1996:365) but labials do not, and maintain the off-glide. In the UPSID survey (Maddieson 1984), an examination of segments with off-glide [y] in phonemic inventories gives the misleading impression that labials are more likely than dorsals to support palatalization, because they occur slightly more frequently. However, the large number of palato-alveolars (č- 141, ǰ - 80; š - 146, ž -61; c -41 j - 31; ç -11, j - 7) may include velars which have been fronted. The usual situation for off-glides is for them to occur at all the major places of articulation, as in Irish or Lithuanian, but there are a few cases of gaps. Languages with phonemic palatalized coronals and labials but not dorsals include Russian (although palatalized velars are derived), Yurak and Igbo. Languages with palatalized coronals and dorsals but not labials include Hausa (although it has [$\phi^y$]), and Kabardian. Languages with a single off-glide series include Songhai, Ocaina and Nyangumata (just coronals) and Lakkia (just dorsals). As for the sonorants, the high occurrence of [ň] (107) in the UPSID survey could also be an indicator of palatalization targeting coronals. The proposed palatalization hierarchy is therefore justified on the grounds of Ethio-Semitic facts, and is not incompatible with cross-linguistic tendencies. I predict that a more thorough survey of palatalization processes would reveal that it is correct. The hierarchy is implicational and languages will differ in the cut-off point, i.e. whether they allow only coronal obstruents to be palatalized (Soddo), both coronal obstruents and coronal sonorants (Nyangumata, Harari, Amharic) or all coronals and dorsals (Western Gurage) or all consonants (Zoque).

Markedness scales are commonly interpreted as representing a series of universally ranked constraints ruling out certain segments (Prince & Smolensky 1993). Applying this method to palatalized segments would not work for cases with double palatalization like /fitäni/ --> [fičäñi]. The winning candidate requires that the coronal obstruent be palatalized *as well* as the coronal sonorant. If the ranking were simply Anchor > Adjacency > *Cor $Son^y$ > *Cor $Obs^y$, then the winning candidate would incur violations of both *Cor $Son^y$ and *Cor $Obs^y$, whereas a candidate with the single coronal sonorant palatalized would only incur a violation of *Cor $Son^y$ and should win out. I propose that the palatalization hierarchy instead dictates that the most optimal anchor for palatalization in a given domain will be palatalized, or else a violation results:

(36) **Palatalization Markedness**

For each output segment corresponding to two input segments $\alpha$ and $\beta$, assess a violation for each $\alpha$-element in the output higher on the palatalization hierarchy which does not correspond to $\beta$

In the candidates in (37), the coronal obstruent must be palatalized to satisfy Markedness (the ranking of this constraint with respect to Adjacency is not determined, so I have placed it at the bottom of the tableau). Furthermore, Adjacency is not violated in the winning candidate because the [ñ] corresponds to the [i] and so does the [č]. In other words, there are no intervenining non-$\beta$ elements, where $\beta$ refers to the [i]:

(37)

| fit'än -i | Anchor | Adjacency | Markedness |
|---|---|---|---|
| a. fit'äni | *! | | |
| b. fit'äňi | | | *! |
| b. fič'äni | | *! | |
| ☞ c. fič'äňi | | | |

I now turn to forms which have two obstruents in the final two root positions. A form like /bit'äsi/ only has one palatalization: [bit'äši]. Markedness is satisfied, so it falls to the Integrity constraint to rule out superfluous palatalization (note that Linearity would outrank Integrity to preserve the /-i/ suffix, as was proposed for Amharic):

(38)

| bit'äs -i | Anchor | Adjacency | Markedness | Integrity |
|---|---|---|---|---|
| a. bit'äsi | *! | | | |
| b. bič'äši | | | | **! |
| c. bič'äsi | | *! | | |
| ☞ d. bit'äši | | | | * |

Reduplicated roots act like any other kinds of roots with respect to the double palatalization of obstruents or sonorants. McCarthy and Prince (1995) account for cases where a base consonant and its reduplicant are identical by a constraint IDENTITY$_{B\text{-}R}$. The high ranking of this constraint with respect to other constraints can account for cases where one of the segments does not match the phonological environment for a process to occur and yet it still undergoes the process because its correspondent does.

(39) **IDENT$_{B-R}$** Correspondent base and reduplicant segments must agree in features

This constraint must be ranked below Integrity. A candidate with double palatalization incurs an extra Integrity violation, even though it would satisfy IDENT$_{B-R}$.[12] In the following example, the second [s] is a reduplicant of the original root [s] in penultimate position (see section 2.3.4.5 and chapter 3 on verbs with final doubling):

(40)

| kisäs -i | Anchor | Adjacency | Integrity | IDENT$_{B-R}$ |
|---|---|---|---|---|
| a. kišäš̲i | | | **! | |
| b. kiš'äs̲i | | *! | * | * |
| ☞ c. kisäš̲i | | | * | * |

Amharic behaves in a similar fashion, but in Gurage, reduplicated consonants like this have double palatalization (see section 2.3), entailing the opposite ranking between IDENT$_{B-R}$ and Integrity.

If the initial consonant is an obstruent and the final or medial one a sonorant, then only the sonorant is palatalized. The optimal consonant anchor would be the obstruent, but in initial position, it is only palatalized if there is no other possible anchor. This requires a

[12] Another possibility would be to rank IDENT$_{I-O}$ and IDENT$_{I-R}$ over IDENT$_{B-R}$ as I do in §2.3.4.5.

constraint preserving the Identity of the initial syllable, so as to prevent palatalization in that position[13]:

(41) **IDENT$_{I\text{-}O}\sigma$1** Correspondent segments in the root-initial syllable of the Input and Output have identical values

This kind of constraint is proposed in Beckman (1995) for Shona height harmony. While the initial syllable in her analysis is seen as a position which resists neutralization and favours contrasts, I am using Positional Identity in a different manner, to restrict the creation of new segments in that position. This constraint must be ranked below the Anchor constraint in order to allow initial palatalization in [šibäri], but to disallow it in [diyägi]. In addition, Markedness must be ranked below IDENT$_{I\text{-}O}\sigma$1 to permit a coronal sonorant to be palatalized and not a coronal obstruent. The form [diyägi] with a palatalized coronal /l/ is illustrated in (42):

(42)

| diläg-i | Anchor | IDENT I-O$\sigma$1 | Markedness | Adjacency | Integrity |
|---|---|---|---|---|---|
| a. dilägi | *! | | | | |
| b. jilägi | | *! | | * | * |
| ☞ c. diyägi | | | * | * | * |
| d. jiyägi | | *! | | * | ** |

When there are no other potential anchors for the palatalization, an initial coronal obstruent is palatalized in initial position in order to satisfy Anchor:

---

13 One might also conceive of this as being a distance threshold of how far away from the trigger the palatalized segment can be. Gradient Align or No Intervening might be useful here, but they only assess output candidates with a palatalized segment and could not judge non-realization vs. bad alignment.

(43)

| sibär-i | Anchor | IDENT I-Oσ1 | Markedness | Adjacency | Integrity |
|---|---|---|---|---|---|
| a. sibäri | *! | | | | |
| ☞ b. šibäri | | * | | * | * |

The initial syllable constraint is never violated for sonorants, however, as a form such as (27a) [nikaʔi] shows. The explanation for this sonorant/obstruent difference can be found in a more general constraint in Harari: verb roots never begin with the palatal sonorants [ň] or [y], but they may begin with palato-alveolar obstruents. This is in fact true of verb roots in other Ethio-Semitic languages (see Berhane 1991 on Tigrinya, Chamora 1996 on Inor).[14] The constraint against initial ň/y must dominate the Anchor constraint:

(44)

| nikaʔ-i | NO INITIAL PALATAL | Anchor | IDENT σ1 | Adjacency | Integrity |
|---|---|---|---|---|---|
| a. ňikaʔi | *! | | * | * | * |
| ☞ b. nikaʔi | | * | | | |

In conclusion, Harari is like Amharic in that only coronal consonants are palatalized, and there is an overt final suffix /-i/. However, Harari differs from Amharic in allowing non-final palatalization, captured by a constraint ranking of Adjacency and Anchor. There is a ban on palatalizing initial consonants unless no other palatalization takes place in the root, in which case an initial obstruent only may be palatalized. This is reflected in a special constraint on the initial syllable, which we will see is also active in Muher (Central Western

[14] Tigre has a few y-initial roots.

Gurage) forms for labialization. In addition, I have introduced a markedness hierarchy for palatalization which seeks out the best consonant host for the palatalization in a given form. This constraint will also play a role in palatalization in Western Gurage.

One might counter that this Optimality analysis is no different than a rule-based analysis with spreading rules mimicking the effects of the Anchor constraints. However, a rule-based analysis without the benefit of ranked and violable constraints is ill-equipped to deal with the 'do something only when' nature of Harari palatalization. A rule-based analysis would have to specify the individual targets and have additional stipulations on why coronal sonorants are palatalized only in particular circumstances. In contrast, the Optimality analysis ranks the constraints of anchoring and initial impermeability, thus allowing them to be violated in certain output candidates. The best targets are specified by the markedness hierarchy, but the actual realization of palatalization on a sonorant or obstruent is dictated by other independent constraints.

### 2.3.3. Northern Gurage (Soddo)

The next case of the 2sf is from the Northern Gurage dialect, Soddo, also known as Kəstenəñña. The data are taken from Goldenberg (1968).[15] In this dialect, there is no overt final suffix /-i/ and palatalization affects final coronal obstruents, as in Amharic. It differs from Amharic and Harari in not allowing palatalized sonorants, which can be accounted for with constraints on altering the identity of sonorants. In addition, the rightmost non-epenthetic central vowel is also fronted (46a-c). If no palatalization occurs, the central vowel /ä/ is still fronted to [e], or the peripheral vowels /o/ /u/ and /a/ are diphthongized (or followed by a glide) as [oy] [uy] and [ay] respectively (46f-j). The contrast between (46f)

[15] Although this is the most comprehensive discussion of the 2sf in Soddo, Goldenberg selects quite irregular verbs to illustrate the process.

and (46g) shows that epenthetic vowels are ignored. The contrast between (46c) and (46d) shows that peripheral vowels are not diphthongized if syllable structure violations result; they may only appear in open syllables or followed by a single word-final consonant (46i-k). This restriction suggests that the glide is not part of a diphthong but is actually in the coda:

| (46) | <u>2sg masc</u> | <u>2sg fem</u> | |
|---|---|---|---|
| a. | lɨbäs | lɨbeš | 'dress! |
| b. | sänbɨt | senbɨč | 'pass the week!' |
| c. | t-äwd | t-ewǰ | 'you tell' (relative imperfective) |
| d. | awd | awǰ | 'tell!' |
| e. | aqqɨs | aqqɨš | 'stay!' |
| | | | |
| f. | sɨkär | sɨker | 'be drunk!' |
| g. | tɨ-säkɨr | tɨ-sekɨr | 'you are drunk' (relative imperfective) |
| h. | qɨläl | qɨlel | 'be light!' |
| i. | tämar | täm**ay**r | 'learn!' |
| j. | qɨlaqɨl | qɨ**lay**qɨl | 'mix up!' |
| k. | t'ur | t'**uy**r | 'carry!' |

In order to account for the vowels being fronted in Soddo, another constraint is required in addition to the one proposed for Amharic and Harari which anchors the 2sf with the root. This new constraint specifies anchoring of the suffix with a vowel (more specifically, an /ä/ or /a/ or a morphologically-affiliated vowel). The necessary constraint is given in (47)[16]:

[16] Base is defined as the string to which an affix attaches.

(47) **Anchor-V**

Any 2sf -i has a correspondent in the string of input base vowels

The Integrity constraint is ranked below both Anchor constraints and Linearity. Since the final /-i/ does not appear as a suffix, Linearity violations are tolerated to avoid extra Integrity violations:

(48)

| lɨbäs-i | Anchor V | Anchor Root | Integrity | Linearity |
|---|---|---|---|---|
| a. lɨbäsi | *! | * | | |
| b. lɨbäši | *! | | * | |
| c. lɨbäš | *! | | | * |
| ☞ d. lɨbeš | | | * | * |
| e. lɨbeši | | | **! | |
| f. lɨbesi | | *! | * | |

While the constraints given above account for cases in which a final alveolar and a rightmost vowel are palatalized, we have not yet considered cases where only the vowel is affected. Again Integrity decides the winning candidate. It must be ranked below the Anchor V constraint in order for the vowel in the output to be fronted:

(49)

| qɨläl-i | Anchor V | Anchor Root | Integrity | Linearity |
|---|---|---|---|---|
| a. qɨleli | | * | *! | |
| ☞ b. qɨlel | | * | | * |
| c. qɨläl | *! | * | | |
| d. qɨläli | *! | * | | |

In Amharic, when palatalization does not occur, the suffix is still realized outside the stem as a true suffix. In Soddo, however, it is consistently realized within the stem, as we have seen. Soddo requires fronting of the stem vowel due to the high-ranking constraint Anchor V. The additional ranking of Integrity above Linearity favours a form with internal fronting and no suffix /-i/. A form like [sɨkär-i], which would be ruled out in Soddo by Anchor V (see (50a)), would be optimal in Amharic since it violates neither Linearity nor Integrity, and Anchor V would be ranked low in the constraint system of Amharic, as can be seen by comparing (50) and (51):

(50) **Soddo**

| sɨkär-i | Anchor V | Integrity | Linearity |
|---|---|---|---|
| a. sɨkäri | *! | | |
| ☞b. sɨker | | | * |
| c. sɨkeri | | *! | |

(51) **Amharic**

| sɨkär-i | Linearity | Integrity | Anchor V |
|---|---|---|---|
| ☞ a. sɨkäri | | | *! |
| b. sɨker | *! | | |
| c. sɨkeri | | *! | |

In summary the following chart shows the main differences in the realization of the 2sf /-i/ in Amharic, Harari and Soddo:

(52)

| **Phonological change** | **Ranking** | **Language** |
|---|---|---|
| Local palatalization | Adjacency > Anchor | Amharic, Soddo |
| Long distance palatalization | Anchor > Adjacency | Harari |
| Suffix inside stem | Integrity > Linearity | Soddo, Amharic variant |
| Suffix outside stem | Linearity > Integrity | Amharic, Harari |

These facts were captured by general Anchor constraints pertaining to either the root or the stem vowels. These constraints, ranked with respect to Adjacency, determine whether palatalization will be long-distance or local. The inside/outside position of the affix is captured by the constraints Linearity and Integrity which restrict the correspondents of the 2sf /-i/ in the output. I have treated Soddo on a par with Amharic and Harari with respect to the representation of the suffix /-i/. Whether this affix appears inside the stem associated to another segment or not is due to the Anchor constraints and Linearity. By treating the Soddo cases as floating features, the connection with the same suffix in Amharic and Harari would be obscured. I now turn to Western Gurage, in which the realization of the 2sf follows a hierarchy of potential anchors.

### 2.3.4. Western Gurage

In Western Gurage, there is no overt /-i/ suffix to express the 2sf, only palatalization or vowel fronting within the stem. In this manner it resembles Soddo, which is a Northern Gurage dialect. I will focus my attention on two dialects: Muher, a dialect which I will classify as Western Gurage, but which shares some traits of Northern Gurage,[17] and Chaha, a Western Gurage dialect, which is perhaps the most well-known of all the Gurage dialects. All examples of the 2nd singular feminine are given in the imperative with no object marker, although the forms are similar for the imperfective. The following examples are taken from Chaha, but the Muher verbs follow the same pattern. The masculine form with no subject marker is contrasted with the feminine form in which palatalization indicates a feminine subject. All verbs are triliterals, although quadriliterals follow the same patterns. In (53), the final alveolar (53a-e) or velar (53f-h) is palatalized:

| (53) | 2sg masc | 2sg fem | |
|---|---|---|---|
| a. | kɨft | kɨfč | 'open!' |
| b. | zɨmd | zɨmǰ | 'pull!' |
| c. | nɨkɨs | nɨkɨš | 'bite!' |
| d. | gɨräz | gɨräž | 'be old!' |
| e. | dɨft' | dɨfč' | 'hit strongly!' |
| f. | dɨrg | dɨrg$^y$ | 'hit!' |
| g. | fɨräx | fɨräx$^y$ | 'be patient!' |
| h. | nɨt'ɨq | nɨt'ɨq$^y$ | 'snatch away!' |

[17] Hetzron (1977) classifies Muher as Northern Gurage based on certain morphological features such as Main Verb Markers (tense markers) not found in Western Gurage. However, he also recognizes that Muher shares other characteristics with Western Gurage that Soddo, the standard Northern dialect, does not, and is therefore genetically connected to Western Gurage.

Labial consonants are not palatalized. It was stated in McCarthy (1983) based on Johnson (1975) (and repeated in Scobbie 1991, Kenstowicz 1994, Archangeli & Pulleyblank 1994, Zoll 1994) that when the final consonant is labial, the feminine suffix is not realized. This statement is not correct. When labials occur in final position, the feminine suffix is indeed realized, but via options other than word-final palatalization. For example, when the final consonant is labial, a velar consonant in non-final position may be palatalized instead, provided all consonants to the right are labial:

| (54) | 2sg masc | 2sg fem | |
|---|---|---|---|
| a. | nɨxäβ | nɨx$^y$äβ | 'find!' |
| b. | nɨgɨf | nɨg$^y$ɨf | 'prune!' |
| c. | nɨqɨm | nɨq$^y$ɨm | 'gather (wood)!' |
| d. | gɨmɨm | g$^y$ɨmɨm | 'chip the rim of the utensil!' |
| e. | qɨfɨf | q$^y$ɨfɨf | 'cut the edges!' |

Alveolars, on the other hand, cannot be palatalized except word-finally. Thus when the final consonant is labial and an alveolar occurs in other positions within the word, the vowel between the final two consonants undergoes fronting as in (55). Compare (54a) above with (55a), and (54d) with (55d):

| (55) | 2sg masc | 2sg fem | | |
|---|---|---|---|---|
| a. | nɨzäβ | nɨze̲β | *nɨžäβ | 'be flexible!' |
| b. | sɨrɨβ | sɨri̲β | *sɨr$^y$ɨβ | 'spin!' |
| c. | tɨräf | tɨre̲f | *tɨr$^y$äf, *čɨräf | 'survive, be left!' |
| d. | nɨdɨf | nɨdi̲f | *nɨǰɨf | 'sting!' |
| e. | sɨräf | sɨre̲f | *sɨr$^y$äf | 'be scared!' |
| f. | t'ɨmäm | t'ɨme̲m | *č'ɨmäm | 'be contrary!' |

We can summarize the realization of the feminine marker as follows:

(56) a. the final consonant is palatalized if palatalizable (velar or alveolar);

b. otherwise, a velar consonant is palatalized, or

c. otherwise, the vowel to the left of the final consonant is palatalized (fronted).

### 2.3.4.1 Basic cases

Western Gurage resembles Soddo in that the suffix is fully absorbed within the root. The Anchor constraint captures the final palatalization. Integrity rules out any multiple correspondence, and is ranked above Linearity:

(57)

| zmd -i | Anchor Root | Integrity | Linearity |
|---|---|---|---|
| ☞ a. zɨmǰ | | | * |
| b. zɨmdi | *! | | |
| c. zɨmǰi | | *! | |

In order to explain why the final coronal is palatalized, we must consider the constraint Adjacency. As formulated, it is not obvious how Adjacency would apply in languages where the suffix is found within the stem. If Adjacency may apply at either the input or the output level (McCarthy 1996), then it captures the Western Gurage facts[18]:

[18] The only problem would be posed by reduplicated roots such as bätit where the second identical consonant is the reduplicant, and therefore not strictly part of the input.

(58) **Adjacency**

If a consonant in the output corresponds to two input segments ordered α and β, assess a violation for each α-element intervening between α and b (in the input or output) which does not also correspond to β or vice versa

This constraint can also serve to explain the locus of palatalization in Gurage roots with two palatalizable consonants. Since Adjacency is not violated, it will be ranked over Anchor. Adjacency is violated in candidate (59b), since there are two consonants which do not correspond to either /z/ or /i/ intervening between them:

(59)

| zmd -i | Adjacency | Anchor Root |
|---|---|---|
| ☞ a. zɨmǰ | | |
| b. žɨmd | **! | |

In the discussion on Harari, the palatalization markedness hierarchy placed coronals above dorsals; therefore, coronals should be better targets than velars for palatalization. This requires that for an input form like /drg/ which produces [dɨrg$^y$], Adjacency must be ranked over Markedness:

(60)

| drg -i | Adjacency | Anchor Root | Markedness |
|---|---|---|---|
| ☞ a. dɨrg$^y$ | | | |
| b. ǰɨrg | *!* | | |
| c. dɨyɨg | *! | | |

Turning now to the second set of examples in (54), we note that velars are palatalized in non-final position. Palatalized labials will of course be ruled out by the feature cooccurrence constraint No Lab$^{y}$, and Adjacency determines that velar palatalization is preferable to coronal-initial palatalization:[19]

(61)

| dgf -i | Adjacency | Anchor Root | Markedness |
|---|---|---|---|
| a. dɨg$^{y}$ɨf | * | | * |
| b. ǰɨgɨf | **! | | |

Despite this result, a form with no velars like /ndf/ will not produce *[nɨǰɨf] but [nɨdif], with a violation of Anchor-Root. This shows that Adjacency must be ranked over Anchor Root, but also that we need an explanation for the difference between coronals and velars with respect to Adjacency. I will redefine Adjacency to refer to simplex fused segments and not complex segments like palatalized velars, which have a secondary off-glide articulation. When coronals are palatalized, the coronal and front vowel are fused into one segment with a single place of articulation. In Western Gurage, this can only happen under strictly local conditions. For velars, on the other hand, palatalization involves adding a secondary off-glide articulation, and no fundamental change in the production of the velar consonant. For example, it has a consonantal (velar) component and a glide (y) component, which differs from [i] in Gurage only by its syllabic position. The coalesced palato-alveolar, on the other hand, is a pure consonant and contains no vowel-like component. This same distinction is used in Zoll's (1996) analysis of Japanese mimetic palatalization,

[19] This is not a common Chaha root, but it is a good illustrative verb of how velars are palatalized instead of coronals when both are non-final.

in which she treats palatalized velars as complex and palatoalveolars as simplex. The off-glide kind of palatalization is not subject to locality:

(62) a) b)

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| t | + | i | --> | č | k | + | i | --> $k^y$ |
| | | coalescence | | | | addition of secondary articulation | | |

This difference is reflected in feature-geometric representations of these segments. For example, in the feature geometry of Clements & Hume (1995), the palatoalveolar has no V-place component, whereas the palatalized velar has a secondary V-place node. Ní Choisáin (1994) presents evidence from Irish which argues that palatal off-glides in segments such as $t^y$ will be preserved even if the main consonant features are lost by debuccalization, so $t^y$ --> $h^y$, suggesting that the [y] is easily separable from the consonant to which it is attached. I therefore reformulate the Adjacency constraint as follows, but assume that (simplex/complex) may be added to the general formulation of Adjacency

(63) **Adjacency (simplex)**

For each <u>simplex</u> output segment corresponding to two input segments α and β, assess a violation for each α-element intervening between α and β which does not also correspond to β or vice versa

By redefining Adjacency in this manner, the correct candidate will be chosen with coronal-velar-labial roots:[20]

---

[20] There is one root which has two velars /a-$x^w$ɨrq-i/ --> [a$x^w$ɨr$q^y$] 'take off, slip off!'. In this case, palatalization affects the rightmost velar. This can be handled via Linearity - the closer to the location of the input suffix the palatalization appears, the better Linearity is satisfied (see R. Rose 1997 on this use of Linearity to align the suffix)

(64)

| dgf -i | Adjacency | Anchor Root | Markedness |
|---|---|---|---|
| ☞ a. dɨgʸɨf | | | * |
| b. ǰɨgɨf | *! | | |

Turning now to the labial-final cases with no velars, these roots exhibit vowel fronting. Since Adjacency rules out non-final palatalized coronals and palatalized labials are always ruled out because of the undominated constraint against them, the only remaining option is to front the vowel[21]:

(65)

| ndf -i | No Labʸ | Adjacency | Anchor Root | Markedness |
|---|---|---|---|---|
| a. ňɨdɨf | | *!* | | |
| b. nɨjɨf | | *! | | |
| c. nɨdɨfʸ | *! | | | * |
| ☞ d. nɨdif | | | * | |

One question which must be addressed is why the /-i/ shows up within the stem as a vowel (nɨdif) and not as a suffix (nɨdfi), since both violate Anchor equally. The second candidate does not violate Linearity. There must be a constraint forcing the vowel within the stem. Here, we can appeal to a similar constraint to the one used for Soddo vowel-fronting; the Soddo case has a caveat that the base vowel must correspond to an input vowel, whereas the Chaha case does not, since the [i] simply appears within the base, attached to an input vowel or not:

[21] Note that if a simplex vowel [e] resulted from fusing /ä/ and /-i/, Adjacency could also apply, but would reference intervening vowels only.

(66) **Anchor (2sf R μ R)**

Any 2sf corresponds to the right edge of a string of base moras

The rightmost moraic position in the base would be between the two final consonants.[22] This constraint must be ranked below the Anchor Root and Adjacency constraints to ensure that a winning candidate with a vowel will be chosen only when these constraints cannot be satisfied in a winning candidate. For example, the violation of Anchor Root would rule out candidate (67b) with the fronted vowel:

(67)

| rgf -i | Adjacency | Anchor Root | Anchor μ |
|---|---|---|---|
| ☞ a. nɨg$^y$ɨf | | | * |
| b. nɨgif | | *! | |
| c. ňɨgɨf | *! | | |

However, a fronted vowel would be chosen when there are only non-final coronals and a final labial in a root, as example (65) illustrated.

Finally, it should be noted that Anchor μ must be ranked over Linearity. The candidate in (68a) shows the suffix outside the base, and therefore not attached with the rightmost base mora:

[22] See chapter 3, section 3.2.1.1 where I argue that all roots have at least two input moras.

(68)

| rdf -i | Anchor μ | Linearity |
|---|---|---|
| a. nɨdfi | *! | |
| ☞ b. nɨdif | | * |

Furthermore, Integrity must be ranked above Anchor μ to ensure that there is no concomittant palatalization and vowel fronting:

(69)

| kft -i | Anchor Root | Integrity | Anchor μ | Linearity |
|---|---|---|---|---|
| a. kɨfič | | *! | | |
| ☞ b. kɨfč | | | * | * |

In (70), I provide a list of the constraints proposed so far for Western Gurage, their ranked order and the roles they play:

(70) Summary:

| CONSTRAINT | EFFECT |
|---|---|
| No Lab$^{y}$ | Bans palatalized labials |
| Adjacency | Prevents coronal palatalization non-finally |
| Anchor Root | Requires palatalization of a root segment |
| Markedness | Palatalizes coronals > velars > labials |
| Integrity | Bans multiple correspondence of 2sf in output |
| Anchor μ | Requires /-i/ to appear in final moraic position within the stem |
| Linearity | Prevents /-i/ from appearing within the stem |

### 2.3.4.2 Dialect differences

Muher and Chaha differ in how they treat alveolar consonants in root-medial position. We know that alveolars may only be palatalized in root final position. We also know that velars may be palatalized in other positions when followed by labials (examples in (56)). But, what happens when there is a velar-alveolar-labial root? Can the initial velar be palatalized in that type of verb? In Chaha, the velar may <u>not</u> be palatalized, and the suffix is instead realized on the final vowel:

(71) **Chaha**

| | <u>2sg masc</u> | <u>2sg fem</u> | | |
|---|---|---|---|---|
| a. | gɨdɨf | gɨdi̲f | *gɨ̆jɨf/*g$^{y}$ɨdɨf | 'stop the fast!' |
| b. | kɨtɨf | kɨti̲f | *kɨčɨf/*k$^{y}$ɨtɨf | 'chop (meat)!' |

The opposite result obtains in Muher, and the velar is palatalized:

(72) **Muher**

| | <u>2sg masc</u> | <u>2sg fem</u> | |
|---|---|---|---|
| a. | gɨdf | **g**$^{y}$ɨdf | 'stop the fast!' |
| b. | kɨtf | **k**$^{y}$ɨtf | 'chop (meat)!' |

In other words, Chaha does not permit skipping over the medial alveolar consonant to palatalize the velar, but Muher does. With the constraint rankings so far established, we can capture the Muher forms; velar palatalization is always favoured over vowel fronting due to high-ranking Anchor Root. But why should the alveolar block palatalization in Chaha? We cannot simply introduce a constraint against palatalizing velars, since it is only in this particular case that velar palatalization is avoided. Elsewhere, as in forms like nɨg$^{y}$ɨf, velar palatalization is preferred to vowel fronting. The answer to this puzzle lies in considering the linear order of the palatalizable consonants. Consonant anchors for palatalization in both dialects are velars and coronals, as we have seen. When they are in the linear sequence coronal-velar, the velar is palatalized. When they are in the sequence velar-coronal, the velar cannot be palatalized, but neither can the coronal due to Adjacency; instead a vowel is fronted. This reveals that given a root with velars and coronals, the suffix must correspond to the *rightmost* palatalizable consonant. If that consonant cannot be palatalized for independent reasons, the suffix does not then correspond to the other consonant. In this case, a form with vowel fronting results. So far, I have achieved the rightmost result indirectly through Adjacency, but since velars are not subject to Adjacency, this constraint will not help solve the problem posed by these particular velar-coronal-labial roots. What is needed is an adjacency constraint which refers to the markedness hierarchy introduced for Harari:

(73) **Adjacent Markedness**

For each output segment corresponding to two input segments α and β, assess a violation for each α-element intervening between α and β which does not also correspond to β *and is higher on the markedness hierarchy*

This constraint is different than the Palatalization Markedness constraint introduced for Harari in that it specifically refers to intervening segments. What this constraint does in effect is to prevent palatalization of a segment if there is a better suited host intervening between it and the right edge of the word, the input location of the 2sf /-i/, *even* if that host cannot support palatalization due to other constraints. Note that simply using the constraints Adjacency and Markedness would not account for the difference between [dɨg$^y$ɨf] and impermissible *[k$^y$ɨtɨf] in Chaha - the order of the velar and coronal is what is important. In (74), I list some input and output forms and which constraints they violate. In the first column, an alveolar is palatalized, which leads to violations of Adjacency if it is not in final position. None of the candidates which violates Adjacency is a winning candidate. In the second column, the outputs have palatalized velars. In two cases, Adjacent Markedness is violated because there is an alveolar to the right of the velar which would make a better host for palatalization. Again, in Chaha, neither of these forms is a winning candidate. Winning candidates are marked with ☞:

(74)

| Input | Coronal ouputs | Violations | Velar outputs | Violations |
|---|---|---|---|---|
| /kft/ | ☞ kɨfč | - | k$^y$ɨft | Adjacent Markedness |
| /drg/ | ǰɨrg | Adjacency | ☞ dɨrg$^y$ | - |
| /dgf/ | ǰɨgɨf | Adjacency | ☞ dɨg$^y$ɨf | - |
| /gdf/ | gɨǰɨf | Adjacency | g$^y$ɨdɨf | Adjacent Markedness |

The constraint Adjacent Markedness repeats some of the work of the constraint Markedness, used for Harari, but it plays a different role. Given a form [dɨrg$^y$], Markedness is violated because a velar is palatalized instead of an alveolar, but Adjacent Markedness is not because there are no intervening coronals between the edge of the word and the velar. In Harari, the Markedness constraint forced palatalization of the best host, the coronal obstruent, even if the result was palatalization of both the final and penultimate consonants, so (25b) /fitäni/ --> [fičäñi] 'hurry!'. In Western Gurage, this is not possible, showing that Integrity is ranked high. For example, the input /mäsx-i/ 'ruminate, chew' does not produce [mäšɨxʸ], but [mäsɨxʸ].

Returning to the difference between Muher and Chaha, the constraint Adjacent Markedness must be ranked lower than Anchor Root in Muher to allow palatalization of the velar despite the violation of Adjacent Markedness candidate (75a) incurs. Tolerating this violation is better than having the suffix realized as a front vowel, which would violate Anchor, the constraint requiring association with a root segment:

(75) **Muher** **Anchor Root > Adjacent Markedness**

| ktf -i | Adjacency | Anchor Root | Adjacent Markedness | Anchor μ |
|---|---|---|---|---|
| ☞ a. kʸɨtf | | | * | * |
| b. kɨtif | | *! | | |
| c. kɨčɨf | *! | | | * |

In Chaha, on the other hand, Adjacent Markedness must be ranked above Anchor to rule out any consonants being palatalized in the velar-alveolar-labial roots. The final labial consonant is of course ruled out by No Labʸ:

(76) **Chaha** **Adjacent Markedness > Anchor**

| ktf -i | Adjacency | Adjacent Markedness | Anchor Root | Anchor μ |
|---|---|---|---|---|
| a. kʸɨtf | | *! | | * |
| ☞ b. kɨtif | | | * | |
| c. kɨčɨf | *! | | * | * |

The ranking of Anchor Root and Adjacent Markedness in both dialects ensures correct results with the other forms, since association to a root consonant is always preferred as long as it does not violate either of the Adjacency constraints. In conclusion, the main Chaha / Muher difference is due to the relative ranking of Adjacent Markedness.

### 2.3.4.3 /r/ and variability

Additional differences between Chaha and Muher are seen with respect to the consonant /r/. In final position in Chaha, /r/ is palatalized, just like other consonants, whereas in Muher, /r/ is never palatalized. I begin with examining the Muher examples. As shown in (77), /r/ is never considerd a host for palatalization and is passed over just like labial consonants:

| (77) | <u>2sg masc</u> | <u>2sg fem</u> | |
|---|---|---|---|
| a. | sɨβɨr | sɨβir | 'break!' |
| b. | bɨdär | bɨder | 'be first!' |
| c. | qɨβɨr | $q^y$ɨβɨr | 'plant!' |
| d. | xɨräm | $x^y$ɨräm | 'spend a year!' |
| e. | qɨrɨβ | $q^y$ɨrɨβ | 'be near!' |

In order to account for the fact that /r/ resists palatalization, I propose the following constraint, which prevents /r/ from hosting the /-i/. In Chaha, as we shall see, /r/ is palatalized to [y] and not [$r^y$]. Therefore, since the output is not a secondarily palatalized sound, I will capture this with a constraint preventing the change from /r/ to [y] rather than a constraint banning [$r^y$]:[23]

[23] This constraint could be formulated in other ways, such as avoidance of glides or peripheral vowels. More generally, there may be a resistance of high sonority consonants to acquiring a high-sonority off-

(78) **IDENT$_{\text{I-O-r}}$** Any correspondent of an input segment /r/ must be identical in the output for features

The consonant /r/ displays similar resistance to palatalization in Japanese mimetic palatalization (Mester & Itô 1989), but the underspecification analysis they advocate for Japanese cannot be extended to Gurage, as will be discussed in §2.3.4.5.

In Muher, IDENT$_{\text{I-O-r}}$ is undominated, and /r/ is excluded from the class of consonant hosts for palatalization, just like labials. This shows that on the markedness scale, /r/ is ranked below dorsals, and the cut-off point for palatalization in the hierarchy in Muher is after dorsals, excluding labials and /r/. A final /r/ will therefore behave just like a labial consonant with respect to palatalization. If there is a velar elsewhere in the root, the velar will be palatalized:

(79) **Muher**

| qβr -i | IDENT$_{\text{I-O-r}}$ | Adjacency | Anchor Root | Adjacent Markedness |
|---|---|---|---|---|
| a. qɨβir | | | *! | |
| b. qɨβɨy | *! | | | |
| ☞ c. qʸɨβɨr | | | | |

Similar results are seen when /r/ is in medial position. The only possible anchor for palatalization is the velar /q/:

glide, which could be why /r/ resists palatalization compared to other sonorants cross-linguistically (Walsh 1995).

(80) **Muher**

| qrf -i | IDENTI-O-r | Adjacency | Anchor Root | Adjacent Markedness |
|---|---|---|---|---|
| ☞ a. qʸɨrf | | | | |
| b. qɨrif | | | *! | |
| c. qɨyɨf | * ! | * | | |

I now turn to the more complex examples from Chaha. In Chaha, a final /r/ is palatalized to [y]. However, glides can never appear in coda position in Chaha, so the [y] fuses with the preceding vowel to produce [i] or [e]. Thus in (81a), /sβr/ --> [sɨβi]. These final vowels thus contain the input segments /r/ and /i/. I have expressed this serially to make it easier to understand why the output has no final [r] or [y] and yet I claim that /r/ is palatalized. One might counter that the /r/ is simply skipped over and then deleted following a front vowel. Despite the fact that there is nothing illegal about an [ir] or [er] sequence, this analysis would also not explain (81c). If the /r/ were really being skipped like a labial, we would expect the velar to be palatalized and not the vowel fronted, since it would be the best consonant host. The fact that /r/ is palatalized shows that the cut-off point in the palatalization hierarchy in Chaha is between labials and other consonants, including /r/. The three final segments are fused, so /bɨdär-i/ --> [bɨde], where [e] corresponds to the three segments [ä], [r] and [i]:

| (81) | | <u>2sg masc</u> | <u>2sg fem</u> | | |
|---|---|---|---|---|---|
| | a. | sɨβɨr | sɨβi | 'break!' | <sɨβɨy |
| | b. | bɨdär | bɨde | 'be first!' | <bɨdäy |
| | c. | qɨβɨr | qɨβi | 'plant!' | <qɨβɨy |

The behaviour of /r/ in other positions in Chaha, however, is less clear-cut. In medial position, an /r/ may be skipped in favour of palatalizing an initial velar <u>or</u> the final vowel may be fronted:

| (82) | | <u>2sg masc</u> | <u>2sg fem</u> | |
|---|---|---|---|---|
| | a. | xɨräm | $x^y$ɨräm *or* xɨrem | 'spend a year!' |
| | b. | qɨrf | $q^y$ɨrf *or* qɨrif | 'knock down!' |

There are therefore two major problems to be solved: 1) why /r/ is always palatalized in final position, and 2) why /r/ sometimes blocks initial velar palatalization and sometimes doesn't. We can divide these data into two variants:

(83) Variant 1: /r/ is palatalized in final position
/r/ **blocks** velar palatalization in initial position

Variant 2: /r/ is palatalized in final position
/r/ **allows** velar palatalization in initial position

In order to capture final palatalization, $\text{IDENT}_{\text{I-O-r}}$ must be ranked at least below Adjacent Markedness. In the tableau in (84), I have simply placed it at the bottom of the tableau. By ranking $\text{IDENT}_{\text{I-O-r}}$ below Adjacent Markedness, we ensure that final /r/ is always palatalized, since a candidate with a palatalized velar or a fronted vowel would violate Adjacent Markedness or Anchor:

(84) Variant 1: **Chaha final /r/**

| qβr -i | Adjacency | Adjacent Markedness | Anchor Root | $\text{IDENT}_{\text{I-O-r}}$ |
|---|---|---|---|---|
| a. qɨβir | | | *! | |
| ☞ b. qɨβi | | | | * |
| c. $q^y$ɨβɨr | | *! | | |

Turning now to medial /r/, the variability can be accounted for by ranking /r/ in a different position with velars in the markedness scale. In Variant 1, it is ranked with the other coronal sonorants above velars (Coronals > Velars > Labials), and in Variant 2, it is ranked on a par with velars (Coronals > /r/, Velars > Labials). While it might seem strange to allow variability within a supposedly universal scale, the sonority scale, another potential universal also allows variability. Some languages enforce only a general version of sonority, making no distinction between obstruents, whereas others make finer distinctions for continuancy or voicing among obstruents. This does not imply that the scale is invalid, but only that languages may selectively use it. The different treatment of /r/ for palatalization is along those lines. If the language makes general place distinctions, /r/ will be treated as a coronal. If sonorancy is an issue, then /r/ will be regarded as more dispreferred, since the higher sonority consonants are less likely to be palatalized. This is why /n/ is more likely to be palatalized than /l/ which in turn is more likely than /r/. In Muher, while the other coronal sonorants are palatalizable, /r/ is not, reflecting a language-specific interpretation of the hierarchy, placing /r/ below velars. This kind of language-specific interpretation seems to be available only for certain segments, such as /r/. For example, with respect to sonority, /r/ has higher sonority in English, but lower sonority than nasals in Lebanese Arabic (Haddad 1984, Kenstowicz 1994a). This may be related to different types of rhotic sounds.

In both Chaha variants, /r/ is considered a potential host, because the cut-off point for palatalization is at labials. In Variant 1, if /r/ is ranked above velars with the other coronals, it will behave like other medial alveolars in Chaha, blocking initial velar palatalization. This is due to Adjacent Markedness:

(85) Variant 1: **r > velars**

| qrf -i | Adjacency | Adjacent Markedness | Anchor Root | Anchor µ | $\text{IDENT}_{\text{I-O-r}}$ |
|---|---|---|---|---|---|
| a. qʸɨrf | | *! | | * | |
| ☞ b. qɨrif | | | *! | | |
| c. qɨyɨf | *! | | | * | * |

In Variant 2, on the other hand, if /r/ is considered on a par with velars, it will not count in the computation of Adjacent Markedness violations, because Markedness militates against an intervening segment which has *higher* markedness only:

(86) Variant 2: **r, velars**

| qrf -i | Adjacency | Adjacent Markedness | Anchor Root | Anchor µ | $\text{IDENT}_{\text{I-O-r}}$ |
|---|---|---|---|---|---|
| ☞ a. qʸɨrf | | | | * | |
| b. qɨrif | | | * ! | | |
| c. qɨyɨf | *! | | * | | * |

There is, of course, one difference between Variant 2 and Muher. In Variant 2, final /r/ *is* palatalized. This is because $\text{IDENT}_{\text{I-O-r}}$ is low-ranked in Chaha. Since Adjacent Markedness is not violated for the palatalized velar candidate in (87b), it falls to the Anchor μ constraint to decide the winning candidate. The winning candidate [qɨβi], because of the fusion of /r/ and /i/ to produce [i], satisfies both Anchor (the /r/ of the consonant root is palatalized) and Anchor μ, since the output segment is in the final moraic position:

(87) Variant 2: **r, velars**

| qβr -i | Adjacency | Adjacent Markedness | Anchor Root | Anchor μ | IDENT$_{I-O-r}$ |
|---|---|---|---|---|---|
| ☞ a. qɨβi | | | | | * |
| b. $q^y$ɨβɨr | | | | *! | |
| c. qɨβir | | | *! | | |

In summary, the Muher / Chaha dialect difference with respect to /r/ is captured by the different ranking of a constraint against palatalizing /r/, IDENT$_{I-O-r}$, which basically corresponds to a different cut-off point in the palatalization hierarchy. The variability within Chaha itself with respect to /r/ is captured by variably ranking /r/ within the hierarchy. In one variant, it is on a par with velars, and in another it ranks above velars with the other coronal sonorants. Importantly, in both Chaha variants, no matter the ranking, the cut-off point is still at labials, so /r/ can be palatalized. The ranking of /r/ can be any of the following possibilities, with the cut-off point marked by ||:

(88)

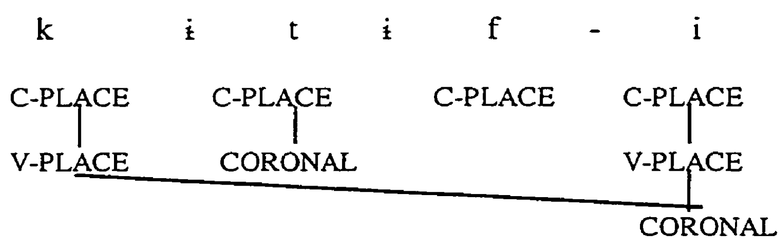
| | |
|---|---|
| r > Dorsals > \|\| Labials | Chaha variant 1 |
| r, Dorsals \|\| Labials | Chaha variant 2 |
| Dorsals > \|\| r > Labials | Muher |

Before proceeding with more cases of the realization of the 2sf in Western Gurage, I will consider some alternate analyses of these facts and weigh their success in relation to the analysis I have proposed.

### 2.3.4.4. Previous analyses: Palatalization and blocking

In this section, I will outline why past approaches to the 2sfem fail to adequately and explanatorily account for all the data, including the variation. Previous derivational accounts of the Chaha feminine morpheme which addressed the full range of data (Rose 1994a, Odden 1994), posited a floating suffix /-i/, specified in feature geometric terms with a Coronal node. Palatalization of an initial velar involves spreading the Coronal node of the suffix /-i/. Any intervening Coronal node will block this spread by the No Crossing Constraint, the ban on crossed association lines. This is illustrated in (89) for the verb /kɨtɨf-$^{i}$/ 'chop (meat)!' from Odden (1994):

(89)




As fronting the velar is blocked as in (89), the only other option to realize the morpheme is as a front vowel, so the actual output is [kɨtif].

Data with final palato-alveolars and front vowels confirm the blocking analysis in Chaha. These segments all have a Coronal node and all block palatalization of a velar to their left:

| (90) | Root | 2sg masc | 2sg fem | | |
|---|---|---|---|---|---|
| a. | qasy | qaš | qaš | *q$^y$aš | 'throw away!' |
| b. | xry | xi | xi | *x$^y$i | 'make a hole!' |
| c. | aqry | äqe | äqe | *äq$^y$e | 'crunch!' |

The feature-geometric coronal blocking approach runs into problems when faced with Muher. We have seen how Muher <u>allows</u> for palatalization of velars even when followed by an alveolar in non-final position (examples (72) repeated here):

| (91) | 2sg masc | 2sg fem | |
|---|---|---|---|
| a. | gɨdf | g$^y$ɨdf | 'stop the fast!' |
| b. | kɨtf | k$^y$ɨtf | 'chop (meat)!' |

This suggests that the analysis of the suffix as spreading the Coronal node, as first presented in Rose (1994a) is misguided, unless one were to assume that the medial alveolars were underspecified for Coronal in Muher. However, there is no premise for attributing this difference to underspecification, since the two dialects have almost identical inventories. In addition, in both dialects, medial alveolars are palatalized in roots whose final segment is /y/. In the examples in (92), a root √ft'y does not derive the expected *[fät'äyä-m], but rather [fäč'ä-m][24]:

| (92) | Root | Chaha | Muher | |
|---|---|---|---|---|
| | βky | bäk$^y$ä-m | bäkk$^y$ä-m | 'cry, mourn' |
| | ft'y | fäč'ä-m | fäčč'ä-m | 'grind flour' |
| | sqy | säq$^y$ä-m | säqq$^y$ä-m | 'squeeze into' |

[24] Adjacency is not violated here, since the [t'] and [y] of the root are adjacent.

If medial alveolars were underspecified, they should not support palatalization. Therefore, any use of underspecification to explain the difference between the two dialects is incompatible with other data.

Odden (1994) circumvents this problem by means of a parameter 'Transplanar Locality', part of three Adjacency Parameters he proposes:

(93) Transplanar Locality:

Nothing which separates the nodes dominating target and trigger may also dominate an element on the target tier.

If the target tier is defined as Coronal (although it is unclear why the tier should be Coronal if the target is velar), any Coronal node on either the C-place or V-place plane which intervenes will block the rule from applying, as is the case for Chaha. Because 'Transplanar Locality' is a parameter, it may be turned off. If it is inactive, then C-place coronals should not block the rule from applying. This is precisely the case of the Muher data in (91). Alveolar consonants should not block palatalization to their left. Front vowels should block palatalization of velars to their left in Muher, too, by normal locality considerations, as in (94a). Palato-alveolar consonants should behave like alveolars and not block, but (94b) shows that they do, posing a problem for Transplanar Locality:

(94) **Muher**

| | 2sg masc | 2sg fem | | |
|---|---|---|---|---|
| a. | mäggi | mäggi | *mägg$^y$i | 'burn!' |
| b. | qaš | qaš | *q$^y$aš | 'throw away!' |

One way around this is to argue that the palatoalveolar consonant is the result of fusing an alveolar with a palatal glide, like the verbs in (92). It is the palatal glide which blocks palatalization of the velar and not the palato-alveolar consonant.

While Transplanar Locality can account for the Muher data, its formalism is problematic. The Western Gurage data imposes a preferential hierarchy of possible realizations of the feminine suffix, as shown in section 2. This is repeated here with (95d) and (95e) added:

(95) **Hierarchy of hosts**

a. the final consonant is palatalized if palatalizable (velar or alveolar);

b. otherwise, a velar consonant is palatalized, unless (d)

c. otherwise, the vowel to the left of the final consonant is palatalized (fronted).

d. in velar-alveolar-labial roots, velar is palatalized in Muher, but the vowel is fronted in Chaha

e. /r/ shows the same patterns as other alveolars in Variant 1 of Chaha, but may be skipped over in medial position only in Variant 2 of Chaha.

These preferences are difficult to express under the type of rule-based approach sketched above. First, there must be implicit ordering between palatalization within the root and palatalization triggered by the suffix. In order for Transplanar Locality to work properly, the suffix must associate to an unpalatalized form such as /qasy/. The [y] of the stem must block the palatalization triggered by the suffix. This must occur before the [y] lodges onto the /s/ making it a non-blocking palato-alveolar. The /y/ and /i/ must fuse since final coronals always host the floating affix. Second, it is unclear how the floating segment ends up on the vowel in forms like [nɨzeβ]. Under the formulation in (93), the entire word must be scanned for an appropriate host before settling on the 'last resort' option to front a vowel. In this case, one is forced to conceive of palatalization as cyclic, or perhaps as several ordered rules applying succesively, whose non-applicability will be blocked by other constraints:

(96) i) Fuse Coronal with a Final Coronal

ii) Spread Coronal leftwards to a Velar

iii) Spread Coronal leftwards to a Vowel

Finally, the blocking approaches have difficulty capturing the variability of /r/. In Rose (1994a) I proposed that /r/ lacks a Coronal node in Chaha. The forms with fronted velars such as [$q^y$ɨrf] are permitted because there is no Coronal node on the medial /r/ to block spreading of the Coronal node from the suffix. Final /r/ is palatalized due to an adjacency constraint with the floating suffix, which forces non-labials to be palatalized stem-finally, even if they lack place specification. I considered the alternate vowel-fronting forms to be secondary and due to influence from another dialect. My original consultant seemed to prefer the palatalized velar forms. However, other Chaha consultants in Ethiopia point to a related dialect, Gura, to explain the palatalized velar forms, and consider the vowel-fronting forms to be primarily Chaha. Nevertheless, preference for one form over another seems to differ from consultant to consultant, and the variation is now an integral part of Chaha morphophonology.

The Coronal blocking approach outlined above relies on underspecification of the Coronal node to explain the behaviour of /r/, but underspecification must be determined according to certain well-defined motivation, i.e. contrasts, markedness or evidence from epenthesis. Current theories of underspecification are not equipped to handle variable underspecification, as would be required to fully explain the variable data. Under the

Optimality account I presented above, variation is a result of the compatibility of /r/ with palatalization, rather than different representations for /r/. I will also show in section 2.3.4.5 how the representational account fails to predict the right results for reduplicated /r/.

In Rose (1995b), I outline a different Optimality Theoretic solution to the problem of the feminine morpheme. This solution is similar to the one presented here, but the Muher / Chaha difference is captured with a transparency constraint:

(97) **NO TRANS-ALV** No transparent alveolars

This constraint would have to refer to the linear sequence of the input and compare it with the output, in much the same way as I proposed for Adjacent Markedness, but there is no direct connection between the transparency of alveolars and the fact that they are the optimal palatalization hosts. The transparency constraint prevents the suffix from skipping over a medial alveolar as in (98c) and being realized on the velar consonant. No Transparent Alveolars is ranked above a constraint against peripheral vowels (NO PER-V) in Chaha. The constraint FUSION=ADJ is the same as the Adjacency constraint I proposed above for Western Gurage:

(98) **Chaha**

| ktf -[i] | NO LAB$^y$ | FUS=ADJ | NO TR-ALV | NO PER-V |
|---|---|---|---|---|
| ☞ a. kɨtif | | | | * |
| b. kɨčɨf | | *! | | |
| c. k$^y$ɨtɨf | | | *! | |

In Muher, on the other hand, associating to the initial velar is preferred over producing a front vowel [i], and hence NO TR-ALV is ranked below NO PER-V:

(99) **Muher**

| ktf -[i] | NO LAB$^y$ | FUS=ADJ | NO PER-V | NO TR-ALV |
|---|---|---|---|---|
| a. kɨtif | | | *! | |
| b. kɨčɨf | | *! | | |
| ☞ c. k$^y$ɨtf | | | | * |

Thus the difference between the dialects amounts to a difference in constraint ranking. While the No Transparent Alveolars constraint can account for the data superficially, it is worth questioning its status. We do not want to just randomly stipulate consonants as being transparent. Do we find this constraint active in other languages? Paradis & Prunet (1989) argue that alveolar consonants are transparent in the West African languages Guere, Mau and Fula, as vowels on either side of alveolars are identical. Similarly, McCarthy (1994) shows that alveolar sonorants are transparent in Bedouin Arabic. However, a closer look at the cited cases for alveolar transparency reveals that only a subset of alveolars participate, namely the alveolar sonorants, and all the cases Paradis & Prunet discuss involve Morpheme Structure Conditions, which recently have been deemed poor arguments for synchronic representations (Paradis & Prunet 1993, Sandler 1991). Chaha thus seems to be the only case where alveolar obstruents are transparent.

The role of No Transparent Alveolars becomes even murkier when we examine the treatment of /r/. As discussed above, in Muher, /r/ is ignored in the same manner as labials. In Chaha, however, the /r/ is palatalized in final position, but when in medial position, it may be skipped to allow palatalization of an initial velar, or the vowel may be fronted:

| (100) | | 2sg masc | 2sg fem | |
|---|---|---|---|---|
| | a. | xɨräm | x$^{y}$ɨräm *or* xɨrem | 'spend a year!' |
| | b. | qɨrf | q$^{y}$ɨrf *or* qɨrif | 'knock down!' |

Working these data into the Optimality account requires two constraints: No Transparent Alveolar Obstruents and No Transparent Alveolar Sonorants. With no universal specification as to their ranking, however, this predicts that we may find languages where alveolar obstruents are transparent but alveolar sonorants are not. No such cases are known to me, although we do find the reverse (i.e. Bedouin Arabic). In addition, it requires that No Per-V and No Transparent Alveolar Sonorants may be unranked with respect to each other in Chaha to allow for both forms.

In conclusion, while both of these alternative analyses arrive at a comprehensive degree of explanation, they do not satisfactorily explain the full range of variability found in Chaha nor sufficiently motivate the 'transparency' of alveolar obstruents. In contrast, the solution I have proposed with potential anchors captures the hierarchy of possible hosts and elegantly explains the variability with respect to /r/.[25]

In order to complete this section, I will show how the data in which the stems end in palatoalveolars or front vowels can be easily handled under the analysis developed in this chapter. The data are repeated here:

[25] In Rose (to appear a), I proposed Anchor constraints pertaining specifically to vowel and consonant 'hosts'. In the present analysis, this has been captured by using the palatalization hierarchy and adjacency.

(101) **Chaha**

| | 2sg masc | 2sg fem | | |
|---|---|---|---|---|
| a. | qaš | qaš | *$q^y$aš | 'throw away!' |
| b. | xi | xi | *$x^y$i | 'make a hole!' |
| c. | äqe | äqe | *ä$q^y$e | 'crunch!' |

**Muher**

| | 2sg masc | 2sg fem | | |
|---|---|---|---|---|
| d. | mäggi | mäggi | *mä$gg^y$i | 'burn!' |
| e. | qaš | qaš | *$q^y$aš | 'throw away!' |

As proposed in Rose (1992), it is not that the palatal segments are blocking palatalization of the velar, but rather that the morpheme is vacuously realized. Since the stem already ends in a palatalized segment, adding another palatalization does not alter the segment. Skipping over it, though, would violate Adjacent Markedness. I provide subscripts to show the correspondence relationships:

(102)

| qa$s_1y_2$ -$i_3$ | Adjacent Markedness | Anchor Root |
|---|---|---|
| a. $q^y{}_3$a$š_{12}$ | *! | |
| ☞ b. qa$š_{123}$ | | |
| c. q$e_3$$š_{12}$ | *! | * |

Anchor Root is violated in (102c) since the -i has palatalized the vowel instead of the consonant (the palatalization of the consonant is due to the [y] of the root).

In conclusion, previous analyses of the Chaha feminine suffix founder in the face of related data from Muher, unless an additional locality parameter is invoked. However, unusual rule ordering is still required (i.e. palatalization from a suffix before palatalization inside the stem), and problems arise with respect to the variability of /r/. Similarly, OT analyses which propose transparency constraints do little more than describe the data. The OT analysis argued for in this chapter not only offers a superior account of the Chaha data, but does so with constraints motivated for related languages, such as Harari and Amharic. The analysis of the variable forms is also a significant improvement over an analysis which relies on variable structural specification, because there is an explanation behind skipping /r/: its treatment as a host in the palatalization hierarchy. Chaha appears to be undergoing a shift, from /r/ being treated as a better host than velar, to it being treated as a worse or equal host to velar. This is in fact alluded to by consultants - that the vowel fronting forms (/r/ > velar) are more 'Chaha', and the velar palatalization forms (velar, /r/) are a secondary development. This would also explain why Muher has no vowel-fronting forms whereas Chaha does. If xɨrem and $x^y$ɨräm are equally good candidates, why doesn't Muher also have both? The speculation is that the Chaha system is moving towards a system where /r/ is being considered a bad host (see Rose (to appear a) for more on the development of this variation).

### 2.3.4.5 Reduplication

The 2sf morpheme interacts with reduplicated forms in interesting ways. This will be discussed in greater detail in chapter three, but here I wish to provide further support for my analysis of /r/ palatalization. Ethio-Semitic languages have three patterns of reduplication, illustrated by the Chaha examples in (103):

| (103) | | Root | | |
|---|---|---|---|---|
| (a) | Doubling of the final consonant: | sd | sɨdɨd | 'chase!' |
| | | βrg | bärgɨg | 'bolt!' |
| (b) | Internal reduplication | sβr | sɨβäβɨr | 'break in pieces!' |
| (c) | Total copy | km | kämkɨm | 'trim by clipping!' |

In 2sf forms with these kind of roots, we expect either the rightmost or final consonant to be palatalized, or both. Within South Ethio-Semitic, there is language variation. In Amharic and Harari, only the second of the two consonants is palatalized. In Western Gurage, both the final root consonant and its reduplicant are palatalized. Some representative examples of biliteral roots with final consonant doubling are given in (104). The second consonant is the reduplicant:

(104) **Amharic**

| | 2sg masc | 2sg fem | |
|---|---|---|---|
| a. | ɨzäz | ɨzäž | 'order!' |
| b. | dasɨs | dasɨš | 'touch, caress!' |

**Chaha**

| | 2sg masc | 2sg fem | |
|---|---|---|---|
| c. | nɨzäz | nɨžäž | 'dream!' |
| d. | sɨkɨk | $s ɨ k^{y} ɨ k^{y}$ | 'stick in/up!' |

I will not be discussing the other cases of double palatalization or labialization which occur with triliteral roots or the internal or total copy cases illustrated above in this chapter. See McCarthy (1983) and chapter 3 for more details on these cases.

In McCarthy (1986a), the difference between Amharic and Chaha was related to a difference in rule ordering. In his theory, consonants and vowels are arrayed on separate tiers. Reduplicated roots of the kind given in (104) involve double-linking of a single consonant to two skeletal slots, as shown in (105). In Chaha, the floating suffix [+high, -back] palatalizes the doubly-linked consonant:

```
(105)
        s      d---- [+high, -back]        s      j
        |     / \              |                 / \
        C  v  C  v  C                -->   C  v  C  v  C
```

Tier Conflation, the mechanism which aligns consonant and vowel tiers, then applies:

```
(106)   s     j     j
        |     |     |
        C  v  C  v  C
```

In Amharic on the other hand, Tier Conflation applies before palatalization. When palatalization takes place, it affects only the final consonant, since the two consonants are no longer linked:

```
(107)   s     d     d-----[+high, -back]
        |     |     |
        C  v  C  v  C                          --> [sɨdäj]
```

The difference in orderings is attributed to a difference between levels. McCarthy claims that Chaha palatalization is morphological, whereas Amharic is phonological. In fact, Amharic palatalization only occurs in specific morphological categories, such as the 2sf or the agentive, and is therefore not purely phonological.[26] In addition, in some dialects, the triggering suffix is no longer present, putting it on a par with Chaha palatalization, in that

[26] In some dialects of Amharic, there is an off-glide before all front vowels.

both lack an overt suffix. As I show in Rose (1994a), even if the mechanism of Tier Conflation is utilized, additional facts from Chaha, notably the fact that vowels may also be affected by the 2sf morpheme, force the conclusion that palatalization occurs after the tiers are aligned.

In Optimality Theory, Tier Conflation is a problematic derivational tool. Concatenation of morphemes in Semitic may proceed according to syllabification constraints and templatic association, but it does not require sustained separation of consonants and vowels. Furthermore, Rose (1992) and Prunet (1996b) show how vocalic segments may constitute part of the root in Gurage. Yet, for purposes of 2sf palatalization they count as vowels and not as 'root' segments. I will provide additional arguments in Chapter 3 against Tier Conflation and against the representation of doubling verbs as doubly-linked long-distance geminates. For the purposes of this section, these kinds of verbs will be treated as reduplication, albeit lacking a morphological function. Reduplication occurs to satisfy the templatic requirement that verb stems be of a certain size and shape (see chapter 3).

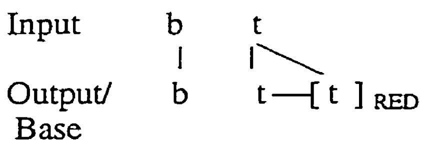
In the approach to reduplication outlined in McCarthy & Prince (1995), constraints hold between the base and reduplicant requiring them to be identical. These may in turn be dominated by other kinds of phonological or morphological constraints which may hinder this identity. For example, some languages may impose identity between the input and output base. Since the palatalization in Amharic and Chaha is triggered by the same suffix, and is not postlexical, whether it affects both base and reduplicant consonant should not be attributed to a difference in levels, but rather to a difference in constraint ranking. The relevant constraints are given in (108), where the palatalizing feature is expressed as the feature [front] for convenience:

(108) **IDENT$_{B\text{-}R}$[front]** Correspondent base and reduplicant segments must agree in the feature [front]

**IDENT$_{I\text{-}O}$[front]** Correspondent input and output segments must agree in the feature [front]

Following standard assumptions about left-to-right association of root to template (McCarthy 1979), the second of the two identical consonants in a verb form such as bätit 'be wide' would be considered the reduplicant, since it fills in the template. The following diagram illustrates the relationships between the input, base and reduplicant. The input-output relationship is shown by the connection between the input /t/ and the first output [t]. The base-reduplicant relationship holds between the two output [t]s and the third relationship between the input /t/ and the second output [t] is a relationship of input-reduplicant:

(109)




I follow Urbanczyk (1996) and McCarthy & Prince (1995)[27] in assuming that there are three different relationships entailing between the segments. If the first /t/ is palatalized, this incurs a violation of Input-Output, but if the second [t] is palatalized, this would incur a violation of Input-Reduplicant. This is contrary the position in Orgun (1995), who allows both base and reduplicant to correspond to the input as part of the same relationship. In Amharic, IDENT$_{I\text{-}O}$ is ranked over IDENT$_{B\text{-}R}$. It is more important to maintain the identity between the input and its output correspondent than between the base and reduplicant. In the candidates, the reduplicant is underlined:

[27] McCarthy & Prince acknowledge the Input-Reduplicant relationship but do not discuss it in detail.

(110) **Amharic**

| das -i | Adjacency | Anchor | $\text{IDENT}_{\text{I-O}}$ | $\text{IDENT}_{\text{B-R}}$ |
|---|---|---|---|---|
| a. dasɨs̲(i) | | *! | | |
| b. dašɨs̲(i) | *! | | * | * |
| ☞ c. dasɨš̲(i) | | | | * |
| d. dašɨš̲(i) | | | *! | |

In Chaha, $\text{IDENT}_{\text{B-R}}$ is ranked above $\text{IDENT}_{\text{I-O}}$, ensuring that the consonants are identical even when palatalized[28]:

(111) **Chaha**

| βät - i | Adjacency | Anchor | $\text{IDENT}_{\text{B-R}}$ | $\text{IDENT}_{\text{I-O}}$ |
|---|---|---|---|---|
| a. bätɨt̲ | | *! | | |
| b. bäčɨt̲ | *! | | * | * |
| c. bätɨč̲ | | | *! | |
| ☞ d. bäčɨč̲ | | | | * |

This palatalization overapplication is very similar to the one in Hausa participles (McCarthy 1986a, Orgun 1995) where both the base and reduplicant are palatalized, even though the reduplicant only occurs in the relevant pre-front vowel position: /fasasee/ is realized [fašašee] 'broken'. The difference between these cases and the Hausa case is that in Hausa, palatalization is purely phonological and has an overt trigger. One unanswered question is whether the overapplication seen in Chaha has any connection to the lack of an overt suffix; there might be a limit on how many Integrity violations are permitted, for example.

[28] I assume that Adjacency is violated in candidate (111b), even though strictly speaking the reduplicant is not present in the output. Either way, the result is the same, because of the high ranking of $\text{IDENT}_{\text{B-R}}$.

I now turn to cases involving palatalization of /r/. In Amharic, Harari and Muher, /r/ is never palatalized. However, in Chaha, as we have seen, it is palatalized in final position, but always realized as a vowel representing the fusion of /r/ /i/ and base vowel. In reduplication cases, contrary to the other consonants, palatalization does <u>not</u> extend to the first /r/:

(112) <u>2sg masc</u> <u>2sg fem</u>

a. qɨrär qɨre *qɨye 'be light!'

b. zärɨr zäri *zäyi 'block the view with a curtain!'

The constraint against IDENT$_{I\text{-}O}$ pertaining to /r/ must be ranked above IDENT$_{B\text{-}R}$ to explain the fact that double palatalization does not occur. While IDENT$_{I\text{-}O}$-r played a large role in Muher morphophonology, it played little role in Chaha until these reduplication cases.

(113)

| qrä | Anchor | IDENT$_{I\text{-}O}$-r | IDENT$_{B\text{-}R}$ | IDENT$_{I\text{-}O}$ |
|---|---|---|---|---|
| a. qɨrer | *! | | | |
| ☞ b. qɨre | | * | | |
| c. qɨye | | **! | | * |

The reduplication data highlight that /r/ only undergoes palatalization to ensure satisfaction of Anchor, but otherwise resists it.

In a purely rule-based feature-geometric analysis, this is extremely difficult to capture. First, a decision has to be made regarding the Coronal specification of /r/. In Rose

(1994a) I proposed that consonants were linked at the Place node only when palatalization takes place. If /r/ is underspecified for Place, then it follows that only one half will be palatalized, since it is not linked:

(114)


However, this analysis only accounts for Variant 2, which allows initial palatalization over a medial /r/. If Variant 1 is considered, in which medial /r/ blocks initial palatalization, we must assume that /r/ has a Place and Coronal node in order to account for the blocking of initial palatalization (qɨrf --> qɨrif). This in turn predicts that in reduplication, both halves should be palatalized since they would be linked at the Place node. But this is not the case. Even in Variant 1, palatalization of /r/ only occurs in final position. The following chart sums up the facts:

| (115) | **Variant 1** | specified for Place predicts ---> | | |
|---|---|---|---|---|
| | | <u>2sm</u> | <u>2sf</u> | |
| | Blocking | qɨrf | qɨrif | |
| | Double pal. | qɨrär | *qɨye | (actual form qɨre) |

| **Variant 2** | unspecified for Place predicts --> | |
|---|---|---|
| | <u>2sm</u> | <u>2sf</u> |
| No blocking | qɨrf | $q^{y}$ɨrf |
| Single pal. | qɨrär | qɨre |

There is no correlation between the underspecification of /r/ and double palatalization. There is no variability with respect to palatalization of medial /r/ in reduplicated forms - it is never palatalized in either dialect. The violable constraints of Optimality capture just this effect, because there is nothing hinging on the specification of /r/, but only on its position. The reduplicated forms provide an argument against a purely representational account of the behaviour or /r/, which makes inaccurate predictions for the variant behavior of /r/ in Chaha.

### 2.3.4.6. Multiple Exponence

In this section I will introduce a constraint, Morphological Expression, which will be used to deal with cases of multiple exponence of morphological categories. There are two cases of multiple exponence involving the 2sf which lead to outputs which avoid the peripheral vowel [i] or [e] in Muher. These cases are 'a-final' verbs and the 2sf imperfective aspect or present tense in Muher.

#### 2.3.4.6.1. 'a-final' verbs

Verbs known as 'a-final' are a set of irregular verbs which, instead of having a final third consonant, have a vowel [a]. Historically, the [a] is the residue of lowered vowels found in the environment of guttural consonants, which are now lost in Western Gurage (with the exception of glottal stop in some dialects of Peripheral Western Gurage, such as Inor and Gyeta)[29] A comparison with related roots in Ge'ez (Classical Ethiopic) shows the connection with [a] in all positions of the root:

| (116) | Ge'ez | Inor | Chaha | |
|---|---|---|---|---|
| a. | bälʕa | bänʔa | bäna | 'ate' |
| b. | kälʕa | xänʔa | xäna | 'refused' |
| c. | ħakakä | akäkä | akäkä | 'scratch' |
| d. | ʕaqädä | agädä | agädä | 'tie' |
| e. | käʕabä | xaʔabä | xabä | 'do again'<br>'make double (Ge'ez)' |

These verbs behave in a similar manner to the regular, triliteral verbs discussed in previous sections. Final coronals are palatalized, although they are not in absolute stem final position. Rightmost velars may also be palatalized. In addition, in the feminine form, the final /a/ is raised to [ä]. The examples are from Chaha, but the data are valid for Muher, too:

| (117) | 2smasc | 2sfem | |
|---|---|---|---|
| a. | qɨt'a | qɨč'ä | 'punish!' |
| b. | nɨsa | nɨšä | 'lift, pick up!' |
| c. | fɨka | fɨk$^y$ä | 'go away!' |
| d. | wɨga | wɨg$^y$ä | 'pierce!' |
| e. | qɨβa | q$^y$ɨβä | 'smear' |
| f. | gɨβa | g$^y$ɨβä | 'enter!' |

[29]Prunet (1996b) analyzes these [a] as consonantal 'guttural vowels' since they act as root consonants in terms of verbal paradigms.

Once again, we find a difference between Chaha and Muher. If palatalization cannot occur, due to lack of appropriate anchors, fronting of the first vowel takes place in Chaha, but not in Muher, as shown in (118):[30]

(118) **Chaha**

| | 2smasc | 2sfem | |
|---|---|---|---|
| a. | dɨfa | difä | 'turn on its side!' |
| b. | sɨma | simä | 'listen!' |

**Muher**

| | 2smasc | 2sfem | |
|---|---|---|---|
| c. | tɨfa | tɨfä | 'slap, flatten!' |
| d. | sɨma | sɨmä | 'listen!' |

The raising of the final vowel is in fact not an exclusive property of 2sf forms. In Muher, it occurs in the 2nd and 3rd plural forms of the imperfective and jussive and in the 3rd plural forms of the perfective (Note: /a+i/ --> [e] and /a+u/ --> [o]). In the examples in (119), the raised vowel is highlighted and underlined. The final suffixes in perfective and imperfective are tense markers:

[30] Leslau (1981) has [ɛ] in final position of 2sf: [sɨmɛ], reflecting the fusion of /a/ with /-i/. My consultants reject this pronunciation.

(119) **Muher**

| | PERFECTIVE | IMPERFECTIVE | JUSSIVE |
|---|---|---|---|
| | /-m/ | /-u, -t, -i/ | |
| 1s | gäbba-xu-m | ä-gäβa-u | nɨ-gβa |
| 2sm | gäbba-xä-m | tɨ-gäβa-u | gɨβa |
| 2sf | gäbba-x$^{y}$-m | tɨ-g$^{y}$äβä-t | g$^{y}$ɨβä |
| 3sm | gäbba-m | yɨ-gäβa-u | yä-gβa |
| 3sf | gäbba-čč-m | tɨ-gäβa-i | tɨ-gβa |
| 1p | gäbba-nä-m | nɨ-gäβa-nä-u | nɨ-gβa-nä |
| 2pm | gäbba-xm$^{w}$-m | tɨ-gäβä-m$^{w}$-t | gɨβä-m$^{w}$ |
| 2pf | gäbba-xma-m | tɨ-gäβä-ma-t | gɨβä-ma |
| 3pm | gäbbä-m$^{w}$-m | yɨ-gäβä-m$^{w}$-t | yä-gβä-m$^{w}$ |
| 3pf | gäbbä-ma-m | yɨ-gäβä-ma-t | yä-gβä-ma |

In Chaha, the equivalent forms show no correspondent of /a/ whatsoever. However, the plural suffixes in Chaha are vowel-initial, /-o/ (masc. plural) and /-äma/ (fem. plural):

| (120) | PERFECT | IMPERFECT | JUSSIVE |
|---|---|---|---|
| 1p | gäpa-nä-m | nɨ-gäβa-nä | nɨ-gβa-nä |
| 2pm | gäpa-xu-m | tɨ-gäβ-o | gɨβ-o |
| 2pf | gäpa-xma-m | tɨ-gäβ-äma | gɨβ-äma |
| 3pm | gäp-o-m | yɨ-gäβ-o | yä-gβ-o |
| 3pf | gäp-äma-m | yɨ-gäβ-äma | yä-gβ-äma |

Chaha does not tolerate vowel hiatus. If the vowel-initial affixes are added to a vowel-final stem, the vowel sequence would be repaired by either coalescence or glide formation. The following are regular repairs of similar vowel sequences in Chaha:

(121)

| | | | | | | |
|---|---|---|---|---|---|---|
| a + V | a + o | --> | [o] | märkama + o | märkamo | 'O beautiful one' |
| | a + ä | --> | [a] | aβa + äna | aβanä | 'my father' |
| ä + V | ä + o | --> | [o] | danä + o | dano | 'O judge' |
| | ä + ä | --> | [ä] | bɨq$^{w}$ɨrä + äna | bɨq$^{w}$ɨräna | 'my mule' |

Only the verb stem with a shape CVCä in the 2nd and 3rd plural forms would be consistent with the general patterns of resolving hiatus in the language. While the resolution of either [ä] or [a] + [o] is consistently [o], if the final vowel of the stem had the shape CVCa, the resulting 3rd person plural feminine forms should be *yɨgäβama not yɨgäβäma. Only a stem ending in the vowel [ä] would produce the correct output. This suggests that in Chaha, also, the CVCä shape is found in the same persons as in Muher.

In the plural forms, the affixes serve to indicate person. The following basic interpretations are given for Muher:

(122)

| | | | | | |
|---|---|---|---|---|---|
| tɨ- | = | 2nd person | -m$^{w}$ | = | masculine plural |
| yɨ- | = | 3rd person | -ma | = | feminine plural |

In the absence of these affixes, and in the absence of palatalization or vowel fronting, the raising of the vowel to [ä] actually *expresses* 2sfem. In other words, the contrast between 2smasc and 2sfem in Muher is indicated by [ä]: dɨfa vs. dɨfä. In Chaha, the difference is always expressed by two properties, the raising of the vowel and palatalization or fronting of the first vowel.

We must consider why in Muher the 2sf /-i/ is not realized, but in Chaha it is realized as fronting of the first vowel. Avoidance of vowel fronting is captured by the following constraint:

(123) **NO PER-V** No peripheral vowels (i e o u)[31]

NO PER-V is based on the observation that peripheral vowels are rare in Ethio-Semitic, and in Western Gurage usually result from the merger of glides with central vowels. While this might seem counterintuitive to treat vowels like /i/ or /e/ as undesirable, Flemming (1995a) offers an interesting explanation. He argues that vowel systems have conflicting goals: i) maximize the number of contrasts, ii) maximize the distinctiveness of contrasts, and iii) minimize articulatory effort. He notes that central vowels are uncommon in front-back contrasts, due to the constraint on maximizing F2 distinctiveness. But, central vowels are usual in the absence of such contrasts. In vertical vowel systems (Caucasian languages, Marshallese and possibly Ethio-Semitic), therefore, minimizing articulatory effort appears more important than maximizing distinctiveness, and peripheral vowels will be avoided. While Flemming proposes a range of comparative maximize/minimize constraints to account for contrasts in vowel systems, for the purposes of this paper, the constraint NO PER-V will suffice. The only evidence that the constraint might be positionally restricted is that word-final peripheral vowels are common. In Tigrinya, word-final /ä/ is fronted and a final epenthetic vowel is [i] not [ɨ]. But, in verbal paradigms, the vowels [a] and [ä] are the major indicators of aspect. The back vowels do not occur except when central vowels are rounded adjacent to labialized consonants, and the front only in Type B verbs in certain languages.[32] NO PER-V is ranked with respect to another constraint $MAX_{I\text{-}O}$:

---

[31] This could abbreviate for a family of constraints, ie No [i], No [o], etc. On a markedness scale, peripheral vowels are marked with respect to central vowels, and if translated into the Place feature markedness hierarchy (Prince & Smolensky 1993, McCarthy et al 1996), central vowels which lack place features (Clements 1991, Rose 1993) would rank below all others.

[32] The only exception to this is Harari, which has epenthetic [i] instead of the usual [ɨ].

(124) **$MAX_{I\text{-}O}$** Every segment of the input must correspond to a segment in the output

In Muher, the $MAX_{I\text{-}O}$ constraint is ranked below No Peripheral Vowels. If this is the correct ranking, then why are vowels fronted at all in regular verbs in Muher? Why is it only in a-final verbs, that vowel fronting is suppressed? Only in a-final verbs is there another means of expressing the morphological category of 2sf - by the raising of the final vowel. So, even though the 2sf /-i/ suffix itself is not realized, the category of 2sf is expressed. This is due to the constraint Morphological Expression:

(125) **Morphological Expression** An input morphological category must be expressed in the output

The Muher forms with final raising satisfy Morphological Expression, even though they violate $MAX_{I\text{-}O}$. Importantly, Morphological Expression does not refer directly to the /-i/ suffix, but to the category 2sf, and will be satisfied by any means of expessing the 2sf as distinct from other forms, in this case, by the raised vowel:

(126) **Muher** No Per V » $MAX_{I\text{-}O}$

| sma -i | Morphological Expression | NO PER-V | $MAX_{I\text{-}O}$ |
|---|---|---|---|
| ☞ a. sɨmä | | | * |
| b. simä | | * ! | |

In Chaha, $MAX_{I\text{-}O}$ must be ranked above No Peripheral Vowel since the suffix vowel /-i/ is realized in the output despite violating the ban on peripheral vowels:

(127) **Chaha** $MAX_{I\text{-}O}$ » No Per V

| sma -i | Morphological Expression | $MAX_{I\text{-}O}$ | NO PER-V |
|---|---|---|---|
| a. sɨmä | | *! | |
| ☞ d. simä | | | * |

If we compare the 'a-final' verbs with a regular triliteral verb in Muher, Morphological Expression will not be satisfied unless a vowel is fronted. This is because there is no other means to satisfy Morphological Expression than by vowel fronting:

(128) **Muher**

| sdβ -i | Morphological Expression | Adjacency | NO PER-V | $MAX_{I\text{-}O}$ |
|---|---|---|---|---|
| a. šɨdɨβ | | *! | | |
| b. sɨjɨβ | | *! | | |
| c. sɨdɨβ | *! | | | * |
| ☞ d. sɨdiβ | | | * | |

All the candidates considered in (126) and (127) have a final raised vowel [ä]. To ensure that this vowel and no other is found, a constraint is required, which I label Allomorph[33]:

[33] This constraint may be overridden when there are vowel-initial suffixes such as the 3ms object marker /-i/; such suffixes will cause the final vowel to delete or to fuse with them. However, when fused, the vowel will be mid and not low.

(129) **Allomorph** Given verb stem allomorphs {CCa and CCä}, 2sf requires CCä in output

While Optimality Theory assumes that all constraints are universal, there must be language specific, usually morphologically related constraints which are not.[34] While there may be an underlying historical explanation for such an allomorph, synchronically, it is a learned alternation, and simply must be specified in the grammar. This constraint will rule out the possibility of the final vowel being fronted to [ɛ], or being realized as [a]. I illustrate this for Chaha which has vowel fronting of the first vowel, even though this would violate the constraint Anchor μ, requiring association of 2sf to the final templatic vowel position. Anchor μ needs to be ranked below Allomorph, but above No Per-V in order to account for regular vowel-fronted forms.

(130)

| sma -i | Allomorph CCä | Morph. Expression | $MAX_{I-O}$ | Anchor μ | NO PER-V |
|---|---|---|---|---|---|
| a. sɨmä | | | *! | * | |
| b. sɨmɛ | *! | | | | * |
| c. sɨma | *! | * | * | * | |
| ☞ d. sɨmä | | | | * | * |

It is worth noting that the realization of /-i/ in other positions besides between the first two consonants would incur violations of other undominated constraints:

[34] This is an example of a language-particular constraint with no claim on universality. As I mentioned in Chapter 1, the theory should allow room for language specific constraints of this type which are generally due to morphological idiosyncracies.

(131) sɨmä.i No V hiatus

sɨmäy No glides in codas

Finally, I will show why palatalization occurs in 'a-final' verbs with coronals and velars. Coronals may be palatalized if they are the rightmost consonant in the root, even though they are not the final root segment. The final root segment is the vowel [a]. Adjacency is not violated in candidate (132c) as no *consonants* (α-elements) intervene between the palatalized consonant and the suffix. Adjacent Markedness is also not violated in (132c), since the constraint references intervening consonants on the palatalization hierarchy. Since only consonants are on the scale, it is only violated if consonants intervene. The following ranking of Adjacent Markedness and Anchor Root is that found in Chaha, but the same result obtains for Muher if these two constraints are reversed:

(132)

| qta -i | Adjacency | Adjacent Markedness | Anchor Root |
|---|---|---|---|
| a. qɨtä | | *! | |
| b. $q^y$ɨtä | | * ! | |
| ☞ c. qɨčä | | | |

In conclusion, the Muher / Chaha difference in a-final verbs is related to the relatively high-ranking of No Peripheral Vowels in Muher and the interpretation of the Morphological Expression constraint. This constraint refers to morphosyntactic features, and ensures that these features (in this case 2sf) are expressed somewhere in the output. In cases of multiple exponence, some expressions of the morpheme may be suppressed if they violate other constraints. I now turn to the other case of multiple exponence in Muher which has suppression of the suffix /-i/ if it were to be realized as a vowel.

### 2.3.4.6.2. Present tense

Muher has verb suffixes in the imperfective verb form which have been labelled Main Verb Markers (Hetzron 1968, 1977), as they do not appear in relative clauses. However, I consider these suffixes to be present tense markers for two reasons. First, they have exactly the same distribution as all tense markers (future and past) in that they do not appear in relative clauses or in the negative. Second, their position on the verb in final position is exactly that of the other tense markers. There is considerable allomorphy with respect to the present tense marker. As shown in the following chart, it is [-u] (or [-w] following vowel-final stems) in 1s, 2sm, 3sm and 1p. It is [-t] in 2sf, 2pm, 2pf, 3pm and 3pf, and [-i] in 3sf. If object markers are added between the subject suffixes and the present tense marker, its realization may also be affected (see Hetzron 1977 and Rose (1996c)). In the following conjugation, the present tense allomorphs are illustrated:

(133) **Imperfective Muher conjugation for verb kft 'to open'**

| | | | |
|---|---|---|---|
| 1s | nɨ-käft-u | 1p | nɨ-käft-nä-w |
| 2sm | **tɨ-käft-u** | 2pm | tɨ-käft-m$^w$-t |
| 2sf | **tɨ-käfč-t** | 2pf | tɨ-käft-ma-t |
| 3sm | yɨ-käft-u | 3pm | yɨ-käft-m$^w$-t |
| 3sf | tɨ-käft-i | 3pf | yɨ-käft-ma-t |

It turns out that this allomorphy has a very important role to play in the realization of the 2sf /-i/ suffix. In a verb where we would expect vowel fronting (a root with final labial or /r/ and no velars), none occurs in the imperfect:

| (134) | 2smasc. | 2sfem. | | |
|---|---|---|---|---|
| | tɨ-nädf-u | tɨ-nädf-ɨt | *tɨ-näd**i**f-t | 'you sting' |
| | tɨ-säβr-u | tɨ-säβr-ɨt | *tɨ-säβ**i**r-t | 'you break' |
| | tɨ-sädβ-u | tɨ-sädβ-ɨt | *tɨ-säd**i**β-t | 'you curse' |

In the negative imperfect, the final present tense suffix is not present. In these forms, vowel fronting does occur. Similarly, the imperative has no other suffixes, and vowel fronting takes place:

| (135) | | 2nd sg. masc. | 2nd sg. fem |
|---|---|---|---|
| a. | Negative Imperfect | a-tt-sädɨβ | a-tt-säd**i**β |
| | | a-tt-säβɨr | a-tt-säβ**i**r |
| b. | Imperative | sɨdɨβ | sɨd**i**β |
| | | sɨβɨr | sɨβ**i**r |

The 2nd person singular present tense markers have different allomorphs: the 2smasculine is [-u] and the 2sfeminine is [-t]. This allomorphic difference sufficiently conveys the morphological category of 2nd singular feminine from 2nd singular masculine and satisfies Morphological Expression. As a result, vowel fronting can be supressed as a means of expressing the same category, just as it was in the a-final verbs. This is shown in (136); Anchor-μ must be ranked at least below No Peripheral Vowels to explain these forms:

(136) **Muher Imperfect**

| t-sädβ-i-t | Morph Expr | NO PER-V | $MAX_{I-O}$ | Anchor μ |
|---|---|---|---|---|
| a. tɨ-sädiβ-t | | *! | | |
| ☞ b. tɨ-sädβ-ɨt | | | * | * |

The negative imperfective and imperative lack the present tense morpheme; the distinction between masculine and feminine must therefore be realized another way: by the /-i/ suffix. This is again due to Morphological Expression:

(137) **Muher Negative Imperfective** (no suffix)

| a-tt-sädβ -i | Morph Expr | NO PER-V | $MAX_{I-O}$ | Anchor μ |
|---|---|---|---|---|
| ☞ a. a-tt-sädiβ | | * | | |
| b. a-tt-sädɨβ | *! | | * | * |

(138) **Muher Imperative**

| sdβ -i | Morph Expr | NO PER-V | $MAX_{I-O}$ | Anchor μ |
|---|---|---|---|---|
| ☞ a. sɨdiβ | | * | | |
| b. sɨdɨβ | *! | | * | * |

The constraint requiring the morphosyntactic features 2sf to be expressed in the output allows for front vowels to be suppressed as a means of expressing 2sf in cases of multiple exponence of this morphological category. Chaha lacks these present tense markers and therefore always has front vowels in these kinds of verbs. This analysis makes the interesting prediction that if a mobile affix is the only means of expressing the morphological category, then it will be more likely to show up within the stem and violate another constraint than remain unparsed.

## 2.4. Western Gurage Impersonal

Two simultaneous cases of mobile morphology in Western Gurage are found in the Impersonal verb form. This is a special subject-less verb form which can be conjugated in perfective, imperfective and jussive forms and has the subject interpretation 'one'. In non-perfective forms, it takes the 3rd person prefix /y-/ or /yä-/, but it has no subject suffix endings. Instead, when no other object marker occurs, the impersonal obligatorily carries the 3rd masculine singular 'Heavy' object /-i/, even with intransitive verbs.[35] The Impersonal has been the subject of a number of papers, beginning with Leslau's (1967) descriptive study, and in the generative literature in McCarthy (1983), Lieber (1988), Elmedlaoui (1992), Rose (1992, 1994b). The Impersonal is characterized by both palatalization and labialization. Palatalization affects the final coronal obstruent of the root, whereas labialization, like the 3rd masculine singular object marker in Chaha, affects the rightmost labial or velar consonant. Some representative examples from Chaha and Muher are given in (139):

[35] The Light/Heavy object distinction refers to allomorphy conditioned by the subject markers. See Polotsky (1938), Hetzron (1977).

(139)

| Root | | Chaha | | Muher | |
|---|---|---|---|---|---|
| sbr | a. | sä**p**$^{w}$är-i-m | b. | sä**bb**$^{w}$är-i-m | 'one broke' |
| srt' | c. | sän**č'**-i-m | d. | särrä**č'**-i-m | 'one forced through' |
| mkr | e. | mä**k**$^{w}$är-i-m | f. | mä**kk**$^{w}$är-i-m | 'one advised' |
| drg | g. | dänä**g**$^{w}$-i-m | h. | därrä**g**$^{w}$-i-m | 'one hit' |
| rt'r | i. | nät'är-i-m | j. | nätt'är-i-m | 'one melted' |
| kft | k. | kä**f**$^{w}$ä**č**-i-m | l. | käffä**č**-i-m | 'one opened' |
| rmd | m. | nä**m**$^{w}$ä**j**-i-m | n. | nämmä**j**-i-m | 'one loved' |

When no hosts for either labialization or palatalization are found, vowels remain unaffected, as seen in (139i-j). The major difference between Chaha and Muher Impersonals is seen in examples (139k-n). Chaha allows both labialization and palatalization, but Muher only has palatalization. A further difference between the two dialects is seen in (140). Muher labialization cannot affect the first consonant of the root:

(140)

| | | Chaha | | Muher | |
|---|---|---|---|---|---|
| br | a. | **b**$^{w}$änär-i-m | b. | bärrär-i-m | 'one flew away' |

The same pattern is found with the 3ms Light object marker in Muher, which has palatalization or labialization and gemination (recall from §2.1, example (1) that the 3ms Light object marker in Chaha is labialization plus /-n/):

(141)

| | | | | |
|---|---|---|---|---|
| | | **Imperfective** | **Imperative** | |
| a. | kft | tɨ-käfɨčč-t | kɨfɨčč | '(you) open it' |
| b. | nks | tɨ-näkɨšš-t | nɨkɨšš | '(you) bite it' |
| c. | btx | tɨ-βätɨx$^{w}$-t | bɨtɨx$^{w}$ | '(you) dig it up' |
| d. | nfq | tɨ-näfɨqq$^{w}$-t | nɨfɨqq$^{w}$ | '(you) break off' |
| e. | ktf | tɨ-kätɨff$^{w}$-t | kɨtɨff$^{w}$ | '(you) chop it' |
| f. | sbr | tɨ-säwɨrr-t | sɨwɨrr | '(you) break it' |

I claim that the Impersonal (and the Muher 3ms Light object marker) is characterized by a discontinuous suffix composed of two parts: /-u..-i/. While it might appear as if the overt 3ms Heavy /-i/ suffix is responsible for the palatalization, palatalization still occurs even in forms with a different object marker, as shown by the following Muher examples:

| | | |
|---|---|---|
| (142) | nämmäd-ä-m | 'he loved' |
| | nämmäj-**nnä**-m | 'one loved us' |
| | nämmäj-**kkä**-m | 'one loved you (2sm)' |

In order to account for the lack of velar palatalization in the Impersonal, a feature cooccurrence constraint NO DOR$^{y}$ is proposed. This requires that the Impersonal has a specific ranking different from the 2sf where velars are palatalized (see Pater 1995, Itô and Mester 1995 on alternate rankings within the same language). However, since palatalization in 2sf forms favour velar palatalization, in those cases, it must be fairly low-ranked. It may seem unusual that a language would involve different anchors for different morphophonological processes, but in Rose (1994b) I argue that this reflects the historical development of secondary articulation in Gurage. In Eastern and Northern Gurage, and indeed in the rest of Ethio-Semitic, palatalized velars do not occur. They are unique to

Western Gurage, and are derived in the 2sf, Type B verbs and in verbs with a root of the type Consonant-velar-y. If palatalized velars developed after palatalization came to characterize the Impersonal, it is not surprising that velars are not palatalized. Most other analyses of the Impersonal assume that because velars may be palatalized in the 2sf, they must also be in the Impersonal, but are blocked by labialization which is ordered first (McCarthy 1983, Lieber 1988). But as Hetzron (1971) points out, there are other cases of only coronals being palatalized, even when labialization does not take place. The relevant examples come from Inor, a Peripheral Western Gurage dialect. In the 3rd masculine perfective plural, palatalization of coronals and labialization cooccur. In the 3rd feminine perfective plural, only a final coronal is palatalized. Significantly, velars are not palatalized, even though in the 2sfem in Inor, velars do undergo palatalization (data from Rose 1994b via Berhanu Chamora):

| | | | 3mascp | 3femp | |
|---|---|---|---|---|---|
| (143) | a. | kfd | käf$^{w}$äj-um | käfäj-am | 'they opened' |
| | b. | nks | näk$^{w}$äš-um | näkäš-am | 'they bit' |
| | c. | drg | dänäg$^{w}$-um | dänäg-am | 'they hit' |
| | d. | sβr | säp$^{w}$um | säpär-am | 'they broke' |

For further arguments in favour of the distinction between different hosts for palatalization in different verb forms, and against analyses that labialization of velars blocks palatalization of velars, see Rose (1994b).

The difference between Chaha and Muher with respect to concommitant palatalization and labialization could also be viewed as a response to morphological expression, as I proposed in Rose (1996a). As we have seen with respect to No Peripheral Vowels, Muher will suppress full expression of a morphological category if it violates another constraint. In the case of the Impersonal, this constraint might be one preserving the identity of the input consonants for labiality. The Impersonal is uniquely characterized by labialization, palatalization and the suffix /-i/. However, when the suffix /-i/ is not present and an alternate object marker occurs, in the perfective forms, the Impersonal can still be recognized by its <u>lack</u> of an overt subject marker. In the following example, the Impersonal form in (144a) has no subject marker, but the regular perfective form in (144b) has the 3fp subject marker /-ma/:

(144)

| | | | | |
|---|---|---|---|---|
| nätt'är-kkä-m | 'one melted you' | vs. | nätt'är-**ma**-kkä-m | 'they melted you' |
| melted-2smO-past | | | melted-**3fpS**-2smO-past | |

This distinction is difficult to maintain in the non-perfective forms, though, because the impersonal stem is homophonous with the 3rd masculine singular. Nevertheless, the impersonal selects Heavy object markers while the 3rd masculine singular selects Light object markers. In the following Chaha forms, /-kä/ and /-i/ are Heavy object markers whereas /-xä/ and /$^{w}$..n/ are Light:

(145)

| | | | | |
|---|---|---|---|---|
| yɨ-rätɨr-kä | 'one melts you' | vs. | yɨ-rätɨr-xä | 'he melts you' |
| yɨ-rätɨr-i | 'one melts (him)' | vs. | yɨ-rätɨr-n | 'he melts him' |

While there is always some means of distinguishing the impersonal from the other forms, it is due to lack of overt markers. In the case of suppressed vowel fronting in the Muher 2sf forms in §2.3.4.6, the lack of other subject affixes led to the interpretation of the /-t/ present tense suffix as representing the feminine only. Following this logic, since Morphological Expression only refers to the morphosyntactic features being expressed, it cannot account for why labialization appears in impersonal forms with no palatalization, since these other methods of identifying the Impersonal form are available to the learner.

The lack of labialization must be tied to the fact that the labialization and palatalization together represent the Impersonal: they form one discontinuous morpheme. Petros (in preparation) argues that there is only one segment, /u/, which is responsible for rounding and also causes palatalization by a feature [+high]. However, cross-linguistically, it is rare for back round vowels to cause palatalization (Bhat 1978), and even rarer for a single vowel to cause two separate processes on separate segments. Lahiri & Evers (1991) propose that [+high] may trigger palatalization, but this is only applied to Japanese, which is actually a case of affrication not palatalization. Affrication involves frication in the release, but there is no change in place of articulation or addition of a secondary off-glide. In the Japanese case, /t/ --> [$t^s$] before high vowels. Until it can be shown that back round vowels may trigger simultaneous labialization and palatalization, I will adopt the discontinuous morpheme analysis.

This difference between Muher and Chaha can be attributed to a difference between rankings of Integrity with $MAX_{I\text{-}O}$. An Anchor constraint ensures that a consonant is palatalized unless prevented by high-ranking Adjacency. In Muher, it is more important that the affix not incur two Integrity violations than be completely parsed, whereas in Chaha, complete parsing of both components of the Impersonal is preferred:

(146) **Muher** Integrity > MAX

| käfät-u..i | Anchor | Integrity | $MAX_{I-O}$ |
|---|---|---|---|
| a.käffät | *! | | * |
| ☞b. käffäč | | * | * |
| c. käff$^{w}$äč | | **! | |

I did not consider a candidate like [käff$^{w}$ät], which satisfies Anchor, but has only one Integrity violation. We cannot appeal to Adjacency or Adjacent Markedness to rule it out because [f$^{w}$] is not a simplex segment, and [t] would not be a better host than [f] for labialization. It seems that palatalization is preferred to labialization. We can capture this by ranking the $IDENT_{I-O}$ [front] constraint lower than an $IDENT_{I-O}$ [round].[36] Both of these constraints are ranked below Integrity and MAX, and play a role only when there is a choice of palatalization or labialization:

(147)

| käfät-u..i | Anchor | $IDENT_{I-O}$ [round] | $IDENT_{I-O}$ [front] |
|---|---|---|---|
| a.käffät | *! | | |
| ☞b. käffäč | | | * |
| c. käff$^{w}$ät | | *! | * |

[36] Another possibility would be to have the Anchor constraint specify the edge, thereby preferring palatalization which is closest to the right edge.

In Chaha, MAX is ranked above Integrity. The IDENT constraints, ranked below MAX and Integrity, do not play a role in Chaha, since forms with only part of the Impersonal suffix are eliminated by MAX:

(148) **Chaha** MAX > Integrity

| käfät-u..i | Anchor | $MAX_{I\text{-}O}$ | Integrity |
|---|---|---|---|
| a.käfät | *! | * | |
| b. käfäč | | *! | * |
| c. $käf^wät$ | | *! | * |
| ☞ d. $käf^wäč$ | | | ** |

Just as with the 'a-final' verbs, Chaha prefers to faithfully parse its input morphemes, but Muher will sacrifice full parsing if doing so would violate other constraints. Finally, there must be a constraint on the initial syllable of the stem, as labialization may not affect the first consonant in Muher. This can be captured by a constraint preserving the Identity of the initial syllable, as we saw in section 2.3.2 for Harari:

(149) **$IDENT_{I\text{-}O}\sigma 1$** Correspondent segments in the root-initial syllable of the Input and Output have identical values

This constraint is ranked above Anchor:

(150) **Muher**

| bärrär -u..i | IDENTI-O σ1 | Anchor | Integrity | $MAX_{I\text{-}O}$ |
|---|---|---|---|---|
| a. $b^w$ärrär | *! | | * | * |
| ☞b. bärrär | | * | | * |

It is also possible that the lack of labialization in the initial position is due to some locality principle, which would restrict the appearance of the labial segment too far from the right edge. One way of thinking of this would be to align the labial feature within the final syllable, but this would only hold of the perfective form: bärrär-ä. As syllabification is different in the imperfective: yɨ-bärr-u, restriction to the final syllable of the base (i.e. the aspect vowels and root consonants without affixes) would predict that the /b/ could be labialized. Thus, some kind of paradigm uniformity would have to be invoked, requiring that the lack of labialization in the perfective is maintained in the imperfective. While intuitively more appealing, this account is difficult to implement without invoking otherwise unjustified output-output correspondences.

## 2.5 Tereno

Before discussing mobile affixes in general, I will briefly examine mobile morphology in Tereno, an Arawakan language of Brazil, whose umlaut process is very similar to that seen in Western Gurage with the 2sf morpheme (Bendor-Samuel 1960/1966). The second person, both a possessive and a subject marker on verbs, is expressed by what Bendor-Samuel terms 'vowel replacements'. It is also expressed by an initial glide [y-]:

(151)

| | | 3s | 2s | |
|---|---|---|---|---|
| Vowel-initial | a. | otopiko | yotopiko | cut down |
| | b. | ayo | yayo | brother |
| u,e --> i | c. | kurikena | kirikena | peanut |
| | d. | yeno | yino | wife |
| a, o --> e | e. | piho | pihe | went |
| | f. | yono | yeno | walked |
| double | g. | nene | nini | tongue |
| | h. | xerere | xiriri | side |
| insertion | i. | tuti | tiuti | head |
| | j. | paho | peaho | mouth |

With vowel-initial words, a glide [y] appears in word-initial position (151a-b). In all other words, the first vowel is 'replaced' if it is not [i]. If the first vowel is [i], the second vowel is replaced as seen in (151e). As with the Gurage cases, we can adduce that Tereno at one time had a prefix *i-, which became incorporated within the stem, thus explaining the left-edge effect. With vowel-initial words, the /i-/ is realized as a glide, but with consonant-initial words, the /i-/ is incorporated by fusing with the initial vowel. If palatalization were permitted, we would expect a similar result to Gurage, or to Zoque (Wonderly 1951, Sagey 1986) where 2nd person is expressed by palatalization of the initial consonant. Fusion with the first vowel is structure-preserving, as it is in Gurage. No new vowels are created. Thus, the fusion of [i] and [o] does not produce [ö], but rather a front mid vowel [e]. The height of the vowel is maintained, but the rounding dropped, as it is for [u]. This is an attempt to maintain the features of the input vowel, while still allowing the prefix to be manifest in the output.

As for the fusion of [e] and [i], as in /yeno/ --> [yino] (151d), no new intermediary vowel can be created, so the only possible output would be [i]. If [e] were the output, there would be no realization of the [i-] prefix, and no distinction between 2nd and 3rd person. Morphological Expression forces the choice of [i]. In a similar vein, morphological expression forces the [i] to skip over an [i] in the first position and affect a second vowel, as in /piho/ --> [pihe] (151e).[37] Interestingly, this patterns like Western Gurage, since the only time when masculine and feminine are identical in Western Gurage is when the final segment is also a high front vowel/glide or palatal segment. In that case, fusion occurs. In Tereno, the surface contrast between persons is more important, and association to the first vowel is sacrificed in favor of morphological expression.

The alternate light diphthong forms in (151i-j) may be seen as an innovative attempt to preserve the segmental makeup of the input, while still allowing the prefix to appear within the stem. Finally, the replacement of both vowels in forms like (151g) nene or (151h) xerere may be related to a reduplicative identity requirement, although it is difficult to ascertain this based on two forms.

## 2.6. Towards a typology of 'mobile' affixes

Other accounts of Chaha 'mobile' affixes propose features [+round] or [+high, -back] (McCarthy 1983, Lieber 1988, Akinlabi, 1994, Zoll 1994, 1996). In my analysis I have proposed a full segment /-i/. There are several reasons why a full segment /-i/ can be justified. First, it captures the affinity with the other Ethio-Semitic languages which still maintain an overt /-i/. The difference between them is attributed to constraints on the anchoring of /-i/. Second, cases where a front vowel appears in the output where there is

[37] Thanks to Rachel Walker for pointing out the applicability of Morphological Expression in this case.

no vowel in the input are easily accounted for. These are cases such as an input /srβ/ 'spin' --> siriβ (2sf) where the masculine has only an epenthetic vowel sɨrɨβ (2sm). In a theory in which floating palatalizing features are used, projection of structure would be required to generate the [i]. Third, locality in determining adjacency can be uncontroversially referred to, since in the input, the segments are linearly ordered. If floating features are used, locality becomes an ill-defined concept, as reference to segment linear order, syllable positions, etc. are required to define locality (Odden 1994). One could imagine that floating features are defined with respect to the tier on which they reside, but this predicts that intervening segments which lack those features will not be calculated for locality. It would be extremely difficult to explain the restrictions on the Chaha 2sf /-i/ affix without reference to the order of stem consonants and affix.

Zoll (1994b, 1996) argues that ghost segments and floating affixes can be unified representationally as Rootless subsegments. She argues that ostensible differences between subsegments and full segments such as *self-sufficiency* (whether the feature can surface independently of other segments) or *no fixed position* cannot be used as reliable criteria for defining subsegments. We have already seen how the Chaha 2sf is sometimes realized as a segment [i], independently of other segments in the stem, and Zoll cites the case of Yawelmani (Yowlumne) glottalization, which can surface as glottalization on another segment or as a full glottal stop. We also saw how 'no fixed position' is not true of the particular realization of some suffixes, such as the Inor 3fp subject marker in (143) which is only realized on the final coronal obstruent. Zoll refers to this case, as well as Japanese mimetic palatalization (Mester & Itô 1989) as examples of floating features which are not free to appear anywhere in the string. She also argues that since infixes do not have fixed positions with respect to stems, mobility is not a diagnostic of subsegments. This leaves only *'exceptional parsing'* as a reliable diagnostic. Latent segments and floating features share the property that they are not always parsed, but this does not correlate with regular parsing of other segments in the language. For example, in Yawelmani (Yowlumne), the [h] of the suffix /-hin/ is always parsed and epenthesis will occur to ensure it. However, the [h] of the suffix /-hnel/ will be deleted if it cannot be independently syllabified. Therefore, there must be something which distinguishes these two segments, and Zoll proposes that the [h] of /-hnel/ lacks a Root node. She discusses several advantages to this analysis. First, by making a representational distinction, the immunity from parsing that latent segments enjoy is related to the ranking of MAX (subsegment) with respect to other constraints on syllable structure. Other segments are regulated by a separate constraint: MAX (segment). In Yowlumne (Yawelmani) epenthesis occurs to syllabify full segments, which are regulated by MAX (segment) but not to syllabify latent segments which are regulated by MAX (subsegment). Second, the limited inventory of latent segments cross-linguistically, particularly consonants, is related to the fact that they lack a Root Node, thereby limiting the range of consonants available.

However, like the other ostensible differences between segments and subsegments, the exceptional parsing diagnostic of subsegments is not consistent, either. An affix like the 2sf /-i/ in Chaha always surfaces somewhere, as does the Tereno 2s morpheme. There is no 'exceptional parsing'. If 'no fixed position' and 'self-sufficiency' are not reliable diagnostics of subsegmental status either, how are these affixes then regarded as subsegments? If there is no reliable means of distinguishing between full segments and subsegments, then it makes it difficult to make a case for a consistent representational distinction. Instead, one must rely on other constraints to determine the appearance of these segments, as I have done throughout this chapter for 2sf /-i/.

The Rootless theory also predicts that floating unattached Class nodes might appear associated to neighbouring sounds. Zoll (1996) lists the following cross-linguistic latent segments:

(152) p m w

t z n l r y

k ŋ

ʔ h

The representations for these kind of latent segments are Class nodes such as C-Place or Laryngeal. Other features are filled in by default rules. While these kinds of consonants may affect neighbouring consonants in various ways in the languages of the world, such as through voicing or other assimilations, except for [w y ʔ h], we never find them acting in any mobile fashion when they are latent. They either appear or don't, depending on syllabic requirements. However, if they are lacking an anchoring Root node and represented as just Class nodes, we might expect them to pop up attached to some other segment, manifesting themselves through a Place alternation, for example. Under this scenario, C-Place-[labial] might attach to a preceding glottal stop and produce a labial stop, for example:

(153)

Hypothetical example: caʔl - (p)iit --> capliit
[lab]

This would have to be ruled out somehow under the Rootless theory by constraints on preserving segment structure, which are probably independently necessary.

While Zoll is right in that none of the criteria by themselves can distinguish subsegments from regular segments, there is one property which is constant for *mobile* affixes: lack of self-sufficiency. This does not entail that the mobile affix *always* appears parasitically, but only that it does so in some, if not most, forms. A close examination of different kinds of 'mobile' affixes reveals that they are a very restricted set: those that impose secondary articulations on other segments, and those which display 'stability' effects:

(154)

| | |
|---|---|
| i palatalization | ʔ glottalization |
| u labialization | h aspiration |
| N nasalization | (A retracted tongue root) |

By mobile, I refer to the ability to appear on different targets within the stem, and not simply at the edges.[38] Features such as [coronal] or [consonantal] are simply never found as mobile (see Cole 1987, and Ní Chiosáin & Padgett 1996 who make a similar point concerning long-distance spreading). Palatalization is found in Ethio-Semitic as well as in Tereno. Labialization is found in Western Gurage. Nasalization occurs in Tereno and Mixtec, glottalization in Coeur d'Alene and Yawelmani, and aspiration in Sanskrit. Retracted tongue root is found in Coeur d'Alene and other Salish languages.

Interestingly, the mobile segments I have identified (N ʔ h i u) are also the basic elements of particle/element based theories of representation (Schane 1984, Kaye, Lowenstamm & Vergnaud 1990).[39] In these theories, secondary articulation such as labialization is represented by an U element. No other features or combination of features show this migratory property. By representing the floaters as full segments, their migratory

[38] We could also add to this list certain tongue shape features such as [lateral] or [retroflex], which have the ability to spread long-distance. If they have this ability, they may also display mobility effects if the original trigger disappeared. However, I know of no such cases where this has occurred.
[39]A is another particle or element, but fails to act as a secondary articulation, as also noted by Humbert 1995. Rose (1996b) argues that emphasis and faucal harmony in Arabic and Salish, respectively, are due to the feature [RTR], and not A or Pharyngeal, transmitted to vowels from consonants. Like secondary articulations, it may attach to a range of segments, although it has a preference for coronals and velars. This predicts that [ʕ] may constitute the sixth potential mobile segment, although it is not purely [RTR]

property is related to their ability to attach to other segments, and not a proposed representational deficiency.

Along the same lines, Humbert (1995) proposes that the following are licensed as secondary complex segments:

(155)

| | | | | | |
|---|---|---|---|---|---|
| nasal | V<br>C | ʔ | C | h | C<br>V |
| pal. | V<br>.vpl - I | lab | V<br>.vpl - U | | |

These are the minimally specified segments in her system, and she represents them, when secondary articulations, as dependent on the root node. This explains certain facts about such segments. Ejectives, a combination of a glottal component and a supralaryngeal consonant, may reduce in one of two ways: they may lose the glottal constriction [t'] –> [t] or they may lose the consonantal portion, leaving a glottal stop: [t'] --> [ʔ]. In Irish, voiceless coronals lenite to [h]. When they have secondary palatalization, they lenite to [$h^{y}$] (Ní Chiosáin 1994). Similarly, in Muher, a [q] (velar ejective) reduces to [ʔ]. If labialized, it keeps its labialization: [$q^{w}$] --> [$ʔ^{w}$]. Nasalization may form a secondary articulation on consonants and vowels as superimposed nasality. This often results from incorporation of a nasal segment. In French, final nasal consonants are incorporated into the preceding vowel: /bɔn/ --> [bɔ̃]. In Bantu, a nasal segment prefix is incorporated as a prenasalized stop (Herbert 1986).

In light of this discussion, it seems appropriate to draw a distinction between mobile segments and latent segments not in terms of underlying featural representation, but by recognizing that only the sounds in (152) are capable of migration within a stem *and* parasitic behaviour. Latent segments, on the other hand, are segments which tend to occur fixed at the edges of morphemes and which appear only if syllable structure permits.[40] These include the stem edge consonants of French and the suffix-initial consonants of Yowlumne. If a representational distinction is justified between the two types, the abnormal syllabification of latent segments can be attributed to their status as morpheme-edge unsyllabified segments and they will be represented as lacking a timing unit. An alternative account is to appeal to cophonologies (Orgun 1996b), in which alternate constraint rankings are associated with different affixes. Latent segments would differ from normal segments in that the affixes to which they belong have constraint rankings associated with them with DEP ranked over MAX, or deletion preferred to epenthesis, thereby allowing affix-edge segments to be deleted instead of preserved via epenthesis.

## 2.7. Conclusion

In conclusion, this chapter describes in detail the main mobile affixes of South Ethio-Semitic languages. I have paid considerable attention to the dialect differences and have argued for analyses which make use of the same constraints with minimal constraint ranking differences. In addition, I have introduced the important idea of maintaining morphological contrasts between forms, at the expense of allowing undesirable segments to appear in the output.

[40] The one exception to this is the Yowlumne affix /-ʔhil/ in which the glottal stop is preserved and the [h] is the 'latent' segment (Zoll 1996). Other factors, such as markedness, or status as a better onset, could explain the preference for the preservation of one glottal segment over another.

# Chapter 3
# Reduplication

## 3.1 Introduction

In this chapter, I examine reduplication within Ethio-Semitic. I will distinguish two types of reduplication: phonological and morphological. Phonological reduplication occurs in order to fulfill templatic constraints and has no associated semantic connotation. Morphological reduplication, on the other hand, is of the more familiar breed: reduplication of base segments in order to convey a specific meaning such as iterative or frequentative. These types are illustrated in (1) from Tigrinya. The biliteral roots of (1a) exemplify phonological reduplication. The triliterals of (1a) and the total copy cases of (1b) also have reduplication to satisfy a template, but reduplication is lexical/morphological - there is no corresponding non-reduplicated verb. The frequentative of (1c) is the more familar kind of reduplication since there is an associated meaning between the plain form säbär 'break' and the reduplicated form säbabär 'break in pieces':[1]

(1) **Tigrinya**

| | | | Root | Perfective stem | |
|---|---|---|---|---|---|
| a. | Final Doubling | biliteral: | zl | zäläl | 'jump' |
| | | | nd | nädäd | 'burn' |
| | | triliteral: | brg | bärgäg | 'bolt (in fright)' |
| | | | dnz | dänzäz | 'be numb' |
| b. | Total copy | | mr | märmär | 'examine' |
| | | | rs | räsräs | 'spray' |
| c. | Frequentative | | grf | gäraräf | 'whip again' |
| | | | sbr | säbabär | 'break in pieces' |

[1] These are the perfective stems minus affixes. In Tigrinya, the gerundive form is more commonly used to express past action. I give the perfective here since the other Ethio-Semitic languages use perfective, and I will have recourse to compare them to Tigrinya.

Reduplication in Semitic poses problems not encountered in other languages, since in Semitic, only the root is copied, and the aspectual vowels intercalated between the root segments are determined by lexical and morphological considerations. Specific types of vowel melodies are required for reduplication which produces quadriconsonantal output stems. This is related to 'fixed segmentism' found in other kinds of reduplication with the exception that the position and quality of the vowels is determined for the whole output stem and not simply the reduplicated portion. In section 3.2, I will examine 'phonological' reduplication, or satisfaction of a template requirement via reduplication as in (1a). Section 3.3 examines the status of 'long-distance' geminates. Several arguments will be invoked to argue that long-distance geminates are simply a special form of copied segments. Any inalterability effects reflect a language-specific identity requirement between base and reduplicant. Section 3.4 examines the interaction between reduplication and the segmental phonology of voicing and palatalization/labialization. Finally, section 3.5 concentrates on the morphological forms of reduplication in Ethio-Semitic and argues for a constraint penalizing double reduplication, which also relies on the rejection of long-distance geminates.

## 3.2 Biliteral roots

In McCarthy's early work on Semitic (1979, 1981), he attributes stems of the pattern $C_1C_2C_2$ in Arabic to underlying biliteral roots. Semitic roots tend not to have two adjacent consonants at the same place of articulation (Greenberg 1950, McCarthy 1994, Pierrehumbert 1992, see Padgett 1992 on coronal subclasses), a generalization explained by the Obligatory Contour Principle (OCP). Therefore a root $C_1C_2C_2$ must be a biliteral root which associates to a given template, such as the CVCVC template of the perfective aspect. The second consonant spreads to fill the final C position of the template as follows; aspectual vowels and the root consonants lie on separate tiers:

(2)

```
s     m
|    / \
C v C v C   ---> [samam]
   \ /
    a
```

The observation that only verbs of the form $C_1C_2C_2$ and not $C_1C_1C_2$ occur in Arabic (and indeed in Semitic in general) was attributed to the directional left-to-right association of the root to the template, an extension of association conventions introduced in research on tone (Leben 1973, Goldsmith 1976, Clements & Ford 1977). Subsequent reanalyses of this proposal argued for rules of edge-in association and leftward spreading of the final consonant (Yip 1988) or alignment constraints pertaining to root segments in OT (Pulleyblank 1994, Sharvit 1994, Gafos 1995). All of these analyses must stipulate directionality, either by association, spreading or alignment, and this seems to be a necessary requirement of any analysis.

Doubts have been raised as to the validity or universality of the OCP (Odden 1988) as applied to Semitic roots. Goldenberg (1994) observes that $C_1C_1C_2$ roots do occur in Hebrew (ddy, mmn, mmš). They also occur in Ethio-Semitic, but most forms can be traced historically to quadriradicals $C_1C_2C_1C_2$ where the second consonant is dropped (Buckley 1989, Rose 1992, Petros in preparation). Thus, there is an overwhelming tendency for $C_1C_2C_2$ roots to occur in comparison to $C_1C_1C_2$, consistent with McCarthy's analysis of biliterals. Synchronically, there is evidence that the identical consonants in $C_1C_2C_2$ roots behave like reduplicated consonants in certain languages, like Western Gurage. As I showed in chapter 2 in §2.3.4.5, the 2nd person feminine singular biliteral roots undergo double palatalization in Western Gurage, ex. <u>nɨzäz</u> (2ms) vs. <u>nɨžäž</u> (2fs) 'dream!', reflecting a requirement that the two consonants must be identical.

An historical explanation underlies the particular form of biliteral roots as $C_1C_2C_2$. Arabic triliteral roots originated from verb extensions or nominalizing suffixes attached to biliteral stems, conveying such notions as durative, reflexive, finitive, etc, as documented by Ehret (1989) (on the biliteral hypothesis see also Cohen 1969, Elmedlaoui 1995 and references therein). There are many doublet suffixes with parallel functions, which Ehret attributes to the circumvention of consonant co-occurrence constraints, the familiar Semitic root cooccurrence constraints preventing homorganic consonants in the same root. For instance, because no root has more than one coronal obstruent, the fortative suffix *s could not be attached to a stem with a coronal obstruent. Hence, the alternate fortative suffix *m would be used instead. As a result, a biliteral reduplicative stem $C_1C_2C_2$ could not result from addition of a suffix identical to the final consonant, because this, too, would violate the cooccurence constraints (see Paradis & Prunet 1993 for additional discussion). Simple stems involved reduplication of the final consonant, which Ehret claims 'must be understood as the necessary outcome of the overall morphology of the verbal system, which requires a triliteral base on which to operate' (p 111). This historical excursus provides insight into why the final consonant is the one which is reduplicated: the $C_3$ position is the position which was added to the basic stem.

### 3.2.1 Filling templates

In this section I address the question of how to capture the expansion of biliteral roots to form triconsonantal output stems. I will introduce a model which imposes faithfulness constraints on the linear relations between moras and segments. I will also assume that biliterals utilize reduplicative copying and not long-distance spreading to achieve augmentation. A long-distance geminate (LDG), the result of long-distance spreading as in (2), differs from a true geminate in that a vowel position intervenes between the two halves. In fact, this is the only characteristic which separates an LDG from a true geminate.[2] In section 3.4, I will argue that this structural representation is unnecessary. Long-distance gemination should instead be represented as copying, of the same kind found in regular reduplication. The only difference with true reduplication is that for biliteral roots, there is no reduplicative morpheme which triggers the copying. Copying occurs instead to satisfy a templatic requirement, just as LDGs did. In the following sections I will address how this requirement should be formulated.

The proposal that templates are composed of strings of C and V positions was introduced in McCarthy (1979, 1981). Under a templatic approach to stem formation, the perfective stem would be a specific string, i.e. CVCVC, and the aspectual vowels and root consonants match up to these positions. Subsequent researchers replaced these 'skeletal' positions with timing slots unspecified for [vocalic] or [syllabic] features (Lowenstamm & Kaye 1986, Hayward 1988); values for [syllabic] would be read off the independently required syllable tree.

McCarthy & Prince (1986, 1990a,b) have argued against this approach on several grounds, the most important of which is that the distribution of C and V positions is arbitrary, whereas a closer examination of attested patterns reveals that the templates can be characterized in terms of the 'authentic units of prosody', such as moras and feet. This theory is known as Prosodic Morphology. Since moras, syllables and feet are independently motivated, the prosodic morphology analysis is more parsimonious. Despite this advance, Prosodic Morphology is not without its own stipulations in dealing with Semitic templates. One immediate problem is how to account for why so many Semitic stems, either verbal or nominal, end in a consonant. The proposed solution is to invoke a

[2] Hayes (1989) argues that geminates are underlyingly moraic. Unfortunately, this cannot be a sufficient criterion to distinguish them from long-distance geminates. In Semitic verbs, gemination is a property of the template or conjugation pattern; therefore geminates will be derived.

constraint requiring that the stem end in a consonant, with the assumption that the final consonant is extraprosodic, i.e does not bear a mora. This is the analysis given in McCarthy & Prince (1990a:14), requiring that the stem end in a final extrametrical syllable, which can only be filled with a single consonant; in OT terms, this notion is translated into the requirement that the stem end in a consonant (or not end in a vowel) formulated as FINAL-C in McCarthy (1993a)[3]:

(3) Final Incompleteness (McCarthy & Prince 1990b)

Ø --> (σ) / ____ ] Stem

FINAL-C (McCarthy 1993a)

* V ] PrWd A prosodic word cannot end in a vowel

Whatever form this requirement takes, it stipulates the restriction in the same way that the CV theory stipulates that templates end in a C. There is another instance where a single consonant is explicitly referred to in the Prosodic Morphology theory. The theory of Prosodic Circumscription (McCarthy & Prince 1990a,b) isolates for or from the domain of rule application prosodic units such as moras, syllables, feet or minimal words, hence the name Prosodic Circumscription. In McCarthy (1993b), however, Form VIII of the Arabic verb (ftaʕal), which has an infix /-t-/, is derived by circumscribing a single initial consonant. Similarly, final extraprosodicity is achieved by factoring out a single word-final consonant by negative circumscription (McCarthy & Prince 1990b). Therefore, although Prosodic Morphology generally refers to 'the authentic units of prosody', in some cases, single segments must have a recognized status within the theory. Furthermore, the problem of the final consonant requirement reveals that only a subpart of the whole template can be defined in terms of prosodic units.

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[3] This constraint is originally proposed for Eastern Massachusetts English.

However templates are defined, either as moras with FINAL-C, skeletal positions, or even as alignment constraints on foot structure, the fact remains that a biliteral root will expand to meet the requirements of the template. This involves no REDuplicative morpheme in the input, but is simply a strategy, like epenthesis, to meet size constraints. McCarthy (1993b) identified two important properties of Arabic stems: they are minimally bimoraic, with final non-moraic consonants, and all verbs stems in Arabic are built on the basic Form I bimoraic shape by addition of moras and affixes. This is also true for Ethio-Semitic languages, where the basic verb stem is bimoraic, unless it is formed from a weak root (see §3.2.3 for further discussion of weak roots). The bimoraic shape can be achieved via syllabification of a triconsonantal root and two input aspectual vowels. Syllabification would result in several conceivable outputs in keeping with the syllable structure of the language. As an illustration, the triliteral root /sbr/, and the /ä..ä/ perfective vowels could produce three well-syllabified forms: [säbrä], [säbär], [äsbär]. While [äsbär] violates ONSET, the other two forms both have violations of NO CODA. Assuming that word-internal codas are moraic and final consonants are non-moraic as in Arabic, the only form which respects bimoraicity is the attested form säbär.[4]

Even when there are no input vowels in the basic stem, bimoraicity still plays a role in determining outputs. In the Type A jussive/imperative in Chaha, the syllabic shape of the output is determined entirely by the nature of the consonants and the epenthetic vowels which appear between them:

[4] The actual form also does not face problems with vowel hiatus when vowel-initial inflectional suffixes are added.

| (4) | **CɨCC shape** | | | **CCɨC shape** | |
|---|---|---|---|---|---|
| a. | yä-sɨrt | let him cauterize | d. | yä-kmɨr | let him pile up |
| b. | yä-dɨmd | let him join | e. | yä-nqɨs | let him limp |
| c. | yä-kɨft | let him open | f. | yä-qβɨr | let him plant |

This led McCarthy (1993b) to argue that the Chaha jussive was 'a-templatic' since there was no constant shape. However, if this were true, there would be no reason for reduplication to occur with biliteral roots:

(5)

| | | |
|---|---|---|
| a. | yä-sdɨd | drive cattle |
| b. | yä-gmɨm | chip the rim |

We would expect a jussive form like yä-sɨd to be formed from a biliteral root √sd if there were no bimoraicity requirement. The actual output in (5a) is bimoraic. The coda [s] bears a mora, as does the epenthetic vowel. The forms in (4) are also bimoraic. The epenthetic vowel bears one mora, the first or second consonant the other and the final consonant is non-mora bearing. Note that if we did not assume that the final consonant were non-moraic, these two shapes, CVCC and CVCVC, would have different numbers of moras, since the final C in the CC cluster is an appendix (see chapter 4). Therefore, the constant requirement for the verb stem is bimoraicity and a final consonant. Quadriliteral forms also have a constant mora count - three moras. In the northern languages, they take the shape CVCCVC (mäskär), whereas in the southern languages, they have the shape CVCV(C)CVC (mɨsäkär) with or without gemination of the penultimate consonant, which is determined by conjugation class and aspect.

### 3.2.1.1 Roots and moras

Based on the generalizations about number of moras and shape of the verb stems, I propose that the input root is not just composed of a sequence of segments, but that each root segment except the final one carries a mora in the input (R= root segment)[5]. Since the final root segment is demonstrably non-moraic in Arabic stems, and will only bear a mora if word-internal, or will attach to a mora provided by a suffix, I characterize it here as lacking a mora. This follows a proposal in Sprouse (1997), that inputs should only bear moras if they are consistently moraic in all forms.

(6)

$$\begin{array}{cccc} \mu_1 & \mu_2 & & (\mu_3) \\ | & | & & \\ R_1 & R_2 & R_3 & (R_4) \end{array}$$

All output forms must respect the associations between segments and moras and will be judged on how well they correspond to them. The extra mora and segment in brackets are added for quadriliterals. I adopt the moraic representation of Hyman (1985) and Zec (1988) that onsets share moras with following vowels. The position of the aspectual vowels (i.e. as occupying $\mu_1$ or $\mu_2$) is lexically determined and will not concern us here. This proposal adheres to the principle of Lexicon Optimization, where the optimal grammar is the most transparent (Prince & Smolensky 1993, Inkelas 1995). Since it is an established generalization that every Semitic root has at least two consonants and every verb stem at least two moras, characterizing the input in this way captures this fact directly (see Sprouse 1997 on enriched inputs). This is global optimization of the lexicon, in that, across paradigms, the bimoraic shape is constant, regardless of whether there are epenthetic or

[5] Petros (1993) suggested a very similar analysis: that every root consonant is followed by a vowel position, which is filled in depending on principles of government phonology. His proposal, as well as that given in (6), is equivalent to the basic template of Semitic verb stems (McCarthy & Prince 1990b). The departure from more traditional representations of the template is that the root and moras are inseparable and together encode the bimoraic template.

lexical vowels: i.e. käfät, käft, kɨft. By specifying the moras in the input, input-output faithfulness is maximized. This proposal directly accounts for left-to-right association of segments to templates, which was proposed in other frameworks. Furthermore, the template is not treated as a separate morpheme, for which there is little evidence in Ethio-Semitic.

Biliteral roots look just like triliterals in the input except that they lack a final consonant. Reduplication occurs with the biliteral roots to give the verb stem a final consonant and to maintain the bimoraic input:

(7)


The final consonant requirement could be expressed in a number of different ways. It could be expressed as a requirement that the shape of the stem match across paradigms (matching triliteral outputs) or alternatively as a method of resolving hiatus when vowel-initial suffixes are added, which is extended to all forms in keeping with paradigm uniformity. For example, /sädä-o-m/ results in [sädädom]. Since all perfective, imperfective and jussive forms have some vowel-initial suffixes, this requirement will be enforced throughout paradigms. These proposals indirectly capture the final consonant requirement by providing a motivation for such a constraint. While I have been criticizing the FINAL-C constraint (McCarthy 1993a) as stipulatory, since it provides no deep explanation for the preference for consonant-final forms, I will use it here for simplicity, but keep in mind that its effect may be derived. Any other means of satisfying both bimoraicity and the final consonant constraint are ruled out by high-ranking LINEARITY, which regulates the sequencing of the moras and root segments.

(8) **Linearity** The input is consistent with the precedence structure of the output

(McCarthy & Prince 1995)

Linearity essentially preserves the order of input elements in the output. Although normally applied to segments, I apply it here to the association of the moras and segments of the input. Linearity assesses violations if both input elements are present in the output, but in the reverse order or if the elements occur simultaneously as fused. This is illustrated in the following tableau for the imperfective stem <u>sädɨd</u>. The first candidate (9a) violates MAX-$\mu$, which preserves the input moras and therefore preserves bimoraicity. Candidate (9b) violates FINAL-C. Linearity is violated in candidates (9c) and (9e) because the second root consonant [d] is not associated to the second mora as it is in the input, but it follows it (reduplicants are underlined) and therefore violates Linearity. This can be assessed by transitivity: if the preceding segments are associated to $\mu_2$, and the [d] follows them but is not associated to it, then it follows that the [d] is ordered after $\mu_2$.The winning candidate (9d) violates none of these constraints. Since [d] is the second consonant of the root, it must appear in the position that all second consonants appear in - associated with the second mora.

(9)

| μ₁ μ₂<br>\| \|<br>s d | LINEARITY | FINAL-C | MAX-μ |
|---|---|---|---|
| μ₁<br>/\|<br>a. sä d | | | *! |
| μ₁ μ₂<br>/\| /\|<br>b. sä dɨ | | *! | |
| μ₁ μ₂<br>/\| /\|<br>c. sä dɨ d | *! | | |
| μ₁ μ₂<br>/\| /\|<br>☞ d. sä dɨ d | | | |
| μ₁ μ₂<br>/\| /\|<br>e. sä sɨ d | *! | | |

Candidates (9c) and (9d) are identical on the surface. That is, it cannot be determined which is the base and which is the reduplicant from the output. I assume that the second consonant is the reduplicant in keeping with historical evidence - this is the position which was attached to biconsonantal stems. The selection of one or the other as base is inconsequential for segmental processes (see section 3.4) and only appears to make a difference for the assessment of Linearity above. There is another candidate which must be considered: sädɨs, with reduplication of the first consonant. This candidate is ruled out by an Anchor constraint requiring the reduplicant to correspond to the rightmost base segment,

(10) **Anchor-$R_{B\text{-}R}$** A segment at the right edge of the base corresponds to a segment at the right edge of the reduplicant

The unattested candidate *sädɨs violates this constraint. Even though there is no RED morpheme in the input, a base-reduplicant relationship can still result from copying. One of the consonants serves as the base, or the direct output correspondent of the input, and the other as the reduplicant, a copy of the base consonant. An alternate assumption, that both output consonants correspond to a single input as in (Orgun 1996a), presents problems for the analysis of double reduplications in §3.5 which penalizes reduplication of a base which itself contains reduplication. If the first base reduplication is analyzed as two output consonants corresponding to a single input consonant instead, then there is no obvious way to capture this restriction. I therefore assume the same kind of base-reduplicant analysis for phonological reduplication as for overt morphological reduplication.

#### 3.2.1.2 South Ethio-Semitic weak roots

Weak roots are those which contain a glide, or in South Ethio-Semitic, a vowel /a/. Glides are realized in the output as vowels or more commonly as secondary articulations on neighbouring consonants. On the surface, these forms fall short of the required bimoraic minimum, and yet do not make use of reduplication to compensate. For example, consider the following Type A imperfective forms in Chaha which have the shape CVCɨC as in (11a) or CVCC as in (11b). The example in (11c) is formed from a weak root √fdy and is only monomoraic. The glide palatalizes the medial alveolar stop, and yet there is no reduplication to compensate for this, so *yɨ-fäjɨj is an impossible form.

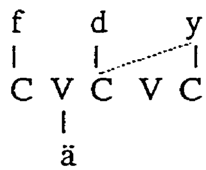
(11) a. yɨ-säβɨr

b. yɨ-käft

c. yɨ-fäj

Prunet (1996a) accounts for this by stating that the [y] can be linked to positions but remain unpronounced in the output. A form such as yɨ-fäj would have the following representation (the second vowel position is uninterpreted):[6]

(12)




Spreading of the second consonant to fill the final C position cannot occur because it is occupied by the glide. The final glide is present but silent. However, the actual phonetic output has only two consonants, and one must rely on this rather abstract representation to capture the fact that no extra reduplication occurs to fill in the final C position. Another analysis presented in Broselow (1984) for Amharic claims that there is no automatic spreading to fill the template. This is to account for weak roots such as those above, which she assumes are underlyingly biliteral and not triliteral weak roots. In the infinitive (and gerundive), there is a final [t] which appears with weak roots: mä-qrät 'remain' from √qry and mä-smat 'hear' from √sma, but mä-sbär 'break' or mä-ksäs 'accuse'. Broselow analyzes this as an epenthetic consonant assuming the final C position of the template. However, since it only ever occurs in these verb forms in the final position, it is more likely a latent consonant, the remnant of a historical infinitive suffix which was deleted following consonants, but remains following vowels (see Rose in preparation).

My analysis proposing linear sequencing between moras and root segments in the input extends to weak roots without appealing to the abstract representation in (12). All of the forms in (13) are weak triliteral roots from Chaha, containing either a glide /w/ or /y/, or a vowel /a/. Their underlying roots are given:

[6] Prunet does not provide a representation for this particular verb form, but for parallel forms.

| (13) | | **Root** | |
|---|---|---|---|
| a. | yɨ-gβa | gβa | 'he enters' |
| b. | yɨ-sma | sma | 'he listens' |
| c. | yɨ-xe | xry | 'he digs a hole' |
| d. | yɨ-βäk$^y$ | βxy | 'he cries' |
| e. | yɨ-fäj | fdy | 'he gets rid of the tapeworm' |
| f. | yɨ-sef | sfy | 'he sews' |
| g. | y-a-fed | fyd | 'he is useful' |
| | y-a-fid | | 'let him be useful' |
| h. | yɨ-fäq | faq | 'he scrapes' |
| | yä-faq | | 'let him scrape' |

That these are weak roots is evident from their conjugation pattern in other forms which I illustrate below (see Rose 1992, Petros 1993, Prunet & Petros 1996, Prunet 1996a,b, Chamora 1997 for additional arguments). A verb root which has three consonants has the shape CäCäC in the perfective and is followed directly by subject suffixes, like the 1pl marker /-nä/ or the 3pl marker /-o/. This is shown in (14a) for the root √sbr 'break' (medial obstruents are devoiced in the perfective in certain forms - see §3.3.4). In contrast, those roots which have a word-final root segment /a/ all end with this vowel in the 1pl perfective, but the vowel is not present before the 3pl marker (14b-c). These are the a-final verbs discussed in chapter 2. Prunet (1996b) provides extensive arguments that /a/ (or A) is a root segment. He proposes that /a/ is underlyingly an abstract pharyngeal glide (denoted A) which is realized as a vowel [a] on the surface.

(14)

| | 1pl perfective | 3pl perfective | |
|---|---|---|---|
| a. | säpär-nä-m | säpär-o-m | broke |
| b. | gäpa-nä-m | gäp-o-m | entered |
| c. | säma-nä-m | säm-o-m | listened |

When the final segment is a glide, verb stems all end in the vowel [ä] before /-nä/, the second vowel of the perfective CäCäC stem, and the glide is absorbed elsewhere in the root, either by palatalization or fronting of a preceding vowel (/n/ is not palatalized in Chaha - see 15b). Before the 3pl suffix, the medial consonant is not palatalized and a [w] glide intervenes between the vowel and the marker /-o/ (15b-e).

(15)

| | 1pl perfective | 3pl perfective | |
|---|---|---|---|
| a. | säpär-nä-m | säpär-o-m | broke |
| b. | xänä-nä-m | xänäw-o-m | dug a hole |
| c. | bäk$^y$ä-nä-m | bäkäw-o-m | cried |
| d. | fäčä-nä-m | fätäw-o-m | got rid of a tapeworm |
| e. | sefä-nä-m | sefäw-o-m | sewed |

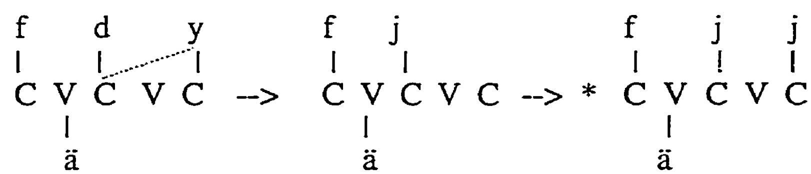
Finally, when the glide or /a/ is medial (16b-c), there are no alternations in the perfective, and the suffixes directly abutt the final root consonant. Crucially, no other consonant replaces the weak one. The regular root √sbr is provided in (16a) for comparison:

(16)

| | 1pl perfective | 3pl perfective | |
|---|---|---|---|
| a. | säpär-näm | säpär-om | broke |
| b. | a-fed-näm | a-fed-om | was useful |
| c. | faq-näm | faq-om | scraped |

One common aspect of both the Prosodic Morphology approach to Semitic templates and the earlier CV or skeletal representation is the notion of template satisfaction. Templates must be filled maximally by melodic segments; spreading of segments occurs in order to fill the templates. Under these serial derivational approaches, unless specified otherwise, template satisfaction must hold over an intermediate stage in the derivation and not the final output to account for weak roots. Otherwise, there is nothing to prevent filling in a mora or a timing slot at a later level in a serial derivational-style framework, as shown in (17) - CV slots are used for expository convenience, but the same argument holds for moras:

(17)




We need to explain why *<u>fäǰɨǰ</u> or <u>sämam</u> are not possible stem forms, with reduplication of the final consonant to fill in the position vacated by the glide or vowel. I will show how this follows from the Linearity constraint.

I will first show how a glide final root can be handled using the constraint LINEARITY. I assume a high-ranking $MAX_{segment}$ constraint to avoid deleting root segments and a constraint against glides to capture the displacement of the root glide. The other constraints are those seen previously with the reduplicated biliteral in (9).

(18)

| μ1 μ2<br>\|  \|<br>f d y | No Glides | FINAL-C | LINEARITY | MAX-μ |
|---|---|---|---|---|
| μ1 μ2<br>/\| /\|<br>a. fä di | | *! | | |
| μ1 μ2<br>/\| /\|<br>b. fä dɨ y | *! | | | |
| ☞ μ1<br>/\|<br>c. fä ǰ | | | * d>y | |
| μ1 μ2<br>/\| /\|<br>d. fä ǰɨ ǰ | | | * d>y<br>*! μ2 >y | |

The first candidate fails on FINAL-C and the second on No Glides, motivating the ranking of FINAL-C over LINEARITY. In candidates (18c) and (18d) the input /d/ and /y/ fuse in the output to form [ǰ], violating Linearity. However, the input segment /y/, as part of the [ǰ], is associated to the second input μ in candidate (18d), but in the input it is not. The input sequence $\mu_2 > y_3$ is violated in the output. In candidate (18c), there is no second mora in the output, so Linearity is only violated because of the fusion of [d] and [y]. The candidate which deletes a mora in the output is the winning candidate, because it fares better on Linearity and the other constraints. This shows that Linearity and FINAL-C are ranked over MAX-μ.

If the final root segment is the vowel /a/, reduplication also does not occur. This is illustrated with the imperfective stem <u>säma</u>. The /a/ must appear as a vowel and bear a mora. Linearity does not play a role in deciding winning candidates in this form, so I have left it out. Instead, we appeal to the previously motivated Anchor-$R_{B\text{-}R}$ constraint, ranked above FINAL-C. Copying the rightmost root *consonant* would violate Anchor-R, as in (19b) and (19d), but copying the final root *segment*, which is the vowel, would produce a hiatus problem (sämaa) which is never allowed in Chaha. The winning candidate is (19a) without a final consonant.

(19)

| μ₁ μ₂<br>\| \|<br>s m a | NO HIATUS | Anchor-R | FINAL-C | MAX-μ |
|---|---|---|---|---|
| μ₁ μ₂<br>/\| /\|<br>☞ a. sä ma | | | * | |
| μ₁ μ₂<br>/\| /\|<br>b. sä ma <u>m</u> | | *! | | |
| μ₁ μ₂ μ₃<br>/\| /\| \|<br>c. sä ma <u>a</u> | *! | | * | |

Finally, the glide or a-medial verbs require another constraint, Contiguity, which has been proposed for epenthesis (Kenstowicz 1994) and reduplication (McCarthy & Prince 1995). Contiguity prevents epenthesis within certain strings, such as morphemes, forcing epenthesis to occur at morpheme junctures. For reduplication, it requires that material copied from a base forms a contiguous string, preventing skipping of certain segments.

(20) **O-Contiguity** The portion of the output standing in correspondence with the input forms a contiguous string

(McCarthy & Prince 1995)

The following tableau illustrates the jussive form of the verb <u>faq</u>, which has no aspectual vowels. The /a/ root segment must appear as a vowel, so it will take over one of the input moras. All output forms will therefore incur a violation of Linearity for the linking of [a] with the first mora. It is, of course, possible to have the [a] remain linked with the second mora, but this would cause a violation for [f] and the second mora, so there is nothing gained. Candidate (21b) has reduplication, which allows preservation of the input moras, satisfying MAX-$\mu$, but it violates Linearity again for the input sequence $\mu_2 > q$ which is not maintained in the output, where the second mora is taken over by the epenthetic vowel. This problem does not arise in (21c), but the intervening reduplicant and epenthetic vowel cause Contiguity violations in that the root segments are separated by other segments not present in the input.[7] Finally (21d) also causes a Linearity violation, as well as a violation of FINAL-C, which is not indicated in the tableau. The winning candidate is the monomoraic form, which violates lower-ranked MAX-$\mu$:

(21)

<table>
<tr><td>μ<sub></sub>1 μ2<br>| |<br>f a q</td><td>LINEARITY</td><td>CONTIGUITY</td><td>MAX-μ</td></tr>
<tr><td>μ1<br>/|<br>☞ a. fa q</td><td>* μ1 > a</td><td></td><td>*</td></tr>
<tr><td>μ1 μ2<br>/| /|<br>b. fa qɨ q</td><td>* μ1 > a<br>*! μ2 > q</td><td></td><td></td></tr>
<tr><td>μ1 μ2<br>/| /|<br>c. fa qɨ q</td><td>* μ1 > a</td><td>**!</td><td></td></tr>
<tr><td>μ1 μ2<br>/| /|<br>d. fa qɨ</td><td>* μ1 > a<br>*! μ2 > q</td><td></td><td></td></tr>
</table>

If the output form were simply required to have two moras, but did not specify the relationship of the moras with the input segments, then the behaviour of the weak root verbs and the biliterals could not be captured. This is essentially the insight of the derivational analysis - the root consonants map to templatic positions interspersed with moras and aspectual vowels, if present. But, under the present analysis, there is no

[7] This candidate could also be considered to violate Anchor-R, if the base is expressed as the string directly preceding the reduplicant. However, with an infix of this type, it is not clear if the base is the [fa] portion or the [q] portion of the root.

intermediate derivational stage at which the template is satisfied. By making this simple assumption about the structure of input roots and moras, the weak roots and the biliteral roots are uniformedly explained. Furthermore, there is no need for separate specifications on directionality of association and spreading of the root. This is accounted for by the input and general constraints on Linearity, Contiguity and deletion.

Other OT attempts to capture the biliteral sädäd pattern through alignment falter on other grounds. Gafos (1995) captures the rightward spreading of Semitic with a constraint aligning an affix with the right edge of the prosodic output ALIGN (Affix, R, PrWd, R) along with the FINAL-C constraint. However, there is no affix in the construction of these verb stems which might be responsible for reduplication. The reduplication is purely phonological and occurs to satisfy a size constraint. His analysis is similar to the one I have presented, in that I must also make use of a right-edge constraint, Anchor-R, but only in assessing which segment the reduplication copies, not in driving the reduplication. There is also no obvious way that the alignment analysis in Gafos (1995) can capture the behaviour of weak roots.

Another proposal which relies on Alignment is Pulleyblank's (1994) analysis, which aligns the root to the left, but his constraint appeals to each individual root node, and must rely on Long Distance Geminates to get the right results:

(22) **Align Left (root node, L; binyan L)**:

The left edge of a root node is aligned with the left edge of the binyan

He shows that no matter the input, either with a biliteral root or a triliteral √smm or √ssm, the output will always be <u>samam</u> given the ranking of the OCP over Align Left. I give an illustration for an input √ssm:

(23)

| ssm | OCP | Parse | Align Left |
|---|---|---|---|
| a. s s m<br>\| \| \|<br>C V C V C | *! | | |
| b. s s m<br>/\ \|<br>C V C V C | | * | * *! |
| c. s s m<br>/\ \|<br>C V C V C | | * | * *! |
| ☞ d. s s m<br>\| /\<br>C V C V C | | * | * |

The doubly-linked /m/ in (23d) is only one C-slot away from the left edge, whereas the singly-linked /m/ in (23b) and (23c) is two C-slots away. While this analysis is successful, it crucially relies on a representation with long-distance geminates, which must be at an intermediate level since Tier Conflation would have to then apply to align the consonant and vowel tiers.[8] I will also show in §3.3 that there is no motivation for long distance geminates as a possible representation. Without this assumption, the analysis presented in Pulleyblank (1994) cannot be maintained.

[8] Pulleyblank makes no claims regarding the vowels, but with no discussion of how they interact with the consonants, I assume that Tier Conflation must apply.

### 3.2.2 Epenthesis and reduplication

In most reduplication cases, a canonical reduplicative affix is given in the input, and the drive to fill the morphological reduplicative requirement and the templatic shape of the affix results in reduplication (although see McCarthy & Prince, 1994b on ways to derive the templatic shape). For example, in the Ilokano reduplicative plural, there is a heavy syllable reduplicative prefix specified in the input (McCarthy & Prince 1994a, Hayes & Abad 1989):

(24) **Ilokano**

| | | | |
|---|---|---|---|
| kaldíŋ | 'goat' | kal-kaldíŋ | goats |
| púsa | 'cat' | pus-púsa | cats |
| róʔot | 'litter' | ro:-róʔot | litter (pl.) |

With reduplicated biliterals in Semitic, on the other hand, there is no morphological or semantic connotation behind the reduplication, only the drive to fill the size requirement. This leads us to ask whether the roles of reduplication and epenthesis are distinct or whether they overlap. In other words:

(25) a) does epenthesis occur to satisfy size requirements, i.e. templates?

b) does reduplication occur to aid syllabification?

If it is possible to show that epenthesis and reduplication play very different roles in phonology, we could make predictions about the domains and functions of each.

The first question can be answered in the affirmative. A simple example can be found in Sierra Miwok, in which epenthesis and not reduplication fills out a given template if there are an insufficient number of consonants.[9] The selection of a specific template is determined by suffixes (Smith 1985, Broselow 1995). The glottal stop is inserted to complete the template:

| (26) | | Root | CVCVC | CVCVVC |
|---|---|---|---|---|
| | a. | polaat | polat | polaat |
| | b. | peeki | peki<u>ʔ</u> | pekii<u>ʔ</u> |
| | c. | tiil | tilə<u>ʔ</u> | tiləə<u>ʔ</u> |

Epenthesis also occurs to satisfy the minimal word size, which is another form of template satisfaction (McCarthy & Prince 1986, Piggott 1992). For example, in Mohawk (Piggott 1995), a prothetic vowel [i] is inserted to achieve a minimal word size. In some cases, epenthesis may actually supercede reduplication if there are restrictions on the kinds of segments reduplication may copy. This is the position taken in McCarthy et al (1996) to handle cases of fixed segmentism in reduplicative morphemes. In order to explain the consistent appearance of glottal stop in a Tübatulabal reduplicative prefix, markedness constraints on place specification rank higher than Base-Reduplicant constraints. This explains why a word such as [do:yan] has a reduplicated form as [ʔo:do:yan] and not [do:do:yan]; the second form has a consonant [d] which has a more marked place specification than [ʔ].

While epenthesis may occur to satisfy templatic requirements, reduplication occurs rarely to satisfy syllabification constraints.[10] I have found two cases where reduplication apparently occurs for syllabification purposes: vowel echo in languages like Klamath and

[9] This kind of epenthesis is also reported for Amharic (Broselow 1984), but it occurs in a limited set of forms and is suggestive of a 'latent' consonant analysis derived from a former suffix. See Rose (in preparation).

[10] Rosenthall (1995) argues that reduplication occurs in the Hausa plural as a response to size requirements on the stem, which has the effect of providing onsets; however regular [y] epenthesis occurs elsewhere to provide onsets.

Somali, and the case of Temiar discussed in Gafos (1995). I first discuss vowel echo. While vowel epenthesis often involves the unmarked vowel (a, i, ɨ, ə), in many cases it entails insertion of a vowel identical to a neighbouring one. One such case is Klamath (Odden 1991) shown below in (27). Other cases are Kera (Ebert 1979) and Somali (Kenstowicz 1994).

| | | |
|---|---|---|
| (27) | sna̱-batgal | 'gets someone up from bed' |
| | sne̱-ge·ǰiga | 'makes tired' |
| | sno̱-bo·stgi | 'causes something to turn black' |
| | sni̱-ǰi·q̓ǰiq'a | 'makes someone ticklish' |

These cases are generally analyzed as spreading of the features of the adjacent vowel. This implies that the two vowels would have linked structure despite the intervening consonant, and is the standard analysis of vowel harmony. However, vowel harmony typically involves only one or two feature and applies across a string of vowels. Vowel echo is limited to a single vowel and copies all the features. Analyzing it as reduplicative copying accounts for why it differs from regular vowel harmony.[11]

### 3.2.3 Temiar

The other case of reduplication to satisfy syllabic constraints comes from Temiar, an Austroasiatic language of Malaysia, as analyzed by Gafos (1995). He argues that reduplication takes place in order to satisfy a constraint that syllables must have onsets, i.e. as a form of epenthesis. However, as this only occurs in a particular morphological

[11] Thanks to Heather Goad for this suggestion.

construction, it is questionable whether the reduplication is not instead a response to a reduplicative morpheme.

In (28), basic biconsonantal and triconsonantal stems are given. The simulfactive form is derived from the perfective by infixation of /a-/ before the final syllable of the base. With biconsonantal stems, *reduplication* of the initial consonant of the base fills in the onset of this prefix (28b). With triconsonantal stems, there is no reduplication. The continuative is formed by infixing a copy of the coda of the base before the final syllable, and again, the initial consonant of the biconsonantal base is copied to fill the onset (28c):

| | | | Biconsonantal | Triconsonantal |
|---|---|---|---|---|
| (28) | a. | Perfective | c v c | c. c v c |
| | | | kɔɔw 'to call' s.lɔg | 'to lie down' |
| | b. | Simulfactive | c a . c v c | c a . c v c |
| | | | ka.kɔɔw | sa.lɔg |
| | c. | Continuative | c c . c v c | c c . c v c |
| | | | kw.kɔɔw | sg.lɔg |

The Temiar reduplication indeed resembles the Semitic biliteral pattern, in that when a third consonant is lacking, reduplication occurs. What is different is that reduplication in Temiar occurs in a specific morphological context, and one could conceive of the problem in a different way: reduplication is required as part of the simulfactive morpheme (along with /a/), but is prevented if there is no position to accomodate it, such as in the triconsonantal stems.

A parallel is found in frequentative verbs with internal reduplication in North Ethio-Semitic to be discussed in §3.5.1, which have the connotation 'intensive', 'diminutive' or 'repetitive'. Tigrinya frequentatives are formed with the vowel /a/ before the penultimate syllable and internal reduplication whereby the second consonant of a triliteral root is copied: säbär-ä 'break' vs. säbabär-ä 'break in pieces'. A quadriliteral root has the characteristic /a/ vowel of the frequentative, but no reduplication: mäskär-ä (regular) vs. mäsakär-ä (frequentative) versus the dispreferred mäsäkakär-ä or the unattested *mäkakär-ä, with one of the root consonants unparsed. Not parsing one of the root consonants would incur a violation of MAX. Reduplication of the consonant would make the template larger than the regular frequentative with three moras; therefore, the form with no reduplication is preferred, despite the fact that frequentatives usually have reduplication. Restrictions on the size of the template in Temiar also prevent reduplication. Gafos proposes a bisyllabic upper-limit to the stem in Temiar; this limit would prevent reduplication from appearing when there are three consonants in the base, so salɔg and not *səgalɔg (other constraints discussed in Gafos (1995) prevent *saglɔg). Therefore, Temiar appears to be a regular case of morphological reduplication rather than phonological.

In conclusion, while epenthesis and reduplication do not have entirely distinct functions, there is little compelling evidence that reduplication occurs to satisfy syllabic requirements in the same manner as epenthesis.[12]

## 3.3 No Long Distance Geminates

In this section, I will reexamine the evidence for long-distance geminates and conclude that there is no evidence to support them. This is a welcome result because of the problematic derivational mechanism of Tier Conflation, which splits apart long-distance geminates. Not

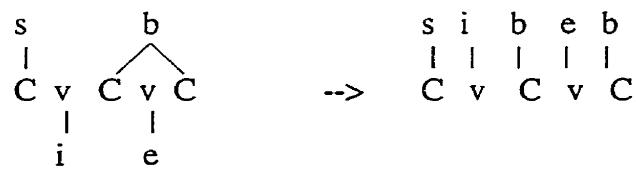
[12] Note that this does not discredit gemination to satisfy templatic requirements, as found in Ponapean, where vowel-initial roots have a reduplicative prefix with a final geminate consonant: /RED-ir/ --> [irrir] (McCarthy & Prince 1986). This is simply one method of filling the bimoraic prefixal template; gemination does not constitute a reduplicative relationship.

only are there empirical problems with Tier Conflation, but it is not consistent with the OT insistence on a one-step derivation.

### 3.3.1 Tier Conflation and LDGs

In his earlier work on Semitic, McCarthy (1979, 1981) proposed that vowels and consonants, representing different morphemes, were arrayed on separate tiers. This Morphemic Tier Hypothesis was extended so that inflectional affixes, including infixes, were on separate tiers from the rest of the stem. Based on a proposal by Younes (1983), McCarthy (1986a) argues for a process of Tier Conflation whereby the elements of two tiers (vocalic and consonantal) are folded into a single linear tier as shown in (29):

(29) a.




Crucially, if a long-distance geminate is involved, it is split into two separate consonantal representations by Tier Conflation. It is unclear whether an intervening vowel is necessary to split apart the geminate or whether separation occurs automatically as a result of Tier Conflation. If it were strictly the latter, we would expect true geminates to also be split apart, but they are not. For example, in Tiberian Hebrew spirantization, long-distance geminates undergo post-vocalic spirantization whereas true geminates resist it, even though McCarthy (1986a) argues that it is a post-Tier Conflation rule:

(30)

| | | | |
|---|---|---|---|
| /sibbe:b/ | --> | [sibbe:β] | 'he surrounded' |
| /saabəbuu/ | --> | [saaβəβuu] | 'they surrounded' |

If long-distance geminates undergo the rule and true geminates do not, true geminates must be linked. Therefore, I will assume the former interpretation of Tier Conflation: vowels are needed to split apart long-distance geminates (LDGs).

The status of these LDGs or long-distance linkings in general is somewhat controversial. Hayes (1986) notes that inalterability effects hold for local linkings, but that long-distance linkings may fail to respect properties that hold of local linkings, such as integrity and ambiguity. Schein & Steriade (1986) note that inalterability is not respected in long-distance linking of vowel features in Yokuts Lowering and Javanese Lowering. Inkelas and Cho (1993) argue that since geminate inalterability is defined by structural properties by Schein & Steriade and by Hayes (1986), any asymmetry in local and long-distance linking undermines the power of the Linking Constraint and the Uniform Applicability Condition (UAC). The Linking Constraint (Hayes 1986) states that Association lines in structural descriptions are interpreted as exhaustive and the UAC (Schein & Steriade 1986) states that a rule applying to some node or segment which has a condition on the structural description of the rule must refer to both units to which the node or segment is linked. In other words, if a rule affects codas, it cannot apply to a geminate, since the coda only references one-half of a geminate. More recently, Gafos (1995) argues against long-distance spreading of the type usually assumed in Semitic on theory-internal grounds. He argues against vowel/consonant planar segregation in general as an overly powerful tool which predicts unattested assimilations between consonants which are adjacent on the same tier. Notwithstanding, a systematic examination of relevant examples is necessary to convincingly put LDGs to rest. I will begin with a discussion of Antigemination and then look at one of the most forceful arguments for LDGs, which comes from Chaha reduplication.

### 3.3.2. Antigemination

Antigemination describes the effect whereby a phonological rule, syncope, will be resisted if the resulting structure violates the OCP, creating a sequence of identical segments (McCarthy 1986a). Crucially, one must assume that these segments would not be automatically fused to create a geminate. Cases where Antigemination is ignored and syncope applies anyway are attributed to either a) phonetic implementation rules or b) Tier separation of vowels and consonants allowing for long distance geminates.

I will illustrate two cases of syncope in Arabic; one applies within an LDG, and the other does not (from McCarthy 1986a). The difference between the two types will be due to ordering with Tier Conflation. In Classical Arabic there is a process referred to as 'Identical Consonant Metathesis', which metathesizes or syncopates a vowel in an open syllable between two identical consonants in the verb stem:

| | | | | | | |
|---|---|---|---|---|---|---|
| (31) | **Syncope** | | | | | |
| a. | samam-tu | I poisoned | c. | samm-a | 'he poisoned' | |
| b. | ħmarar-tu | I reddened | d. | ħmarr-a | 'he reddened' | |
| | **Metathesis** | | | | | |
| e. | yasmumna | they (f.) poison | f. | yasummu | 'he poisons' | |

However, the infix /t/, a separate morpheme, blocks the metathesis rule from applying:

(32) k-**t**-atab 'he copied' *kattab

The explanation lies in the representation of the identical consonants. Those forms in (31) are represented as long-distance geminates. Deleting the vowel leaves an acceptable geminate structure[13]:

(33)

```
s       m              s       m
|      / \             |      / \
C v  C v C      -->    C v  C     C
  |    |                 |
  a    a                 a
```

Since the rule only applies between identical consonants, and only between heteromorphemic consonants, McCarthy writes the rule so as to include the long-distance geminate in the representation. With the infix, deleting the vowel would create a sequence of identical consonants, violating the OCP[14]:

(34)

```
k t    t   b           *k t   t   b
| |    |   |            | |   |   |
C C v  C v C    -->     C C   C v C
    |    |                      |
    a    a                      a
```

As seen above in (33), the long-distance geminate respects the OCP and no violation of Antigemination occurs when syncope applies. Antigemination will only be violated if the consonants are separate and adjacent as in (34) which occurs when they are separate morphemes or as the result of Tier Conflation splitting the segments apart. The syncope example shown here is therefore a case of syncope applying before Tier Conflation, and LDGs play the role of a licit, geminate structure.

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[13] It is unclear whether the vowel position or just the vowel is deleted. Either way, the point is the same.
[14] If the two [t] were on separate morphological tiers, then at this point in the derivation, no OCP violations would occur. They would occur once Tier Conflation applied, however, since the two [t] would then be adjacent.

If any cases of antigemination involving Semitic roots exist (and not separate morphemes as above), the syncope rule must apply following Tier Conflation, when the segments act as separate entities. This is the case of Iraqi Arabic, where a regular syncope rule is blocked if the two flanking consonants are identical:

(35)

| | | | | | |
|---|---|---|---|---|---|
| a. | xaabar | 'he telephoned' | c. | xaabr-at | 'she telephoned' |
| b. | ħaajaj | 'he argued' | d. | ħaajij-at | 'she argued' |

This kind of syncope rule must apply following Tier Conflation, otherwise the resulting structure should be a licit geminate.

Since rules may apply before or after Tier Conflation, there is no *consistent* antigemination effect. Odden (1988) strongly attacks the universality of Antigemination and cites several counterexamples, showing how deletion of a vowel may occur only between identical consonants in some languages. For example, in Moroccan Arabic, binyan III doubled verbs may undergo syncope: šafef --> šaff 'to line up'. While this appears to be a flagrant violation of the OCP, McCarthy (1986a) attributes examples of this kind to 'phonetic implementation rules', a proposal which is difficult to refute unless it can be shown that the syncope rule is not phonetic. In his phonetic explanation, however, McCarthy does not explain why syncope applies *only* when the flanking consonants are identical.

Odden (1988) cites a clear-cut example from Hindi where a regular syncope rule deletes a vowel 'blindly', i.e. with no regard for the fact that the consonants on either side are identical. This rule deletes a schwa only in the last syllable of the stem when a suffix is attached, but not elsewhere: /daanəw+i/ --> [daanwi] 'demon', /kaanən+i/ --> [kaanni]

'garden' but /waaraaṇəsii/ --> [waaraaṇəsii] 'Benares', and Odden argues that this lexical restriction shows that this is not a phonetic rule. The only way to explain this counterexample would be to invoke otherwise unwarranted separation of vowels and consonants on separate tiers. Odden also argues that various rules need to refer to identical consonants, so we might expect syncope rules to also refer to them, either by requiring that syncope applies only between identical consonants or everywhere but between identical consonants. For example, there are cases of epenthesis which only apply if the flanking consonants are identical or near-identical. In Lenakel (Lynch 1978), /t-r-rai/ becomes [tɨrɨray] 'he will write', but /t-r-lɛləŋ/ becomes [tɨrlɛlɨŋ] 'he will return', with no epenthesis between /r/ and /l/.

Tier Conflation relies on a difference between lexical and postlexical phonology and is equated with Bracket Erasure in McCarthy (1986a). But Bat-El (1988) shows that Tier Conflation does not eliminate morphological distinctions as there are rules applying after Tier Conflation in Modern Hebrew which must still reference morphemic distinctions. In addition, there are rules applying pre- and post Tier Conflation which are both arguably part of the lexical phonology. One example is the palatalization triggered by the 2sf in Amharic and Western Gurage. As we saw in chapter 2, in Chaha, both final identical consonants are palatalized, whereas in Amharic, only the final one in a sequence of identical consonants is palatalized. McCarthy (1986a) argues that Chaha palatalization applies before Tier Conflation and Amharic palatalization after, the former labelled a morphological operation and the latter a phonological operation. But, both kinds of palatalization are triggered in specific morphological environments by certain specific suffixes. I show in Rose (1994a) how Tier Conflation presents ordering paradoxes in Chaha because of the single palatalization of /r/ and vowels, suggesting palatalization must occur after Tier Conflation. Solutions to the difference between Chaha and Amharic were presented in chapter 2. In conclusion, the evidence for antigemination as a forceful argument for tier separation and Tier Conflation is absent. Without the separation of vowels and consonants onto distinct tiers, long-distance geminates are unjustified.

The problematic example of Classical Arabic metathesis cited above suggests that there is a distinction between consonants with a reduplicative relationship and identical consonants which are unrelated morphologically, since syncope only applies to what McCarthy represents as an LDG. This distinction may be necessary, but a closer examination of the facts shows that McCarthy's intepretation of the syncope rule would not apply to the infixes or suffixes cited because they do not present the appropriate conditions for syncope regardless of the nature of the consonants. In the following forms, a comparison with different roots shows that syncope does not apply in the forms he cites no matter what the nature of the consonants is:

(36)

| | | | | |
|---|---|---|---|---|
| Form 8 | k**t**atab | he copied | j**t**amaʕ | he met |
| Form 5 | y-a**t**atabbaʔ-u | he pursues | y-a**t**akallam-u | he speaks |
| Form 1 | magat-**a**taa | they (f.du.) detested | katab-ataa | 'they (f.du.) wrote' |
| | | | *katabtaa | |

Syncope is triggered only by vowel-initial inflectional suffixes and only if the consonants are identical. Therefore, as Odden concludes, many of these rules must reference identical consonants without them necessarily being long-distance geminates. I conclude that Antigemination is not an argument for Long Distance Geminates.

### 3.3.3. Vocalic LDGs

Although LDGs were argued to be the correct representation for identical Semitic root consonants, the LDG analysis of identical melodic vowels in the verb stem has received comparatively little discussion. In McCarthy (1979), automatic spreading of vowels is assumed, for example, the two instances of [a] in katab are represented with a single linked /a/.[15] If we take seriously this representation of identical vowels at the pre-Tier Conflation stage, then certain predictions are made as to their behaviour. Any process affecting vowels at a pre-Tier Conflation stage should affect both copies. As shown in Chapter 2, there are processes of palatalization which affect both copies of a reduplicated root consonant in Chaha in the 2nd singular feminine form, eg. sɨdɨd (2sm) vs. sɨǰɨǰ (2sf) 'drive cattle'. The vowels, on the other hand, are not subject to this kind of double fronting. This is not clearly demonstrated in most non-perfective forms since there is usually only one /ä/ vowel, or in the jussive, two epenthetic vowels. In the imperfect passive, however, there are two /ä/ vowels. Given the LDG assumption that two identical vowels in a vowel stem are doubly-linked and result from spreading, we would expect both to be fronted. In the following example, a root √rdf is given in the passive with a /t-/ prefix in (37a). The imperfect passive has the form: t-CäCäC, but only one of the /ä/ vowels is fronted in the feminine form. On the other hand, both consonants are affected in the feminine with the biliteral root √rz or √gd in (37b,c):

| (37) | | 2smasc. | 2sfem. | |
|---|---|---|---|---|
| | a. | tɨ-t-rädäf | tɨ-t-rädef | 'you are being stung' |
| | b. | tɨ-t-razäz | tɨ-t-ražɨž | 'you tell someone's last will' |
| | c. | tɨ-t-gädäd | tɨ-t-gäjäj | 'you reveal a secret' |

[15] The explicit arguments for spreading are not strong with respect to vocalism in Arabic. /a/ appears to be the only vowel capable of spreading.

The fact that only one vowel is fronted suggests that there is no linking between these two vowels, even though they are identical in the masculine form. I have no evidence to suggest that there is a reduplicative relationship between them, though. [16]

### 3.3.4 Tier Conflation and the Devoicing Effect in Chaha

#### 3.3.4.1 Voicing dissimilation and gemination

One of the strongest arguments for a linked structure in the representation of LDGs comes from the Devoicing Effect in Chaha, as argued in McCarthy (1986b). Chaha, and indeed many Gurage dialects, are unusual within the Semitic family as the underlying root consonants are altered on the surface in a large number of verb forms, leading to considerable opacity (see Prunet 1996a). We have already seen how this is so with the weak verb roots. One of the features of Chaha which adds to this opacity is devoicing of the penultimate root consonant, a phenomenon I will term the Devoicing Effect. The Devoicing Effect is the requirement that the penultimate root consonant be devoiced in certain aspectual forms. This effect is lexical, depending on the classification of the root. As discussed in chapter 1, Chaha triliteral roots are divided into four classes: Type A, Type B, Type C and Type D (Petros 1993), which correspond to different patterns of conjugation. All Types have the Devoicing Effect in the perfective form of the verb, and in Types B, C and D, it extends at least into the imperfective forms. In quadriliterals it is found in the perfective and imperfective, and in the perfective and imperfective of all

[16] Biliteral roots of the form √Ca where the second segment is a vowel (or in Prunet (1996b) an underlying abstract pharyngeal segment realized as a vowel) show vowel fronting applying to only one of the vowels when reduplicated, but there is only one verb which illustrates this: ɨm-baba --> ɨmbɛbä. This is problematic for a theory that assumes the vowels are reduplicated. However, the constraints formulated to account for a-final verbs in chapter 2 (including the constraint in 2.3.4.6.1 requiring the final vowel to be [ä]) will conspire to produce this particular output, regardless of the lack of identity between the two vowels.

passive-reflexives. See Petros (in preparation) for a full discussion of the relevant contexts. The regular Type A paradigm is exemplified in (38):[17]

| (38) | Perfective | Imperfective | Jussive | |
|---|---|---|---|---|
| A | **CäCäC** | **CäCC** | **CCC (trans.)/** | |
| | | | **CCäC (intrans.)** | |
| a. | käfät-ä-m | yɨ-käft | yä-kɨft | 'open' |
| b. | qä**p**är-ä-m | yɨ-qäβɨr | yä-qβär | 'not be full' |
| c. | bä**t**är-ä-m | yɨ-βä**d**ɨr | yä-β**d**är | 'be first' |

The Devoicing Effect is clearly seen in examples (38b) and (38c), where the perfective form has a penultimate voiceless consonant [p]/[t] respectively, and the imperfective and jussive forms have a voiced consonant [β]/[d].[18]

Where Chaha has voiceless consonants alternating with voiced ones, related Gurage dialects such as Muher or Ezha show an alternation between geminates and simple consonants. Thus the 'devoicing' of the penultimate consonant in Chaha corresponds to gemination of voiced consonants in Muher and Ezha. This is shown by comparing Chaha with its closest relative, Ezha, which differs mainly by this property:

[17] The distinction between [n] and [r] is neutralized everywhere except pre-consonantally. For example, [n] occurs word-initially and [r] intervocalically (except when [n] represents a former geminate) and stem-finally. Roughly, in pre-consonantal position, [r] is normally found, but when it corresponds to the initial root consonant, it is [n]. Petros (1996) shows that the distribution of [n] and [r] is related to a number of other factors, including the morphology of the stem.

[18] β/b alternate. [b] occurs in word-initial position and following a nasal stop, and when geminate in geminating languages like Ezha; [β] occurs elsewhere. I will be assuming [β] represents the phoneme. See Petros (in preparation).

(39)

| | Perfective | Imperfective | Jussive | |
|---|---|---|---|---|
| Chaha | dä**p**är-ä-m | yɨ-däβɨr | yä-dβɨr | 'add' |
| Ezha | dä**bb**är-ä-m | yɨ-däβɨr | yä-dβɨr | |
| Chaha | bätäx-ä-m | yɨ-βätɨx | yä-βtɨx | 'uproot' |
| Ezha | bättäx-ä-m | yɨ-βätɨx | yä-βtɨx | |
| Chaha | bä**t**är-ä-m | yɨ-βädɨr | yä-βdär | 'be first' |
| Ezha | bä**dd**är-ä-m | yɨ-βädɨr | yä-βdär | |
| Chaha | sänäf-ä-m | yɨ-särf | yä-sɨräf | 'be afraid' |
| Ezha | sännäf-ä-m | yɨ-särf | yä-sɨräf | |

Leslau (1948) states that historical voiced geminate obstruents became voiceless and all geminates were simplified in Chaha. Indeed, the Peripheral Western Gurage dialect Endegen shows the intermediate stage, and has voiceless geminates: √bdr --> bettär-ä 'be first'. [n] represents a former geminate /rr/ or /nn/ in Chaha. Where there are devoicing/voicing alternations, there is a corresponding [k]/[x] alternation in some verbs: ex. näkäβäm / yɨräxɨβ / yänxäβ. This is due to the fact that /xx/ is realized as [kk] in geminating languages, and this was simplified to [k] in Chaha.[19] The correspondences for root consonants are summarized below. I will assume that devoicing of sonorants is prohibited:

[19] But see Petros (in preparation) who argues that [k] and [x] form a single phoneme in Chaha.

| | | | |
|---|---|---|---|
| (40) | bb | --> | p |
| | dd, tt | | t |
| | gg, kk, xx | | k |
| | $gg^y$, $kk^y$ | | $k^y$ |
| | $gg^w$, $kk^w$ | | $k^w$ |
| | zz, ss | | s |
| | tt' | | t' |
| | qq | | q |
| | mm | | m |
| | ff | | f |

While Chaha does have palato-alveolar consonants (ž, š, č, j, č'), their distribution in the verb stems indicates that they are always the result of palatalization of an alveolar, usually from a weak root, which contains a glide or vowel (i.e. √fdy --> fäčä-m and not *fätäyä-m). Therefore, they are subsumed under the corresponding alveolars in the list in (40). The labialized velars and labials, and palatalized velars may also result from weak roots, but also pattern as inherent root consonants, so I have included them in the table in (40) (but see Prunet & Petros 1996 for arguments that all complex consonants are derived in Chaha).

The Devoicing Effect, although a result of historical change, is still a stable pattern in any verb conjugation. Petros (in preparation), in fact argues that devoicing applies to underlying geminates which are then neutralized absolutely to simple consonants. Alternatively, the Chaha learner must simply ascertain that the penultimate consonant, and not necessarily a geminate, is devoiced in the appropriate forms. In the next section, I will examine how the Devoicing Effect interacts with biliteral verbs and why it is significant for the representation of LDGs.

### 3.3.4.2 Biliterals and Devoicing

McCarthy (1986b) and Leslau (1948) observe that verbs of the form $C_1C_2C_2$ or $C_1C_2C_3C_3$ (triliterals with quadriliteral conjugations) in Chaha systematically did not undergo the Devoicing Effect:

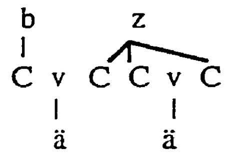
| | | | | |
|---|---|---|---|---|
| (41) | a. | bäzäz-äm | *bäsäz-äm | 'be in low spirits' |
| | b. | bɨrägäg-äm | *bɨräkäg-äm | 'bolt' |
| | c. | fägäg-äm | *fäkäg-äm | 'die without being slaughtered' |
| | d. | gädäd-äm | *gätäd-äm | 'make a hole, tear' |

McCarthy relates this to the linked structure of these long-distance geminates and appeals to Geminate Inalterability. The devoicing effect targetted the geminate penultimate consonant and interpreted association lines exhaustively, i.e. only two links cause the rule to apply:

(42)
```
CC
\/
[-son]  -->  [-voice]
```

The rule is blocked from applying to singletons and to triply-linked structures, such as in (43), which would be the representation of LDGs. This is the representation of the historical form with gemination *bäzzäz before simplification of the geminate. Note that the medial gemination was a requirement of perfective templates and was independent of whether there was an extra link with the final consonant.

(43)




This explains why geminates with an extra association line did not undergo the devoicing effect.

The inalterability account in McCarthy (1986b) actually raises some immediate problems. Devoicing <u>does</u> apply in cases involving an LDG /b/:

(44) qä**p**äβ-äm 'shave'

xɨrä**p**äβ-äm 'cover'

McCarthy (1986b) observes that the only occurrences of [p] in Chaha are as a result of the Devoicing Effect. Thus, it is not an underlying segment, and /b/, having no contrasting voiceless counterpart, lacks a voicing specification. He proposes a serial account in which the Devoicing Effect applied cyclically, before and after Tier Conflation, which aligns the consonantal and vocalic tiers and would no longer link the final two segments. The Devoicing Effect applies to [b] after Tier Conflation, but not to the other consonants. The other voiced obstruents (i.e. fägäg) have a [+voice] specification, and as such are subject to the Strict Cycle Condition which prohibits a feature-changing rule from applying in a non-derived environment (this presumes that Tier Conflation does not create a derived environment). Devoicing a /b/, however, would not be a feature-changing process because it lacks a [+voice] specification. This is illustrated in (45):

| | | | |
|---|---|---|---|
| (45) | xäbbäb | fäggäg | däbbär |
| Devoicing | *blocked* (Linking con.) | *blocked* | däppär |
| Tier Conflation | | | |
| Devoicing | xäppäb | *blocked* (SCC) | ---- |
| Simplification | xäpäb | fägäg | däpär |

It turns out that the Devoicing Effect has nothing whatsoever to do with LDGs, linking, feature-changing or the Strict Cycle Condition. The analysis presented above completely misses the real reason why the Devoicing Effect fails to apply; the real reason is unearthed by systematically examining all the 'exceptions' to devoicing, which turn out to share a key property. The Devoicing Effect is not an exceptionless process, but is dependent on the sonorant nature of the final consonant. The significant insight that the final consonant determines the Devoicing Effect is due to Petros (in preparation) who provides extensive development of this point and a more complete list of verbs. In (46) I provide a partial list of triliteral and quadriliteral verbs which undergo the Devoicing Effect, organized according the final consonant of the root.[20] In each case, the final consonant is a sonorant: /r, m/ or a /β/.[21] Exceptions to this generalization are given in (46b) (the verb säg$^{y}$äm has a root √sgy), whereby the verbs all have voiced penultimate consonants even though the final root consonant is a sonorant (all verbs are given in 3ms with the suffixes /-ä/ and /-m/):

[20] Some verbs with devoiced /t/ also have alternate forms with /d/: adäräm 'spend the night', xädäräm 'thatch', a-fädäräm 'falsely blame, finish up'. Conversely, in other Gurage dialects such as Inor or Endegen, /t/ devoices in biliteral roots, but other voiced consonants such as /z/ or /g/ do not: gätädäm 'make a hole' (Inor). The reasons behind this are unclear.

[21] For example, as Prunet (1996b) notes, [β] patterns with the sonorants in the related dialect Inor with respect to two properties: 1) a glottal stop appears following sonorants but not following obstruents in a special class of a-final verbs: nɨβʔa 'grow!' vs. nɨfa 'fan a fire!', and 2), like other continuant sonorants, does not block nasal harmony. In Chaha it patterns with the sonorants in conditioning epenthesis sites (Petros 1996). See also chapter 4.

(46) (a) **Devoicing Effect applies**

**CCr**

| | | |
|---|---|---|
| dβr | däpär-äm | add |
| rβr | näpär-äm | be, live |
| qβr | qäpär-äm | plant' |
| sβr | säpär-äm | break |
| dyβr | jäpär-äm | finish |
| qyβr | $q^y$äpär-äm | help, aid |
| mygr | mä$k^y$är-äm | light fire |
| tgr | täkär-äm | cultivate new field |
| dygwr | jä$k^w$är-äm | wither |
| mgr | mäkär-äm | pus |
| βdr | bätär-äm | be first |
| gdr | gätär-äm | put to bed |

**CCm**

| | | |
|---|---|---|
| dygm | jakäm-äm | strike |
| gydm | $g^y$ätäm-äm | sell on credit |

**CCA**

| | | |
|---|---|---|
| sβA | säpa-m | be more than expected |
| tbA | täpa-m | be firm, solid |
| wgA | wäka-m | pierce, crush |
| gbA | gäpa-m | enter |

**CCβ**

| | | |
|---|---|---|
| sdβ | sätäβ-äm | curse |
| gydβ | $g^y$ätäβ-äm | place horizontally |

(b) **Exceptions**

| | | |
|---|---|---|
| myzr | mezär-äm | 'count' |
| rzβ | näzäβ-äm | 'be flexible' |
| gyβr | $g^y$äβär-äm | 'pay taxes' |
| sgr | sägär-äm | 'amble' |
| sygr | šägär-äm | 'replace' |
| sgy | säg$^y$ä-m | 'bring a witness' |
| Akβr | akäβär-äm | 'celebrate' |

In contrast to the verbs in (46), the final consonant in the verbs in (47) is an obstruent, either voiced or voiceless. Exceptions are listed in (47b). They have undergone the Devoicing Effect, even though the final consonant is an obstruent:

(47) (a) **Devoicing Effect fails to apply**

| | | | | | |
|---|---|---|---|---|---|
| rdf | nädäf-äm | 'sting' | Adg | adäg-äm | 'throw down' |
| rgf | nägäf-äm | 'fall (leaf)' | Agd | agäd-äm | 'bind, tie' |
| gdf | gädäf-äm | 'break the fast' | rgd | nägäd-äm | 'trade' |
| rgs | nägäs-äm | 'reign' | sgd | sägäd-äm | 'worship, bow' |
| t'βs | t'äβäs-äm | 'roast' | t'βt' | t'äβät'-äm | 'seize, hold' |
| gyβs | $g^y$äβäs-äm | 'be sick from food' | t'βq | t'äβäq-äm | 'be tight' |
| dgs | dägäs-äm | 'give a feast' | qβt' | qäβät'-äm | 'miss' |
| grβt' | gɨräβät'-äm | 'invert, reverse' | | | |
| grdf | gɨrädäf-äm | 'grind coarsely' | | | |
| mrgd | mɨrägäd-äm | 'act mad' | | | |

(b) **Exceptions:**

| | | |
|---|---|---|
| myzx | mesäx-äm | 'chew' |
| syβt | šäpät-äm | 'prefer' |
| srβt | sɨräpät-äm | 'spend time away' |

Chamora (1996) states that verbs which fail to devoice when the final consonant is sonorant in Inor are borrowings from Amharic, and McCarthy (1986b) makes the same point for Chaha. However, Amharic and Chaha are closely related languages and share many of the same verb roots. If a verb occurs in Chaha which violates a rule, it does not necessarily mean that it was borrowed if it also occurs in Amharic. The systematic pattern that a final sonorant induces devoicing, but a final obstruent (regardless of its voicing quality) does not, cannot be denied. The small number of exceptions to this general pattern (as opposed to the large number of exceptions if the conditioning final consonant were not considered) might be explained as lexical exceptions. As further support for the importance of the final consonant, consider the following 'total copy' reduplicative verbs. All of these verbs are formed by doubling a biliteral root. In the following examples, the Devoicing Effect has applied, and just as in the regular verbs, the final consonant of the verb stem (minus the inflectional markers -ä-m) is *sonorant*.

(48) (a)

| | | |
|---|---|---|
| βr | am-bɨräpär-äm | 'stretch like cotton' |
| dr | dɨrätär-äm | 'step on, pile up' |
| gm | gɨmäkäm-äm | 'break the edge' |
| gr | an-gɨräkär-äm | 'buzz (like bees), disperse' |
| gr | an-gɨrakär-äm | 'balk' |
| $g^{w}$r | $g^{w}$ɨräk$^{w}$är-äm | 'burrow, make a hole' |
| gβ | an-gɨβäkäβ-äm | 'rumble (thunder), make rumble' |
| dβ | dɨβätäβ-äm | 'patch over' |

(b) **Exceptions:**

| | | |
|---|---|---|
| βr | bɨräβär-äm | 'search' |
| zr | zɨräzär-äm | 'change money' |

Total copy verbs which do not undergo the Devoicing Effect, and were formally treated as exceptions (McCarthy 1986b) form an even longer list, and apart from the highlighted forms, the final consonant (or the second in the root) is an *obstruent*:

| | | | |
|---|---|---|---|
| (49) | gz | gɨzägäz-äm | 'saw off, stagger' |
| | gs | gɨsägäs-äm | 'travel fast' |
| | $g^w$d | an-$g^w$ɨdä$g^w$ɨd-äm | 'enoncer, éroder' |
| | $g^w$z | $g^w$ɨzä$g^w$äz-äm | 'spread grass in layers' |
| | dg | dɨgädäg-äm | 'squeeze in, press down to make room for' |
| | df | dɨfädäf-äm | 'press slightly' |
| | βt' | bɨt'äβät'-äm | 'dissolve powder' |
| | βs | bɨsäβäs-äm | 'be putrid, rotten' |
| | βq | bɨqäβäq-äm | 'be overage or overripe' |
| | βs | a-βsäβäs-äm | 'grope' |
| | zf | zɨfäzäf-äm | 'soak' |

Thus, it is clear that the Devoicing Effect was not a context-free process in Chaha. It only applied to penultimate consonants followed by a sonorant.

As for the biliteral roots and the triliterals with final doubling, reduplication would produce an exact copy of a final consonant: √fg --> fägägäm. A biliteral root with a copied consonant must conform to the Devoicing Effect if appplicable. Any voiced obstruents /z, d, g/ will not be devoiced when followed by voiced obstruents, even copies of themselves, since the Devoicing Effect is only triggered by sonorants. With biliteral roots with a reduplicated /β/, such as qäpäβäm from the root √qβ, we have a different situation. The penultimate labial is followed by a sonorant [β] which triggers devoicing just like it did with a verb like sätäβäm from a root √sdβ. It should be noted that at the time that

Devoicing originally applied, the penultimate labial was geminate, and therefore a stop, which could devoice. In summary, the only reason that the doubled roots with /β/ behave differently from those with other kinds of obstruents is that a non-geminate /β/ in the final position is a sonorant [β] which triggers devoicing.

Scobbie (1991) criticizes the approach developed in McCarthy (1986b), in particular the notion of the non-derived environment which is crucial to that analysis. He argues instead that the explanation as to why biliteral verbs fail to display the Devoicing Effect is related to Semitic Morpheme Structure Constraints banning adjacent homorganic consonants. If a historical form such as √gd - gäddädä is devoiced and simplified - gätädä, then a Chaha speaker has no access to the fact that it came from a geminate, and could only assume that simple [t] resulted from underlying /t/, as [t] is not an allophone of /d/. If it is interpreted as an underlying /t/, then the sequence /td/ would violate the MSC. Therefore, the devoicing is blocked in these forms to avoid violating the MSC. In the case of the labials, a [p] could not be posited as coming from a /p/ as there is no underlying /p/, so there is no confusion. Scobbie's analysis makes no reference to linked structure, but only to sequential identical segments, which would also eliminate an argument against LDGs. However, his explanation does not hold up, because it assumes that the speaker has no additional information as to the underlying root form, and could only assume that [t] relates to /t/. Scobbie's assumptions are based only on the perfective form of the verb, but it is reasonable to assume that a speaker would have access to the entire paradigm to determine the root consonantism. The voiced counterparts to devoiced radicals show up in the non-perfective form of the verbs: gätäräm / yigädɨr / yägdɨr. If anything, the doubled verbs give more information about the root than regular triliterals which devoice. A speaker could determine that a form like gätädä could only have come from an underlying root consonant /d/ precisely because of the MSC. If the MSC has as much power as he attributes to it, then a form such as gätädä would be impossible, but in fact, it is attested in the related Gurage dialect Inor, where devoicing applies to the penultimate consonant regardless of whether it is identical to the ultimate.

As to why the Devoicing Effect should apply, Petros (in preparation) offers the following constraint: a geminate with a [+voice] specification is not licensed if it is the rightmost laryngeal specification in the stem. I formalize this as follows:

```
(50)    *      C C
                \/
               Root
                |
               Lar      #
                |
             [+voice]
```

Only voiced obstruents will be specified as [+voice]. Sonorants will lack a voicing specification (or have an SV node) and hence have no Laryngeal node. This accounts for why devoicing occurs when voiced obstruents are followed by a sonorant (51a), since the Laryngeal specification is the rightmost one in the stem. This does not hold when the geminate is followed by an obstruent (51b); all obstruents will have Laryngeal specifications:

```
(51)    a.   m ä g g ä r                b.  n ä d d ä f
                  \/                            \/    |
                  Lar                          Lar   Lar
                   |                            |     |
               [+voice]                    [+voice][–voice]

          mäkär 'suppurate'                 nädäf 'sting'
```

This analysis crucially relies on an underlying geminate. Historically, this is an accurate characterization. Synchronically, if we wished to avoid absolute neutralization of geminates, that is positing underlying geminates which are all realized as simple consonants on the surface, the constraint could be translated as applying to the penultimate consonant in the root.[22]

In conclusion, the Devoicing Effect would have to occur after Tier Conflation and thereby does not constitute an argument for long-distance geminates at all, but rather crucially relies on separate segments. Furthermore, the sonorancy of the voiced labial is determined by position - either word-initially or following a nasal, it will be [b], otherwise it is realized as [β]. In order to determine the position [β] occupies in relation to other segments, Tier Conflation would have to have applied. In conclusion, the Devoicing Effect does not require LDGs at all.

None of the evidence amassed in support of LDGs holds up to closer scrutiny. The antigemination effects may make reference to identical consonants but exceptions to antigemination are simply cases where the identity of the consonants is required in order for syncope to apply, or is immaterial to whether syncope applies. The Devoicing Effect was also shown to have nothing to do with linkings, and actually requires that a reduplicated biliteral have separate consonants in order to determine the application of the constraint.

[22] Petros (in preparation) also identifies a [cont] dissimilation effect in Chaha roots applying to the distribution of [k] and [x]. A [+cont] obstruent cannot be followed by a [+cont] obstruent. Geminates will always be realized as [k]. He argues that this explains why LDGs involving [k] or [x] are always realized as [k]: yä-skik and not *yä-sxix. The dissimilation constraint would, however, apply to the unattested form causing the second [x] to dissimilate to [k]. Identity effects would force the two consonants to be identical and both would be realized as [k].

## 3.4 Reduplication and segmental phonology

In this section, I examine the relationship between reduplication and segmental phonology, namely devoicing and palatalization/labialization. Is there a requirement that the base and reduplicant consonants have to be identical? In (48) and (49), I provided examples of 'total copy' verbs. These are biliteral roots which expand to a quadriconsonantal output, which has three moras, i.e. √gz --> gɨzägäz. Prunet & Petros (1996) argue that these verbs, along with 'local movement' verbs which are verbs with four surface root segments and a prefix /ɨn-/, convey the semantic notions of local movement (movement with minimal displacement of the subject, ie 'shake'), sound or physical transformation of the subject. The same properties are also found in Arabic total copy verbs. They argue that it is the selection of the longer quadriliteral template which causes the reduplication and not that the root or template is marked with a reduplicative morpheme. This is somewhat problematic as regular quadriliteral roots do not necessarily have this meaning. What distinguishes this type of reduplication from more familiar types in other languages is that there is no corresponding non-reduplicated verb. In other words, a biliteral with total reduplication may not have a corresponding biliteral with final reduplication. For example, the verb qɨt'äqät'äm 'hammer, pound' in Chaha has no corresponding verb *qät'ät'äm. We can determine that this is a reduplicative verb, though, because both [t'] will be palatalized in the feminine form: qäč'qɨč' 'hammer (fs)!' The expansion by biliteral roots in response to a RED morpheme or a templatic requirement is a lexical property of certain roots.

### 3.4.1 Devoicing and Identity

Recall that there are three kinds of reduplication in Ethio-Semitic, total copy, frequentative and final doubling. They are given here with the assumed base-reduplicant connections in the model of McCarthy & Prince (1995). There may also be a connection between input and reduplicant (Urbanczyk 1996):

(52)

| | **a. Total copy** | **b. Frequentative** | **c. Final Doubling** |
|---|---|---|---|
| | gɨzägäz | kɨtätäf | t'ɨmäzäz |
| Input | g z | k t f | t' m z |
| | \| \| | \| \\ \\ | \| \| \| |
| Output | g z [g z]RED | k [t]RED t f | t' m z [z]RED |

When devoicing applies to these verbs, only the penultimate consonant is devoiced. The corresponding base or reduplicant consonant does not also devoice:

(53)

| | | **Root** | | |
|---|---|---|---|---|
| Total Copy | a. | dr | dɨrätär-ä-m | 'step on, pile up' |
| | b. | gm | gɨmäkäm-ä-m | 'break the edge' |
| Frequentative | c. | sβr | sɨβä**p**är-ä-m | 'shatter' |
| | d. | dygm | jɨgä**k**äm-ä-m | 'hit again' |
| Final Doubling | e. | zrβ | a-zrä**p**äβ-ä-m | 'incline' |

I now examine each of the reduplication cases in turn and give some motivation for the proposed representations in (52).

### 3.4.1.1 Total copy and Final Doubling

I assume that the third and fourth consonants of the total copy stems are reduplicants in keeping with the general pattern of left-to-right association of roots to templates argued for in McCarthy (1981), and the proposals in section 3.2 about interspersing of moras and segments. I will assume that there is a RED morpheme equal to a mora in the input which triggers the reduplication and copies only the root consonants. I abstract away from the vowels, which match the vowel patterns of the regular quadriliteral verb forms.

Since the total copy verbs show the Devoicing Effect and the biliteral roots with final doubling do not, McCarthy (1986b) proposed that the distinction between these two kinds of verbs is a representational distinction between copy for the former and linking for the latter. The total copy cases do not have structural linking between the identical consonants, but the final doubling cases do. However, we have seen that the Devoicing Effect is triggered by sonorant consonants in final root position, and linking plays no role.

Instead, we can appeal to Identity constraints to explain the normal application of devoicing (as opposed to overapplication, where the base and reduplicant would both be devoiced, even though only one is in the penultimate position). Languages may impose identity requirements between base and reduplicant, as argued in McCarthy & Prince (1995) and repeated here:

| | | |
|---|---|---|
| (54) | **IDENT$_{B-R}$** | Correspondent base and reduplicant segments must agree in features |
| | **IDENT$_{I-O}$** | Correspondent input and output segments must agree in features |
| | **IDENT$_{I-R}$** | Correspondent input and reduplicant segments must agree in features |

I showed in chapter 2 how Chaha requires 2sf palatalization to appear on both the base and the reduplicant, whereas Amharic does not. However, Chaha does not require the base and reduplicant to match in [voice] specifications. It is more important for the base consonant, the initial one, to retain its original [voice] specification. This means that the constraint $\text{IDENT}_{\text{I-O}}$[voice] pertaining to the input-output relationship must be ranked over the $\text{IDENT}_{\text{B-R}}$[voice] relationship. In (55a), the input consonant, which is the initial one, is devoiced in the output, violating $\text{IDENT}_{\text{I-O}}$[voice]. In (55b), the reduplicant, the penultimate consonant, is devoiced, violating $\text{IDENT}_{\text{B-R}}$[voice]:

(55)

| ɨn-βr + RED ä | DEVOICING EFFECT | $\text{IDENT}_{\text{I-O}}$ [voice] | $\text{IDENT}_{\text{B-R}}$ [voice] |
|---|---|---|---|
| a. ɨm-pɨräpär | | *! | |
| ☞ b. ɨm-bɨräpär | | | * |
| c. ɨm-bɨräβär | *! | | |

This contrasts with quadriconsonantal forms with final doubling, which, like biliterals with final doubling, do not display the Devoicing Effect (56a-c) unless the final consonant is a sonorant (56d):

(56)

| | | |
|---|---|---|
| a. | bɨrägäg-ä-m | 'be startled, bolt' |
| b. | mɨrädäd-ä-m | 'whip' |
| c. | t'ɨmäzäz-ä-m | 'twist' |
| d. | a-zräpäβ-ä-m | 'incline' |

Prunet & Petros (1996) also argue that the verbs in (55) display the hallmark semantic properties of the 'local movement' verbs and we can assume that there is a reduplicative (RED) morpheme which triggers reduplication; otherwise, they should just form basic triconsonantal stems. Buckley (1990) also proposed that these quadriconsonantal verbs involved copying and not spreading. Thus, although they resemble biliterals with final doubling in obeying the Devoicing Effect, these triliterals involve morphological reduplication and not phonological reduplication. The same ranking of IDENT constraints proposed for total copy verbs will capture forms like (56d), in which the penultimate but not the ultimate consonant is devoiced. For these cases, we must also include the $\text{IDENT}_{\text{I-R}}$ relationship:

(57)

| a-zrβ RED ä | DEVOICING EFFECT | $\text{IDENT}_{\text{I-O}}$ [voice] | $\text{IDENT}_{\text{I-R}}$ [voice] | $\text{IDENT}_{\text{B-R}}$ [voice] |
|---|---|---|---|---|
| a. azräpäp | | * | *! | |
| ☞ b. azräpäβ | | * | | * |
| c. azräβäβ | *! | | | |

### 3.4.1.2 Frequentative

The frequentative differs from the total copy and final doubling verbs in that it corresponds to an independently existing regular (triliteral) verb. It conveys the notion of repetition, distributive or intensification and is characterized by internal reduplication of the penultimate consonant of the root. The copied consonant occupies the antepenultimate position. In most Ethio-Semitic languages the frequentative has a vowel [a] between the second and third consonants. In Western Gurage, the [a] is not consistent and is often [ä], as in the following Chaha examples:

(58)

| | | Regular | | Frequentative | |
|---|---|---|---|---|---|
| a. | Perfective | säpär-ä-m | break | sɨβäpär-ä-m | shatter |
| b. | Imperfective | yɨ-säβɨr | | yɨ-sβäpɨr | |
| c. | Jussive | yä-sβɨr | | yä-sβäβɨr | |
| d. | Perfective | kätäf-ä-m | chop | kɨtätäf-ä-m | chop a lot |
| e. | Imperfective | yɨ-kätɨf | | yɨ-ktätɨf | |
| f. | Jussive | yä-ktɨf | | yä-ktätɨf | |
| g. | Perfective | sänt'-ä-m | cause to penetrate | sɨränt'-ä-m | cause to |
| h. | Imperfective | yɨ-särt' | | yɨ-sränt' | penetrate again |
| i. | Jussive | yä-sɨrt' | | yä-srärt' | |

The frequentative is unlike concatenative reduplication in non-Semitic languages in that the vocalic melody is independent. In fact, a reduplicated root, since it will have four consonants, must be conjugated like a quadriliteral. The conjugation of a regular quadriliteral is given in (59a-b). The frequentative is given in (59c); the distribution of vowels correspond except for the position of the vowel [ä] in the jussive.

| (59) | Perfective | Imperfective | Jussive | |
|---|---|---|---|---|
| a. | mɨsäkäräm | yɨ-msäkɨr | yä-mäskɨr | 'testify, bear witness' |
| b. | gɨrätämäm | yɨ-grätɨm | yä-gärdɨm | 'break in half' |
| c. | sɨβäpär-ä-m | yɨ-sβäpɨr | yä-sβäβɨr | 'break into many pieces' |

Before proceeding with the behaviour of devoicing in the frequentative, I will first address how the frequentative is formed. Three competing possibilities are listed in (60):

(60) (a) The frequentative is derived from the regular form by infixation and copying/spreading

(b) The frequentative is derived from the root and has its own template

(c) The frequentative corresponds to the regular form but has its own template

The option in (60a) is assumed by Buckley (1990) for Tigrinya, with infixation before the last syllable. Angoujard (1988) proposes a template with the penultimate consonant position marked as a 'copy' position or an infix in Amharic. The root maps to the template and then the preceding consonant is copied to the copy position. His position is thus a combination of (60a) and (60b). In Rose (1992) I assumed that the frequentative was formed by mapping the root directly to the frequentative template as in (60b). The possibility in (60c) is similar to the melodic transfer analysis of broken plurals in Hammond (1988) where features of the singular are passed to the plural. The reason the formation of the frequentative is difficult to pin down is due to three factors: 1) the vowels of the frequentative melody are different than those of the regular form; many of the characteristic vowels of certain verb types, like Type B (front vowels) or Type C ([a]) are not found in the frequentative; 2) in Chaha, the characteristic palatalization of Type B verbs is not present in the regular jussive but *is* found in the frequentative jussive (Rose 1992) and 3) in Tigre and Tigrinya, the frequentative of quadriliterals can be expressed with the frequentative template but without reduplication.

The following Harari verbs illustrate the consistency of the frequentative vowels. All four types in Harari have a different vowel between C1 and C2, but in the frequentative, that vowel is not present and the frequentative takes the same shape

CiCaCäCa (the only exception is Type D, but the rounding of the vowel is due to the initial consonant which is underlyingly labialized - /$q^w$/ rounds /ä/ to [o] and /i/ to [u]):

(61)

| | Regular | Frequentative | |
|---|---|---|---|
| A. | säbära | sibabära | 'break' |
| B. | šemäqa | šimamäqa | 'hide' |
| C. | magäda | migagäda | 'burn' |
| D. | qoräma | qurarräma | 'rap on the head' |

The first hypothesis in (60a), while straightforward, cannot account for the three problematic factors listed above without additional mechanisms. The hypothesis in (60b) would require the template to be marked with a REDuplicative portion, i.e. Cä[Ca]$_{RED}$CäC. The reduplicative section of the template can be occupied by non-reduplicative material if the root is a quadriliteral, which cannot otherwise be accomodated. The hypothesis in (61c) would have to establish correspondence only between the root consonants, making it essentially equivalent to (61b). Vowels are independently determined by the lexicon. This is the hypothesis I will adopt with the assumption that the template is not a separate entity to which the root maps, but is derived by infixing a RED morpheme and vowel [a] (or [ä] in Gurage) before the final mora (disregarding suffixes). The fact that the reduplicant copies the consonant to its right is expressed as follows:

(62) **ANCHOR-L $_{B-R}$** Any element at the left edge of the base has a correspondent at the left edge of the reduplicant.

The base is the phonological string to which the reduplicant attaches, and because it copies to its right, the morpheme will be analysed as a prefix. The base is therefore the material to its right. This is shown in the following representation:

(63)

```
Input      k          f   t
           |           \   \
Output     k ä [RED a]-f ä t
```

Returning to the Devoicing Effect, we can see how the quadriliteral has the Devoicing Effect in both perfective and imperfective forms. Likewise, in the frequentative forms in (64c-d), the DE applies in the perfective and imperfective, even though it does not in the corresponding non-reduplicated Type A imperfective form, which is <u>yɨ-säβɨr</u> (64c is a Type B verb).

| (64) | <u>Perfective</u> | <u>Imperfective</u> | <u>Jussive</u> | |
|---|---|---|---|---|
| a. | mɨsäkäräm | yɨ-msäkɨr | yä-mäskɨr | 'testify, bear witness' |
| b. | gɨrätämäm | yɨ-grätɨm | yä-gärdɨm | 'break in half' |
| c. | jɨgäkäm-ä-m | yɨ-jgäkɨm | yä-jgägɨm | 'hit again' |
| d. | sɨβäpär-ä-m | yɨ-sβäpɨr | yä-sβäβɨr | 'break into many pieces' |

Like the final doubling case, n the frequentative it is the reduplicant which fails to devoice in conformity with $\text{IDENT}_{\text{B-R}}$; in the total copy case it is the input base consonant which fails to devoice. Therefore, like for final doubling, the constraint $\text{IDENT}_{\text{I-R}}$ regulating the relationship between the input and the reduplicant, must be ranked above $\text{IDENT}_{\text{B-R}}$ in order to account for the absence of forms such as *<u>dɨpäpär</u>, for example. This is illustrated below:

(65)

| dβr<br>RED ä | DEVOICING<br>EFFECT | IDENTI-O<br>[voice] | IDENTI-R<br>[voice] | IDENTB-R<br>[voice] |
|---|---|---|---|---|
| a. dɨpäpär | | * | *! | |
| ☞ b. dɨβäpär | | * | | |
| c. dɨβäβär | *! | | | |

In conclusion, it is more important to be faithful to the input with respect to voicing than to have the base and reduplicant match in voicing.[23] In the next section I turn to how total copy, frequentatives, and final doubling interact with morphological labialization and palatalization.

### 3.4.2 Palatalization/Labialization and Identity

As demonstrated in Chapter 2, morphological palatalization and labialization will affect both reduplicated consonants in Western Gurage. This is true both of final doubled biliterals and triliterals and frequentative and total copy forms. As a first example, let us take the 2nd feminine singular marker. With reduplicated roots, both base and reduplicant are palatalized, although, the feminine marker should normally be realized on one segment, and not on non-final alveolars:

[23] An alternate possibility, which I do not explore, is that the IDENT constraints pertaining to the input are in fact ranked lower than the $IDENT_{B-R}$ constraint, but that some form of anti-homonymy prevents overapplication. Overapplication would devoice both consonants, making the output then indistinguishable from roots with underlying devoiced consonants.

(66)

| | | 2smasc | 2sfem | |
|---|---|---|---|---|
| a) | Doubling | nɨzäz | nɨžäž | 'dream!' |
| | | gärdɨd | gärjɨj | 'cut in large pieces!' |
| b) | Frequentative | jɨgägɨm | jɨg$^{y}$äg$^{y}$ɨm | 'hit again!' |
| c) | Total Copy | qät'qɨt' | qäč'qɨč' | 'hammer!' |

The facts are similar for labialization, as demonstrated by the 3rd masculine singular object marker (composed of labialization and a suffix /-n/):

(67)

| | | no object | with object | |
|---|---|---|---|---|
| a) | Doubling | gɨmɨm | gɨm$^{w}$ɨm$^{w}$-ɨn | 'chip it!' |
| b) | Frequentative | kɨfäfɨt | kɨf$^{w}$äf$^{w}$ɨt-ɨn | 'open it again!' |
| c) | Total Copy | qɨt'äqɨt' | q$^{w}$ɨt'äq$^{w}$ɨt'-ɨn | 'hammer it!' |

In order to account for why there is overapplication with total copy verbs, McCarthy (1983), proposed that palatalization and labialization applied directly to the root; reduplication copied the root, thereby copying the palatalization, and the consonants were mapped to the template. However, I show in Rose (1994a) how applying palatalization before Tier Conflation is problematic in Chaha. Furthermore, since the palatalization and labialization are part of inflectional morphemes, we would expect them to concatenate following formation of the basic stem and not before. Under the analysis presented here, the palatalization or labialization is enforced despite an IDENT$_{I\text{-}O}$ violation. This is a case of overapplication, since the morpheme only needs to be realized once, on the final consonant. It is the high ranking of IDENT$_{B-R}$ which ensures overapplication. The example is repeated from (111) in chapter 2[24]:

(68) **Chaha**

| βt - i<br>ä | Anchor | IDENT$_{B-R}$<br>[front] | IDENT$_{I-O}$<br>[front] |
|---|---|---|---|
| a. bätɨt | *! | | |
| b. bäčɨt | | *! | |
| c. bätɨč | | *! | |
| ☞ d. bäčɨč | | | |

We can see that base-reduplicant identity is strictly enforced in these palatalization and labialization cases. This even happens when the reduplicant differs in voicing from the base consonant (both frequentative and total copy):

(69)

| | **2smasc.** | **2sfem.** | |
|---|---|---|---|
| a. | tɨ-jgäkɨm | tɨjg$^y$äk$^y$ɨm | 'you hit again' |
| b. | tɨ-gmäkɨm | tɨg$^y$mäk$^y$ɨm | 'you break the edge' |
| | **3smasc.** | **Impersonal** | |
| c. | yɨ-zβäpɨr | yɨ-zb$^w$äp$^w$ɨr-i | 'turn upside-down' |

Therefore, as opposed to voicing, morphological palatalization and labialization overapply, motivating a high ranking of IDENT$_{B-R}$ with respect to these features.

[24] Adjacency could also be violated for candidate (68b) if the output form is considered.

### 3.4.3 The problem of the labials

When the final two consonants are bilabial in final doubled verbs, they differ in voice in the perfective by the Devoicing Effect, and are treated as separate consonants for labialization. Only the final one is affected (β --> w). When they are identical, in the imperfective and jussive forms (β-β), labialization treats them as such and affects both consonants:

(70)

| | no object | with object | |
|---|---|---|---|
| Perf. | qäpäß-ä-m | qäpäw-ä-n-ɨm *qäp$^w$äw-ä-n-ɨm | 'shave' |
| Imperf. | yɨ-qäßɨß | yɨ-qäwɨw-ɨn | |
| Juss. | yä-qßɨß | yä-qwɨw-ɨn | |

Triliterals with final doubled bilabials also behave in a similar manner:

(71)

| | no object | with object | |
|---|---|---|---|
| Perf. | an-zɨräpäß-ä-m | an-zɨräpäw-ä-n-ɨm | 'make it droop' |
| Imperf. | y-an-zɨräpɨß | y-an-zɨräpɨw-ɨn | |
| Juss. | y-an-zärßɨß | y-an-zärwɨw-ɨn | |

Compare this, however, with the total copy and frequentative reduplication cases. In these cases, the [p] and [β] are both labialized, despite the voicelessness of the penultimate consonant:

| (72) | | no object | with object | |
|---|---|---|---|---|
| | Perf | dɨβäpäräm | dɨwäp$^{w}$ärä-nɨ-m | 'add again' |
| | Imperf. | yɨ-dβäpɨr | yɨ-dwäp$^{w}$ɨn-n[25] | |
| | Jussive | yä-dβäβɨr | yä-dwäwɨn-n | |
| | | | | |
| | Perf | ɨm-**bɨ**räpär-ä-m | ɨm-**b**$^{w}$ɨräp$^{w}$är-ä-nɨ-m | 'fluff' |
| | Imperf. | yɨ-m-**bɨ**räpɨr | yɨ-m-**b**$^{w}$ɨräp$^{w}$ɨn-n | |
| | Jussive | yä-m-**bä**rβɨr | yä-m-**b**$^{w}$ärwɨn-n | |

The explanation for the difference between total copy and frequentatives on one hand and the final doubling on the other lies in the position of the voiceless consonant in the root and the Devoicing Effect. In the frequentative and total copy cases, the rightmost labializable consonant to host the labial suffix is the devoiced [p]. In the doubling case it is the [β]:

| | | | | |
|---|---|---|---|---|
| (73) | Double | an-zɨräpäβ-ä-m | an-zɨräpäw-ä-n-ɨm | 'make it droop' |
| | Freq. | dɨβäpäräm | dɨwäp$^{w}$ärä-nɨ-m | 'add again' |
| | Total | ɨm-**bɨ**räpär-ä-m | ɨm-**b**$^{w}$ɨräp$^{w}$är-ä-nɨ-m | 'fluff' |

The [p] resists a secondary articulation unless it is forced to receive it by constraints placing [w] on the rightmost labializable consonant. In order to capture the resistance of [p] to labialization, I place a constraint on [p$^{w}$] itself.[26] Since this is not an underlying segment in the language, whereas all other labialized consonants are (although see Prunet & Petros

[25] /r + n/ --> [nn]

[26] Another approach would be to analyze a secondarily articulated consonant as violating the Devoicing Effect since the [w] articulation is voiced. This would involve revising the Devoicing Effect to include the penultimate consonant losing <u>any</u> voice specification when not followed by a Laryngeal node in the stem, either [+voice] or Sonorant Voice or Spontaneous Voice (Rice 1993, Piggott 1992). The secondary [w] articulation, which has a Sonorant Voice, is suppressed to satisfy the Devoicing Effect. This would not violate MAX, since the [w] does show up on the rightmost labial, the /β/. However, this analysis loses the generalization that the Devoicing Effect pertains to adjacent Laryngeal nodes. If it is extended to incorporate SV as well, then this insight is lost, and there is no way to group SV and Laryngeal together as a natural class.

1996 who disagree); constraints on structure preservation would disfavour this segment, but not other labialized segments. I formulate this constraint simply as NO $P^w$. A constraint such as Adjacency (pertaining to complex and simplex segments) penalizes every intervening non-labialized consonant (an Anchor-R constraint requiring that the [u] associate to a segment at the right edge of the base would also account for the data). The $IDENT_{B-R}$[labial] constraint refers to the secondarily articulated labial feature:

(74)

| an-zrβ -REDä -ä -u n -m | Adjacency | No $p^w$ | IDENTB-R [labial] |
|---|---|---|---|
| ☞ a. an-zɨräpäw-ä-n-ɨm | | | * |
| b. an-zɨräp$^w$äw ä-n-ɨm | | *! | |
| c. an-zɨräp$^w$äß ä-n-ɨm | *! | * | |

Since the [p] is the rightmost segment, it must be labialized in accordance with Adjacency, even if doing so will violated No $p^w$. The best candidate is then one which has double labialization in accordance with IDENTB-R:

(75)

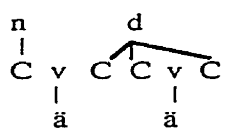
| dβr -RED-ä-ä-u n | Adjacency | NO $p^w$ | IDENTB-R [labial] |
|---|---|---|---|
| a. dɨβäp$^w$är ä-n-ɨm | * | * | *! |
| ☞ b. dɨwäp$^w$är ä-n-ɨm | * | * | |
| c. dɨwäpär ä-n-ɨm | **! | | |

In conclusion, in this section I have shown how Identity effects capture the overapplication of palatalization or labialization or the underapplication of voicing in the three kinds of reduplication in Western Gurage. In the following section, I turn to another issue in reduplication: double reduplications.

## 3.5 Double reduplications

In this section I will discuss constraints on double reduplication and show how Western Gurage differs from Tigrinya in this respect. Prunet & Petros (1996) remark that there is no triple association of segments to templates in Semitic. Thus, a biliteral root may expand to a triconsonantal: nq --> näqäq but a biliteral will never expand to a quadriconsonantal: nq --> *nɨqäqäq. They account for this with a constraint on triple linking. But, triple-linking as a structural configuration is in fact attested in Ethio-Semitic if linking is assumed. In Semitic verb stems, all geminates, whether local or long-distance, would be derived by spreading. Therefore, a biliteral root with medial gemination, such as in the Amharic or Muher word <u>näddäd-ä</u> 'he stung', should be ill-formed, but this particular kind of triple association is permitted:

(76)




In order to distinguish this kind of linking from the LDG-type, Prunet & Petros (1996:311) must appeal to the intervening vowel slot of long-distance geminates and have the constraint apply to the configuration $C_i$ V $C_i$ V $C_i$ .

If, on the other hand, the final consonant is a copy of the geminate consonant (nädd$_i$äd$_i$ä), the ban on *nɨdädädä can be explained as a general prohibition on copying twice, which I will formalize below. This approach accounts for two properties that the linking account presented in Prunet & Petros (1996) cannot capture. First, verb forms which do not have intervening vowels between copied segments are still ruled out. This would rule out Tigrinya or Tigre quadriliterals mərrər based on the quadriliteral shape məskər (as distinct from Type B verbs which have medial gemination):

(77)

```
m    r_i  r_i  r_i
|    |    |    |
C ə  C    C ə  C        *mərrər
```

Second, we will see that the copying analysis unites the avoidance of double reduplication found not only with final doubling but also total copy verbs. The triple-linking account could not explain the failure of total copy verbs to have double reduplications, since total copy does not involve linking but copying in any analysis.

I capture the avoidance of double reduplications with the constraint Integrity (McCarthy & Prince 1995), here applied to the base-reduplicant relationship:

(78) **INTEGRITY** No element of S1 (=B) has multiple correspondents in S2 (=R)

By base, I refer to the original base to which the innermost of two reduplicants attach. The second string is both reduplicants assessed together.[27]

[27] Another possibility would be to refer to the base-reduplicant relationship with a constraint such as No Bigamy (no element involved in one relationship can be involved in another).

Double reduplications are attested in some languages, and they usually involve two reduplicative affixes, or two repetitions of a base consonant in the output form. More familiar types are seen in Lushootseed (Urbanczyk 1996:278), where the two prefixes are distributed-diminutive respectively:

| | | | |
|---|---|---|---|
| (79) | a. | bí-bi-bədaʔ | 'small children' |
| | b. | pí-pi-pšpiš | 'kittens' |
| | c. | yú-yu-yəbil | 'children are starving' |

In Urbanczyk's definition of the base, there is an implied single correspondence between base and reduplicant, where the base is defined as 'the string immediately adjacent to the reduplicant'. This implies that the outside reduplicant does not care if the base itself contains a reduplicant, giving the bracketing in (80b) not (80c) for a hypothetical example:

| | | |
|---|---|---|
| (80) | a. | $b_1$i-[$b_1$ida] |
| | b. | $b_2$i-[$b_{12}$i$b_1$ida] |
| | c. | $b_1$i-[$b_1$i[$b_1$ida] |

But, in languages which penalize double reduplications, the bracketing must be more like that in (80c), where the outside reduplicant is aware that the base segment it copies is itself part of a B-R relationship (either as the base or the reduplicant). There are in fact cases where other material intervenes between a base and a reduplicant, as the following examples show, demonstrating that the base which a reduplicant copies can be singled out as a particular morphological category (underlined here):

| | | | | |
|---|---|---|---|---|
| (81) | Indonesian | tari-mən-RED | <u>tari-</u>mə-nari | 'dance (recip.)' (Mc & Prince 1995) |
| | St'át'imcets | š-RED-RED-qwəč | šqəw-qə-<u>qwəč</u> | 'little potatoes' (Shaw 1997) |

In the South E-S languages, the ban on double reduplication includes not only phonological (biliteral) reduplication as discussed in section 3.2, but also morphological reduplication. Since the frequentative form corresponds to an independently existing verb form, I will examine its interaction with final doubling and total copy to show the role of the constraint INTEGRITY.

### 3.5.1 Biliteral roots and Integrity

I begin with an examination of biliteral roots. In Chaha, a frequentative cannot be formed from a biliteral root, as discussed above. The shape of the frequentative in Chaha is CɨCäCäC in the perfective:

(82) Chaha (W. Gurage)

| **root** | | **regular** | | | **frequentative** | |
|---|---|---|---|---|---|---|
| rd | a. | nädäd | burn | d. | *nɨdädäd | burn again |
| rq | b. | näqäq | detach | e. | *nɨqäqäq | detach again |
| t'm | c. | t'ämäm | bend | f. | *t'ɨmämäm | bend again |

In Tigrinya, however, frequentatives *can* be formed from biliteral roots. The frequentative shape is CäCaCäC in the perfective. I underline the reduplicant and the vowel [a] which characterize the frequentative:

(83) Tigrinya

| **root** | | **regular** | | | **frequentative** | |
|---|---|---|---|---|---|---|
| ħt | a. | ħatät | ask | f. | ħatatät | ask many people |
| qd | b. | qädäd | tear | g. | qädadäd | tear again |
| wt' | c. | wätt'ät' | pull, force | h. | wät'at'ät | force many people |
| gf | d. | gäfäf | collect, amass | i. | gäfafäf | collect from many sources |
| fq | e. | fäqäq | pry open | j. | fäqaqäq | pry open many places |

The Tigrinya forms in (83) violate Integrity, but this violation is tolerated in order to express the frequentative morpheme. In Chaha, no Integrity violations are tolerated. This motivates the following rankings:

(84) Chaha: Integrity > Morphological Expression

Tigrinya: Morphological Expression > Integrity

Other means of satisfying Morphological Expression are ruled out because they have reduplication of the wrong consonant, violate templatic constraints, or syllabic constraints:

(85)

| | **Chaha** | **Tigrinya** | |
|---|---|---|---|
| a. | nɨnädäd | nänadäd | Anchor-L, Contiguity violation |
| b. | nɨʔädäd | näʔadäd | DEP violation |
| c. | nɨädäd | näadäd | ONSET violation |
| d. | nadäd | nadäd | template violation |
| e. | naddäd | naddäd | Geminate violation or template violation |

In the first case (85a), the wrong reduplicant is chosen. Anchor-L requires that the consonant to the right of the RED morpheme is copied. It also fares worse on Contiguity and Linearity than the attested candidate. (85b) and (85c) violate DEP (no epenthesis) or have ONSET violations. The candidate (85d) is ruled out because it violates a size restriction that the frequentative be at least three moras long. Candidate (85e) violates the ban on geminates in Chaha, if the sequence is analyzed as a geminate. But, in addition, it violates Linearity in that the affix [a] occurs before the reduplicant and not after it, if the sequence [dd] is analyzed as the sequence of reduplicant-base. In the input, the REDuplicant precedes the [a].

### 3.5 Quadriliterals in Tigrinya

Quadriliteral roots form the frequentative by one of two methods (only certain verbs may form frequentatives, generally statives and resultatives do not):

(86)

1) a frequentative stem with three moras but no reduplication (CäCaCäC) OR
2) reduplication to form a longer frequentative stem (CäCä$C_1$a$C_1$äC)

Some examples of both are given in (87):

(87)

| **root** | | **regular** | | | **frequentative** | |
|---|---|---|---|---|---|---|
| glbt' | a. | gälbät' | turn over (tr.) | i. | gälabät' | turn over and over (tr.) |
| | | | | ii. | gäläbabät' | |
| fnčl | b. | fänčäl | break off, chip | i. | fänačäl | break off many pieces |
| | | | | ii. | fänäčačäl | |
| fns'g | c. | fäns'äg | penetrate | i. | fänas'äg | keep penetrating |
| | | | | ii. | fänäs'as'äg | |
| $g^w$ndb | d. | $g^w$ändäb | cut in half | i. | $g^w$änadäb | cut in half again |
| | | | | ii. | $g^w$änädadäb | |

The longer form has reduplication and therefore fares better on the constraint $MAX_{B\text{-}R}$ requiring reduplication to be total.[28] On the other hand, the shorter form corresponds to the normal frequentative shape, with three moras. Both forms satisfy Morphological Expression and Integrity. The preference for one or the other is determined by which is more important, the reduplication or the size of the frequentative, which will be determined by having variable ranking between $MAX_{B\text{-}R}$ and a templatic constraint restricting the frequentative's size (perhaps expressed via DEP due to the extra vowel required in the longer forms). In the following tableau, I show only Morphological Expression and Integrity:

[28] I assume that $MAX_{B\text{-}R}$ is violated if there is a RED morpheme in the input but no reduplication in the output. An alternate possibility would be a constraint MAX-RED, requiring that the RED morpheme have a correspondent in the output.

(88) **glbt'- Frequentative**

| glbt' RED a | MORPH EXPR | INTEGRITY |
|---|---|---|
| a. ☞ gäläbabät' | | |
| b. ☞ gälabät' | | |
| c. gälbät' | *! | |

### 3.5.3 Reduplicative quadriliterals in Tigrinya

In contrast to the regular quadriliterals, total copy quadriliterals have only one frequentative form: the short form with no internal reduplication:

(89)

| **root** | | **regular** | | | **frequentative** | |
|---|---|---|---|---|---|---|
| bs' | a. | bäs'bäs' | mix | d. | bäs'<u>a</u>bäs' | mix many things/ continuously |
| t'b | b. | t'äbt'äb | pat | e. | t'äb<u>a</u>t'äb | pat continuously |
| tb | c. | täbtäb | beat | f. | täb<u>a</u>täb | beat continuously |

Frequentatives of total copy verbs may **<u>never</u>** form a frequentative by copying the penultimate consonant:

(90) *bäs'ä<u>ba</u>bäs'

*täbä<u>ta</u>täb

Unlike the regular quadriliterals, the extra reduplication in total copy verbs would violate Integrity since the base corresponds to two consonants in the output. Therefore, the shorter form is always selected:

(91) **tb - Frequentative**

| tb RED a | MORPH EXPR | INTEGRITY |
|---|---|---|
| a. täbätatäb | | *! |
| b. ☞ täbatäb | | |
| c. täbtäb | *! | |

This predicts that triliterals with final doubling should behave the same way since they also have reduplication. This is confirmed by the following examples:

(92)

| **root** | | **regular** | | | **frequentative** | |
|---|---|---|---|---|---|---|
| šrm | a. | šärmäm | chip | e. | šäramäm | chip many times |
| | | | | | *šärämamäm | |
| qrd | b. | qärdäd | dice | f. | qäradäd | dice a lot |
| | | | | | *qärädadäd | |
| ʕbl | c. | ʕabläl | dominate | g. | ʕabaläl | be dictatorial |
| | | | | | *ʕabälaläl | |
| zrt | d. | zärt'ät' | disrespect elders | h. | zärat'ät | disrespect many elders |
| | | | | | *zärät'at'ät | |

### 3.5.4 Chaha quadriliterals

No frequentatives are formed from any kind of quadriliteral in Chaha, including regular ones[29].

| (93) | **Regular** | **Total copy** | **Final doubling** |
|---|---|---|---|
| | *mɨsakär | *kɨmakäm | *gɨradäd |
| | *mɨsäkakär | *kɨmäkakäm | *gɨrädadäd |

We have already seen how Integrity is ranked high in Chaha to account for why biliterals with final doubling do not form frequentatives, but how do we explain the regular quadriliterals? As mentioned before, Chaha quadriliterals have the same syllable structure as the frequentative (except in the jussive: sɨbäbɨr vs. mäskɨr):

| (94) | | |
|---|---|---|
| | Frequentative | sɨbäbär |
| | Quadriliteral | mɨsäkär |
| | Total copy | kɨmäkäm |
| | Doubled | bɨrägäg |

This contrasts with Tigrinya, where the frequentative has a distinct template from the quadriliteral; it has an extra syllable and so is readily identifiable:

| (95) | | |
|---|---|---|
| | Frequentative | säbabär |
| | Quadriliteral | mäskär |
| | Total copy | bäsbäs |
| | Final doubling | qärdäd |

29 Frequentatives can be formed from quadriliterals in Amharic, but otherwise it has the same kind of restrictions on double reduplications as in Gurage. See Rose (to appear b) for discussion.

A frequentative formed from a quadriliteral in Chaha would be almost indistinguishable from a regular quadriliteral. This is further reinforced by the fact that the vowel [a] is not a consistent exponent of the frequentative in Chaha as it is in Tigrinya. It is only occasionally used. Furthermore, many non-frequentative quadriliterals have [a] between $C_2$ and $C_3$:

| | | | |
|---|---|---|---|
| (96) | šɨrašär | level ground | |
| | zɨrasär | scatter objects | (cf. zɨräsär cut meat into strips) |
| | tä-dβatäβ | hesitate | |
| | a-xramät' | chew | |

Therefore, we can conclude that Morphological Expression is not satisfied by an inserted [a] nor even a vowel [ä] between $C_2$ and $C_3$, because many non-frequentatives also have these vowels.

As for adopting a longer template with an extra syllable, Gurage has no stems with five surface consonants, so we can assume that this is ruled out by constraints on templatic size ranked above Morphological Expression. In conclusion, since the regular quadriliteral cannot use /a/ nor make the template bigger to form the frequentative, neither of these are options for reduplicated quadriliterals either.

## 3.6 Conclusion

In this chapter, I have analyzed the major cases of reduplication in Ethio-Semitic. Instead of the previous analysis of reduplicated biliterals as spreading, I have argued that they should instead be characterized as reduplication establishing a correspondence relationship. Arguments for spreading to create long-distance geminates were assessed and rejected. I further showed how constraints on reduplicative correspondence interact with segmental phonology. Finally, adopting the correspondence strategy led to a clear expression of constraints on double reduplications, which are problematic and must be treated differently under a spreading account. My account explains why Tigrinya and Chaha differ in just the way they do by ranking Integrity with respect to the constraint Morphological Expression proposed in chapter 2.

# Chapter 4
# Epenthesis

## 4.1. Introduction

Epenthesis in Ethiopian Semitic languages has been largely ignored from a comparative viewpoint, with the exception of Hayward (1988). Epenthesis patterns in Harari were first discussed in a generative framework in Kenstowicz & Kisseberth (1979), and the same facts were repeated in Itô (1986, 1989) as support for her arguments for templatic and directional syllabification. Berhane (1991) and Denais (1990) focus on epenthesis in Tigrinya, arguing for another form of directional determination of epenthetic vowels. The other languages, however, have received little attention on this issue, partly because they are assumed to be relatively straightforward. In fact, the other Ethio-Semitic languages are interesting for their <u>contrast</u> with the unusual patterns of Tigrinya and Harari. In this chapter I will present a general description of epenthesis in Ethio-Semitic. All Ethio-Semitic languages violate common restrictions on the sonority of coda-onset sequences in a large number of words, but not all languages behave uniformedly with respect to whether intersyllabic sonority plays a role in epenthesis. Tigrinya and Harari obey strict left-to-right directional syllabification with complete disregard for intersyllabic sonority restrictions. In contrast, Chaha generally follows the left-to-right pattern, but epenthetic vowels, independently required for structural reasons, are positioned to avoid intersyllabic sonority violations. This is a case of emergence of the unmarked (McCarthy & Prince 1994a) in a new arena - syllable contact. This chapter is organized as follows. In §4.2, I discuss the syllable structure of Ethio-Semitic languages. In §4.3, I present epenthesis data from Harari. In §4.4, I show how Tigrinya differs from Harari in having constraints on templatic shape outranking normal epenthesis patterns. In §4.5, I discuss Tigre and the

Ethio-Semitic typology, and in §4.6, I explore the issue of intersyllabic sonority in Chaha and show how it accounts for the position of epenthetic vowels.

## 4.2. Syllable structure

All the Ethio-Semitic languages have the basic syllables CV and CVC. In addition, in word-initial position, onset-less syllables V and VC are permitted; for the most part, the languages do not tolerate vowel hiatus.[1] Tigre, Tigrinya and Harari (and also Gafat) do not allow CVCC syllables, whereas the other languages permit these syllables word-finally, a situation similar to that in most dialects of Arabic. In those Ethio-Semitic languages which allow final CVCC syllables, the sonority of the first consonant must be higher than that of the second[2]. Violation of the appropriate sonority contour will lead to epenthesis between the final consonants, as illustrated by the following masculine singular imperative forms from Chaha. In (1a,b) the appropriate fall in sonority between the two final consonants is found. In (1c,d), sonority rises, and epenthesis occurs to break up the impermissible cluster:

(1) **Chaha**

| | | | | |
|---|---|---|---|---|
| a. | /srt/ | --> | sɨrt | cauterize! |
| b. | /kft/ | --> | kɨft | open! |
| c. | /rt'r/ | --> | nɨt'ɨr | melt! |
| d. | /dβr/ | --> | dɨβɨr | add! |

[1]Exceptions include words where medial gutturals have been dropped, ie. Amharic säat 'hour', bäal 'holiday' from *säʔat, *bäʔal.

[2] In some words like sɨgɨd 'worship, bow! (2ms)', there are alternate pronunciations without epenthesis: sɨgd. These are discussed in §4.6.3.

This is similar to certain Arabic dialects, such as Lebanese (Haddad 1984)[3], but unlike Cairene Arabic (Broselow 1976, 1980, 1992). In Cairene, the sonority of the final two consonants in a word is unimportant, as seen by the following examples. The contrast between (2h) and (2i) shows that both falling and rising sonority between the final consonants is permitted:

(2) **Cairene Arabic** (Abdel-Massih 1975)

| | | |
|---|---|---|
| a. | bint | girl |
| b. | dars | lesson |
| c. | sitt | lady |
| d. | ṣaʕb | difficult |
| e. | widn | ear |
| f. | tusʕ | a ninth |
| g. | šakl | shape |
| h. | sidr | chest |
| i. | ʔird | monkey |

Word-medially, in coda-onset sequences, both falling or rising sonority are attested in Ethio-Semitic, as the Chaha examples in (3) illustrate. Falling sonority clusters [r-t] as in (3a) and rising sonority [t-r] clusters (as in 3e) are attested. Since Chaha has no complex onsets, both of these clusters are coda-onset sequences:

[3] In Lebanese /r/ patterns as having lower sonority than nasals; /farm/ --> [farim] 'chopping' and /ʔamr/ --> [ʔamr] 'order'. This does not invalidate the sonority scale, but shows that certain consonants may vary in sonority. Since there are many kinds of rhotics, from fricatives to trills to flaps, it is not surprising that the sonority of various 'r' sounds may differ.

(3) **Chaha**

a. sɨrto 'cauterize!' (m.pl.)

b. dɨßro 'add!' (m.pl)

c. at'met' 'solidified juice from äsät plant'

d. qumt'a 'short pants'

e. matrašä 'litter to carry dung'

f. č'azma 'ground bee'

Word-initially, C-r sequences are sometimes transcribed with no epenthetic vowel, but this may be due to a lack of perceptible release from the initial consonant. In section 4.6, I shall show how intersyllabic sonority between coda and onset does play a role in Chaha syllabification.

Sonority is generally viewed as a ranked scale known as the Sonority Hierarchy (early versions of the sonority hierarchy are proposed in Sievers 1881 and Jespersen 1904, see also Hooper 1976, Hankamer & Aissen 1974). Selkirk (1984) provides the most fully articulated version, complete with integer values for each consonant or set of consonants:

(4)

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| a | eo | iu | r | l | mn | s | vzð | fθ | bdg | ptk |
| 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | .5 |

The sonority scale as given in Selkirk (1984) is purported to be universal. However, Clements (1990) argues that the sonority scale universally refers to major class features only and should be derived from them, rather than major class features being eliminated in favour of the sonority hierarchy, as Selkirk argues. Clements calculates that the more +

values of the major class features a segment has, the higher its sonority is, as follows (O = obstruent, N = nasal, L = liquid, G = glide, V = vowel):

| (5) | O | N | L | G | V | |
|---|---|---|---|---|---|---|
| | - | - | - | - | + | syllabic |
| | - | - | - | + | + | vocoid |
| | - | - | + | + | + | approximant |
| | - | + | + | + | + | sonorant |

The major class divisions are universal, in that all languages make at least the divisions in (5). Further divisions among these classes are language-specific, although sonority is still relevant among particular obstruents, for example, where fricatives have higher sonority than stops, or voiced consonants have higher sonority than voiceless.

The purpose of the sonority hierarchy is to determine what sequences of sounds can occur in syllables. Sonority must rise towards the nucleus and fall away from it in the rime. In addition, there may be minimal distance requirements (Hooper 1976, Steriade 1982, Selkirk 1984, Clements 1990) on onsets or rimes to explain why, for example, English onsets may be composed of [dr] but not [dn]. Both obey sonority, but in the second case, the relative sonority of [d] and [n] is too close on the sonority scale.

In addition to sonority within syllables, the sonority hierarchy has been used to regulate heterosyllabic sequences of consonants. Some languages place strict restrictions on coda-onset sequences, requiring a syllable-final consonant to be equally or more sonorant than a following onset (Hooper 1972, Murray & Vennemann 1983, Clements 1990 and expressed in terms of government/binding in Kaye, Lowenstamm & Vergnaud 1990, Harris 1990, Rice 1992). This general requirement was termed the Syllable Contact Law by Murray & Venneman (1983):

(6) **Syllable Contact Law**

The preference for a syllabic structure A$B, where A and B are segments and *a* and *b* are the sonority values of A and B respectively, increases with the value of *a* minus *b*

Zec (1988) proposes to capture the syllable contact law by way of general moraification. A moraification algorithm creates sequences of ascending sonority only. She states (p. 110) that 'two adjacent segments *a* and *b* will belong to different moras only if *a* is more sonorous than *b*; if *a* is less sonorous than *b*, the two segments create a sequence of ascending sonority, and will therefore be grouped into a single mora'. Sonority in her framework is calculated by major class features (Clements 1990) and by minimal distance constraints. Kaye, Lowenstamm & Vergnaud (1990) and Rice (1992) formalize the relationship between the coda and onset in terms of licencing or government. In some languages, epenthesis, metathesis or deletion occur to 'repair' ill-formed heterosyllabic sequences. Ponapean allows heterosyllabic clusters if homorganic. However they must conform to the syllable contact law, or government between coda and onset; epenthesis will occur if they do not as the examples in (7c-d) illustrate (the liquids are realized as nasals) (Rice 1992):

(7) **Ponapean**

| | | | |
|---|---|---|---|
| a. | sel-sel --> | sensel | 'tied' |
| b. | tar-tar --> | tantar | 'strike, of a fish' |
| c. | rot-rot --> | rotorot | 'dark' |
| d. | lus-lus --> | lusulus | 'jump' |

Similarly, in Sidaama (formerly known as Sidamo), metathesis occurs to repair illicit heterosyllabic sequences (Rice 1992, Vennemann 1988, Teferra 1994):

(8) **Sidaama**

| | | | | |
|---|---|---|---|---|
| a. | gud-nónni | --> | gun.dónni | 'they finished' |
| b. | hab-némmo | --> | ham.bémmo | 'we forget' |
| c. | duk-nánni | --> | duŋ.kánni | 'they carry' |
| d. | has-némmo | --> | han.sémmo | 'we look for' |

Since Ethio-Semitic languages do not have complex onsets, and only have what appear to be complex codas in word-final position, sonority between syllables will be more important than sonority within syllables. I will not argue for one or the other of the various proposals regarding sonority, but will assume the general correctness of the sonority scale. See Gnanadesikan (1997) for a reanalysis of the sonority hierarchy in terms of ternary scales and ranked constraints within Optimality Theory. As can be seen from the examples in (3), Ethio-Semitic languages do not repair violations of the Syllable Contact Law by epenthesis or some other strategy, like Sidaama or Ponapean do. This does not mean that the Syllable Contact Law does not hold in Ethio-Semitic languages, though. I will show that despite numerous violations, Chaha does obey the Syllable Contact Law when it has the opportunity to do so for independent reasons. Languages like Harari, however, show no signs of respecting the Syllable Contact Law.

## 4.3. Harari

### 4.3.1 Description of Harari epenthesis

Harari does not allow CVCC final syllables. Any sequence of consonants word-finally undergoes word-final epenthesis *following* the two consonants. The epenthetic vowel is [i] in Harari, sometimes realized as [ɨ] in closed syllables. This is illustrated by the following simple imperfective forms. The simple imperfective has the stem shape CäCC, whereas the jussive has the shape CCäC. Epenthesis appears on the imperfective forms to resolve the word-final cluster:

(9)

| | Imperfective (CäCC) | | Jussive (CCäC) | |
|---|---|---|---|---|
| a. | yi-käfti | e. | yä-kfät | 'he opens/let him open' |
| b. | yi-säbri | f. | yä-sbär | 'he breaks/let him break' |
| c. | yi-qädmi | g. | yä-qdäm | 'he advances/let him advance' |
| d. | yi-sägdi | h. | yä-sgäd | 'he prostrates/let him prostrate' |

These forms (9a-b) can be contrasted with cognate verb roots in Chaha which permit word-final clusters or have epenthesis between the final consonants (parentheses indicate the epenthetic vowel is optional):

(10) **Chaha imperfective**

| | | |
|---|---|---|
| a. | yɨ-käft | 'he opens' |
| b. | yɨ-säßɨr | 'he breaks' |
| c. | yɨ-säg(ɨ)d | 'he bows, worships' |

Other examples of word-final epenthesis can be seen with certain subject markers in Harari. The following forms show that the perfective subject markers 3fs /t/ and 2ms /x/ trigger word-final epenthesis when following consonant-final verbs:

| (11) | | **w/object** | |
|---|---|---|---|
| 3fs | gädäl-**ti** | gädäl-t-äñ | 'she killed me' |
| | | gädäl-t-äš | 'she killed you (f.)' |
| 2ms | gädäl-**xi** | gädäl-x-äñ | 'you killed me' |
| 2fs | gädäl-ši | gädäl-ši-ñ | 'you killed me' |
| 1s | gädäl-xu | gädäl-xu-š | 'I killed you (f.)' |

The 1s /-ñ/ and 2sf /-š/ consonantal object markers following consonant-final subject markers have a special äC form: [äñ] or [äš]. This is contrasted with the 2sf [ši] which has a non-epenthetic word-final [i] and no [ä] vowel.

Turning to the nouns, lexical nouns with a final underlying CC cluster have word-final epenthesis. This is supported by contrasting them with cognates in Amharic, Arabic or W. Gurage which all allow final CVCC syllables. Tigrinya, which also has word-final epenthesis shows almost identical forms to Harari. This comparison is offered as external evidence only. Below I offer language-internal evidence that the final [i] is indeed epenthetic:

(12) **CVCCi**

| | **Harari** | | **Tigrinya** | **Other** | |
|---|---|---|---|---|---|
| a. | bɨrzi | 'honeyed water' | bɨrzi | bɨrz | (Amharic) |
| b. | č'ärqi | 'small rag' | č'ärqi | č'ärq | (Amharic) |
| c. | dɨnki | 'dwarf' | dɨnki | dɨnk | (Amharic) |
| d. | därsi | 'education' | | dars | (Arabic) |
| e. | kärsi | 'abdomen' | kärši | kärɨs | (Tigre) |
| f. | mɨšti | 'wife' | | mɨšt | (Amharic) |
| g. | näfsi | 'soul' | näfsi | näfs | (W. Gurage) |
| h. | qulfi | 'button' | $q^{w}$ɨlfi | $q^{w}$ɨlf | (Amharic) |
| i. | sɨnqi | 'provisions' | sɨnqi | sɨnq | (Amharic) |
| j. | gunč'i | 'cheek' | | gunč' | (Amharic) |
| k. | jinsi | 'kind' | | jins | (Arabic) |
| l. | ħamdi | 'praise, thanks' | | ħamd | (Arabic) |
| m. | kibri | 'pride' | | kibr | (Arabic) |
| n. | qismi | 'share, portion' | | qism | (Arabic) |

The status of the word-final [i] can be tested by adding the vowel-initial 1s possessive marker /-e/. The final epenthetic [i] of the nouns is missing when this suffix is attached, although a form with epenthetic [y] is also attested, i.e. <u>näfsiye</u>:

(13)

| | | | | | |
|---|---|---|---|---|---|
| a. | mɨšti | 'wife' | d. | mɨšte | 'my wife' |
| b. | näfsi | 'soul' | e. | näfse | 'my soul' |
| c. | qulfi | 'button' | f. | qulfe | 'my button' |

The following words in (14) end in [i], but this [i] is not epenthetic since it is preceded by a single consonant and not a cluster. In these cases, the final vowel cannot be dropped when the 1s possessive /-e/ is added, and only the form with the epenthetic glide is possible:

(14)

| | | | | | | |
|---|---|---|---|---|---|---|
| a. | wedäli | 'kind of deer' | c. | wedäliye | 'my deer' | *wedale |
| b. | wäri | 'doorframe' | d. | wäriye | 'my doorframe' | *wäre |

Quadriconsonantal nouns have the pattern CVCCiC, with epenthesis between the last two consonants:

(15) **CVCCiC** - quadriconsonantal pattern

| | | | |
|---|---|---|---|
| a. | ħiffiñ | 'viper' | |
| b. | mɨssɨr | 'lentil' | |
| c. | qalbis | 'collar' | |
| d. | qɨmč'ir | 'wrinkle' | |
| e. | qɨnč'ib | 'kind of cactus' | |
| f. | qɨnt'ɨr | 'male organ' | |
| g. | fɨlqɨm ašä | 'chip' | |
| h. | fättiš ašä | 'examine' | |
| i. | sin gilgil | 'small crooked tooth' | |
| j. | jammiʔ | 'all, everything' | cf. Arabic jamiʔ |
| k. | maxrib | 'evening prayer' | cf. Arabic maGrib |
| l. | mäšriq | 'east' | |
| m. | wänfit | 'sieve' | |

Finally, there are words which appear to be exceptions to the general epenthesis pattern of triconsonantal lexical nouns, but I will argue instead that the [i] vowels are not epenthetic. Instead of the form CVCCi illustrated in (12), the following nouns in (16) have the shape (C)VCiC. The final two examples (16j-k) have four consonants, but they have the shape CVCVCiC and not CVCVCCi. The comparative data from the other languages is intended to show that the [i] or [ɨ] in Harari generally corresponds to a non-epenthetic vowel in related languages. Recall that in the data in (12), the final epenthetic vowel in Harari did not correspond to a vowel in related languages. The following is a near exhaustive list of 'exceptions' to the general CVCCi pattern of triconsonantal nouns from Leslau (1963).

(16) (C)VCiC

| | | | | | |
|---|---|---|---|---|---|
| a. | igir | 'foot' | | ɨgɨr | (Amharic) |
| b. | gidij | 'eyebrow' | | | |
| c. | gɨlib | 'knee' | | gulbät | (Amharic) |
| d. | lazim | 'caller to prayer' | | lazim | (Arabic) |
| e. | šakir | 'grateful' | | šakir | (Arabic) |
| f. | šarib | 'whiskers' | | šarib | (Arabic) |
| g | t'ifir | 'claw, fingernail' | | t'ɨfɨr | (Amharic) |
| | | | but | s'ɨfri | (Tigrinya) |
| h. | tɨfit | 'slap' | | t'ɨffi | (Amharic) |
| i. | wajib | 'duty, obligation' | | wa:jib | (Arabic) |
| j. | musafir | 'traveller, peddler' | | | |
| k. | waqalim | 'sausage' | | $q^{w}$alima | (Amharic) |

When vowel-initial suffixes are added to the words in (16), the vowel between the two final consonants is still present:

(17)

a. igir-e 'my foot'

b. gɨlib-e 'my knee'

c. musafir-e 'my traveller'

d. waqalim-e 'my sausage

In Chaha, on the other hand, an epenthetic vowel would not appear between the two root-final consonants when followed by a vowel-initial suffix:

(18) Chaha

a. agɨr-äna --> agräna 'my foot'

b. sɨdɨβ-äna --> sɨdβäna 'my curse'

c. mäqaβɨr-äna --> mäqaβräna 'my grave'

This suggests that the [i] between the final consonants in the Harari words in (16) is not epenthetic, but a full-fledged [i]. Since in Harari the epenthetic [i] overlaps with the phoneme /i/, it is not always easy to determine whether word-medial [i] is epenthetic or not.

Some adjectives take the form CäCiC. If these adjectives had the templatic shape CäCC, we would expect a final epenthetic [i]. This suggests that the pattern is really CäCiC with a non-epenthetic [i], the same pattern found in Ge'ez with or without gemination: <u>t'äbib</u> 'wise', <u>balix</u> 'sharp, <u>ʕabiy</u> 'great' (Lambdin 1978:76). Like the forms in (16), the data in (19) are surface exceptions to the general rule that final CC clusters are resolved via epenthesis following the consonants and not between them. But, if the [i] in these adjectives is not epenthetic, then they are not bona fide exceptions:

(19)

| | | | |
|---|---|---|---|
| a. | ħas'ir | 'short' | Tna ħas'ir < ħs'r be short' |
| b. | qäč'in | 'thin, slender' | Ge'ez: qätt'in |
| c. | wäriq | 'green' | |
| d. | ħajis | 'new' | Ge'ez: ħaddis |
| e. | bäxil | 'parsimonious, miserly' | |

This concludes the descriptive portion of the distribution of the epenthetic vowel in Harari. I now turn to the position of the epenthetic vowel with respect to directional syllabification.

### 4.3.2 Harari epenthesis and directionality

Kenstowicz & Kisseberth (1979) formulate the epenthesis rule in Harari as occurring in the following environments:

(20) ø --> i / CC __ C

CC __ #

#C __ C

In a triconsonantal cluster, the epenthetic [i] is inserted between the second and third consonants, and following two consonants word-finally. This is to account for data such as the following:

(21)

| | | | | |
|---|---|---|---|---|
| a. | /t-säbr/ | tisäbri | *tisäbir | 'you break' |
| b. | /zä-t-sbär/ | zätsibär | *zätisbär | 'you don't break' |

Itô (1986) argues for left-to-right syllable construction in Harari, paralleling her proposals for Cairene Arabic. A maximal syllable CVC is constructed beginning from the left edge of the word and proceeding rightwards, avoiding onset violations. Thus, for the input /t-säbr/, an epenthetic vowel is inserted to provide [t] with an onset. The next consonant [s] cannot be incorporated as a coda of the syllable [ti] because this would leave the next syllable onset-less. Therefore, [s] and [ä] form another syllable. The consonant [b] is incorporated as the coda of the syllable [sä] and the [r] then receives an epenthetic [i] for support following it:

(22)
```
 σ     σ      σ
/\   / | \   /\
O    O N C   O
t    s ä b   r        --> tisäbri
```

The distinction between Harari and Cairene Arabic is that final CC clusters are allowed in Cairene regardless of their relative sonority, as discussed in (2).

With triconsonantal lexical nouns as in (12), the same approach accounts for word-final epenthesis:

(23)
```
   σ      σ
 / | \   /\
O    C   O
b    r   z        --> bɨrzi
```

As for quadriconsonantal nouns as in (15), L-R directionality places epenthesis between the final two consonants:

(24)
```
   σ        σ
 / | \    / | \
 O N C    O NC
 q   m    č'  r        --> qɨmč'ɨr
```

It appears that Harari obeys strict L-R directionality. Those forms which appear to be counterexamples as in (16) have non-epenthetic [i] vowels. In addition, the directionality of epenthesis overrides the Syllable Contact Law completely. For example, epenthesis always follows the two final consonants, even if doing so would cause a heterosyllabic sonority violation. In the following examples, the coda is less sonorant than the onset, violating the Syllable Contact Law:

(25)

a. kibri 'pride'

b. qismi 'share, portion'

c. ti-säbri 'you (ms.) break'

We can thus conclude that given two constraints, Syllable Contact Law, and Directionality, Directionality is ranked above Syllable Contact in Harari. I will now formalize these constraints.

Directionality of syllabification is very much a serial operation, and as such, does not fit within Optimality Theory's insistence on a single derivational step. It has been recast in Optimality Theory as Alignment constraints. These particular Alignment constraints require that the edge of every syllable be aligned with the edge of the prosodic word (Mester & Padgett 1994, Wiltshire 1995):

(26) **Align (Syllable, Edge, PrWd, Edge)**

Every syllable must be aligned with the edge of some prosodic word

Each syllable is judged for satisfaction of alignment by counting how many moras away from the edge of the prosodic word it is, with the assumption that closed syllables are mora-bearing. Mester & Padgett (1994) use Alignment to capture the parametrical difference between Cairene and Iraqi Arabic (Broselow 1980, 1992, Selkirk 1981, Itô 1986, 1989). Itô proposed that the distinction between Cairene and Iraqi Arabic epenthesis sites was due to a directionality parameter: L --> R syllable construction in Cairene and R --> L syllable construction in Iraqi. This is to account for pairs like the following:

| | | | | |
|---|---|---|---|---|
| (27) | Cairene | /ʔul-t-l-u/ | ʔul.tí.lu | 'I told him' |
| | Iraqi | /gil-t-l-a/ | gi.lít.la | 'I told him' |

In each case, an attempt is made to construct a maximal CVC syllable, in keeping with the Onset Principle, starting from either the left or right edge. Alignment will produce the same effect as directional syllabification, resulting in closed syllables more to one edge than the other. For right-to-left directionality, Align L is used and closed syllables are found closer to the right edge:

(28) **Iraqi**

| gil-t-l-a | Align L (σ, PrWd) | No Coda |
|---|---|---|
| a. gil.ti.la | σ2 σ3<br>μμ! μμμ | * |
| ☞ b. gi.lit.la | σ2 σ3<br>μ μμμ | * |

The first syllable is well-aligned with the left edge of the word. The second syllable is either two moras away in candidate (28a) (preceded by a closed syllable which has two moras) or one mora away in candidate (28b) (preceded by an open syllable which has one mora). The same assessment is computed for the third syllable and then the total number of moras are compared between candidates, producing (28b) as the winning candidate because it has one less mora. The same calculation is repeated with Align R for Cairene (left-to-right syllable construction), resulting in closed syllables being closer to the left edge:

(29) **Cairene**

| ʔul-t-l-u | Align R (σ, PrWd) | No Coda |
|---|---|---|
| ☞ a. ʔul.ti.lu | σ1 σ2<br>μμ μ | * |
| b. ʔu.lit.lu | σ1 σ2<br>μμμ! μ | * |

Harari resembles Cairene, in that L-R directional syllabification or Align R result in closed syllables towards the left edge of the word. There are two ways in which the Alignment analysis of Mester & Padgett is problematic. First, as they point out themselves, there is overlap with the constraint FILL (or DEP), which penalizes epenthesis and therefore, indirectly, greater numbers of syllables. Therefore, the more syllables there are, the more violations there will be since each syllable is assessed individually for satisfaction of Align. Second, since final consonants in Arabic are non-moraic, Align-R cannot distinguish between two candidates CVCVC and CVCCV from an input /CVCC/ as shown below:

(30)

| CVCC | Align R (σ, PrWd) |
|---|---|
| μμ μ<br>a. CVC.CV | σ1 σ2<br>μ |
| μ μ<br>b. CV.CVC | σ1 σ2<br>μ |

This suggests that counting moras is problematic, and that the constraint should instead be formulated to count light syllables:

(31) **Anchor ($\sigma_\mu$ R, Pwd R)**

The right edge of every monomoraic syllable has a correspondent at the right edge of some prosodic word

While this constraint suffers from the same problem as the Mester & Padgett (1994) analysis in that the more syllables there are, the more violations pile up, it solves the problem of the final non-moraic coda. Violations may be computed by counting syllables or moras; in the following tableau and subsequently, I count syllables. The first light syllable of candidate (32a) is the final one, which is positioned at the right edge and therefore satisfies Anchor-R. Candidate (32b) has two light syllables. The first is one syllable away from the right edge, and incurs one violation; the final syllable is perfectly anchored:

(32)

| CVCC | Anchor R ($\sigma_\mu$, PrWd) |
|---|---|
| μμ μ<br>☞ a. CVC.CV | σ1 |
| μ μ<br>b. CV.CVC | σ1 σ2<br>*! |

Turning now to heterosyllabic sonority, the Syllable Contact Law is stated as follows, modified from Murray & Vennemann (1983) as a categorical statement (see also Bat-El 1996, Urbanczyk 1996, Davis & Shin 1997 on Syllable Contact in OT):

(33) **Syllable Contact**

In a syllabic structure A$B, where A and B are segments and *a* and *b* are the sonority values of A and B respectively, *a* must be higher in sonority than *b*.

Harari epenthesis has the ranking Anchor-R > Syllable Contact. It is more important to have a closed syllable at the left edge (by aligning the open syllables towards the right edge) than to obey SyllCon:

(34)

| kbr | Anchor-R | SyllCon |
|---|---|---|
| ☞ a. kibri | σ1 | * |
| b. kibir | σ1 σ2 *! | |

Anchor-R will also choose the correct candidate when a prefix is added. In (35a), there are only two monomoraic syllables, but in (35b), there are three:

(35)

| t-säbr | Anchor-R | SyllCon |
|---|---|---|
| ☞ a. tisäbri | σ1 σ2 ** | * |
| b. tisäbir | σ1 σ2 σ3 ** *! | |

The ranking of Anchor-R above SyllCon can be termed a case of blind alignment in that considerations of sonority are sacrificed to achieve good alignment of syllables towards an edge.[4] Anchor-R itself is dominated by considerations of syllable structure such as ONSET and maximal syllable size (i.e. no complex codas or onsets). I now turn to Tigrinya, which resembles Harari closely.

[4] Broselow (1992) argues against the directionality account of the Iraqi/Cairene epenthesis patterns in that it cannot account for word-initial clusters in Iraqi, or for loanwords. I do not attempt to reanalyze all the patterns here, but suggest that the Anchor constraints pertaining to open syllables as well as Syllable Contact look promising in solving this problem. Assuming that Iraqi has Anchor-L ranked higher than Anchor-R to account for word-internal epenthesis patterns, we discover that Anchor-L cannot determine between a #CCV cluster parsed as #CiCV or #iCCV. The first parse has perfect alignment of the open syllable with the left edge, and the other has a closed syllable so it is not judged with respect to Anchor. Appealing next to Anchor-R favours the vowel-initial form, and that is indeed what we find: /ktaab/ --> [iktaab] 'book'. The loanword patterns suggest that Syllable Contact may be ranked higher in Cairene than in Iraqi. For example, the word Fred is borrowed as [ifrɛd] in Iraqi and as [firɛd] in Cairene, showing avoidance of [f-r]. The Syllable Contact analysis also accounts for the problematic triconsonantal clusters discussed in Broselow (1983): 'street' is parsed as [istireet] in Cairene (avoidance of t-r) but as [sitreet] in Iraqi.

## 4.4. Tigrinya Epenthesis

### 4.4.1 Triconsonantal nouns

Like Harari, Tigrinya does not allow word-final CVCC syllables. A final CC cluster is repaired by word-final epenthesis of [i] following the two consonants. The epenthetic vowel is [i] word-finally and [ɨ] elsewhere. This is illustrated by the following triconsonantal nouns:

(36)

| | | |
|---|---|---|
| a. | kälbi | 'dog' |
| b. | bɨrki | 'knee' |
| c. | lɨbbi | 'heart' |
| d. | sɨnni | 'tooth' |
| e. | s'ɨfri | 'nail' |
| f. | ʔɨgri | 'foot' |

The final two forms (36e-f) show that intersyllabic sonority is disregarded in favour of directionality. The sequences [fr] and [gr] violate Syllable Contact. Borrowed nouns with final clusters undergo word-final epenthesis, too (data from Berhane 1991):

(37)

| | | |
|---|---|---|
| a. | banki | 'bank' |
| b. | wäyni | 'wine' |
| c. | dänsi | 'dance' |

Tigre, the closest spoken language to Tigrinya, resolves word-final clusters by epenthesis <u>between</u> the two consonants, as the following cognates show. This is similar to Chaha epenthesis (see (1)), except that Tigre has no CVCC syllables word-finally.

| (38) | | **Tigre** | **Tigrinya** | |
|---|---|---|---|---|
| | a. | ʔɨgɨr | ʔɨgri | 'foot' |
| | b. | kälɨb | kälbi | 'dog' |
| | c. | näfɨs | näfsi | 'soul' |
| | d. | ħɨlɨm | ħɨlmi | 'dream' |

As demonstrated by Berhane (1991), the epenthetic status of final [i] in Tigrinya can be tested by attaching suffixes. Vowel hiatus is generally repaired by glottal stop insertion. But, epenthetic [i] is missing before vowel-initial suffixes, as shown in (39a). In (39b), a consonant initial suffix causes the epenthetic vowel to be realized as [ɨ] since it is no longer final. This would not be expected if it were not epenthetic:

| (39) | | **Regular nouns - final [i] is epenthetic** | | |
|---|---|---|---|---|
| | a. | kälbi + u --> kälbu | 'his dog' | *kälbiʔu |
| | b. | kälbi + xa --> kälbɨxa | 'your dog' | *kälbixa |

In contrast, non-epenthetic word-final [i], part of the template of derived agentives or instrumentals, triggers glottal stop insertion between [i] and the suffix. Furthermore, this [i] is not centralized to [ɨ] because it is not epenthetic:

(40) **Derived nouns - final [i] is non-epenthetic**

| | | | | |
|---|---|---|---|---|
| a. | därafi - a | --> | därafiʔa | 'her singer' |
| b. | gomadi - a | --> | gomadiʔa | 'her cutter' |
| c. | mä-srɨħi - a | --> | mäsrɨħiʔa | 'her instrument for working' |

I will now examine some forms which Denais (1990) considers problematic because the epenthetic vowel is placed between the final two consonants instead of following them. This occurs in derived instrumental nouns. Instrumentals are formed with a prefix /mä-/ and one of two templatic forms: mä-CCɨC or mä-CCäCi. It is the first forms in (41a-d) which Denais considers problematic:

(41)

| | | |
|---|---|---|
| a. | mä-sfɨn | leader |
| b. | mä-mhɨr | teacher |
| c. | mä-rfɨʔ | needle |
| d. | mä-ngɨd | business |
| | | |
| f. | mä-xdäni | instrument for covering |
| g. | mä-dräfi | microphone |
| h. | mä-gräfi | instrument for whipping |
| i. | mä-dfɨʔi | instrument for pushing (ä-->ɨ before guttural [ʔ]) |

But, L-R directionality or Anchor-R predicts these outputs, since the prefix forms a closed syllable with the initial consonant of the root, and then the two remaining consonants are incorporated into a single syllable:

(42)

```
   σ       σ
  / | \   / | \
  O N C   O N C
  m ä n   g    d            ---> mängɨd
```

If the epenthetic vowel occurred following the two final consonants, an additional epenthetic vowel would be needed to syllabify all consonants, producing a form like *<u>mänɨgdi.</u>

The same logic applies to quadriconsonantal nouns and quadriliteral jussive forms:

(43) **Quadriconsonantal nouns**

| | | | | |
|---|---|---|---|---|
| a. | dɨngɨl | 'virgin' | *dɨngɨli | *dɨnɨgli |
| b. | qɨlsɨm | 'forearm' | | |
| c. | bɨrsɨn | 'lentils' | | |
| d. | bɨllɨs' | 'choice' | | |

**Quadriliteral imperative verbs CäCCC**

| | | |
|---|---|---|
| e. | mäskɨr | 'testify!' |
| f. | gärnɨb | 'tatoo beauty mark!' |

Tigrinya appears to follow Anchor-R in the same way as Harari, with no regard for Syllable Contact.

### 4.4.2 Exceptions to epenthesis and the role of the template

The one major exception to the left-right pattern in Tigrinya is with Type C jussive and imperfective verbs. These are triliteral verbs with the vowel [a] between the first two consonants. There are no other vowels within the template in the jussive or imperfective Type C form. Instead of an epenthetic vowel following the two remaining consonants to produce the familiar CVCCi form, the epenthetic vowel occurs between the two final consonants:

(44)

| | | | | |
|---|---|---|---|---|
| Type C | a. | yɨ-galɨb | 'he gallops' | *yɨ-galbi |
| | b. | yɨ-barɨx | 'he bless!' | *yɨ-barki |

The verb in (44b) can be compared with the lexical noun bɨrki 'knee', which has the same three consonants (/k/ --> [x] postvocalically). The behaviour of Type C verbs is also one area where Tigrinya differs from Harari, which has word-final epenthesis:

(45)

| **Harari** | | | **Tigrinya** | | |
|---|---|---|---|---|---|
| a. | yi-magdi | 'he burns' | d. | yɨ-barɨx | 'he blesses' |
| b. | yi-marxi | 'he takes prisoner' | e. | yɨ-marɨx | 'he leads' |
| c. | yi-nawt'i | 'he changes' | f. | yɨ-galɨb | 'he gallops' |

The only other Tigrinya verb form with epenthesis between the final two consonants is the causative jussive of Type A verbs. Normally, Type A jussives have the form CCäC. When causative, however, they take the stem shape CCɨC, with epenthesis between the final consonants:

(46) Causative jussive - CCɨC

| | | |
|---|---|---|
| a. | yä-sbɨr | 'let him make break!' |
| b. | ʔa-sbɨr | 'make break!' |

However, as with the instrumental nouns and agentives in (40), the prefix forces the epenthetic vowel to appear between the final two consonants. If it appeared following them, an additional epenthetic vowel would be necessary: *yä-sɨbri. In summary, Tigrinya has the same epenthesis strategy as Harari with the exception of Type C verbs.

Berhane (1991) argues that Type C cannot have word-final epenthesis since this would place the [a] in a closed syllable: **barki*. He considers peripheral vowels (the non-central vowels i e a o u) to be long, and therefore not permitted in closed syllables since Tigrinya does not allow 'super-heavy' syllables. However, the postulation of long vowels in Tigrinya is mostly based on historical arguments. There is no contrast between long and short vowels of the same quality, but between peripheral and central vowels of different quality, ie between [a] and [ä] and [i] and [ɨ]. There is little synchronic evidence, such as closed-syllable shortening, or distribution restrictions, ie no peripheral vowels in closed syllables, which points to the vowels as long. Indeed, as Buckley (1997) stresses, there are ample counterexamples to peripheral vowels appearing in closed syllables:

| | | | |
|---|---|---|---|
| (47) | a. | säbir-na | 'we breaking' |
| | b. | mɨ-wlad-na | 'our giving birth' |
| | c. | t'el-na | 'our goat' |
| | d. | sanbuʔ | 'lung' |
| | e. | habobla | 'hurricane' |
| | f. | fiddo | 'short pants' |
| | g. | qarma | 'gnat' |

It would appear that the restriction of [a] appearing in closed syllables in Tigrinya is heavily morphologized. This restriction is preserved in the templatic system of the language, that is in the verb morphology and the broken plurals, but is violated in lexical nouns. To account for this synchronically, I will argue that templatic shape overrides the normal epenthesis pattern. In Type C perfective verb forms, the template calls for the shape CaCäC. The imperfective and jussive forms, however, only have one stem vowel [a] between the first two root consonants, which, with epenthesis, could be either yɨ-CaCCi or yɨ-CaCɨC. The first form fares better on alignment, but it would not be of the same CvCvC shape as the perfective, and indeed most other verb forms:

(48)

| | Perfective | Imperfective | Jussive | |
|---|---|---|---|---|
| a. | baräx-a | yɨ-barɨx | yɨ-barɨx | 'bless' |
| b. | galäb-a | yɨ-galɨb | yɨ-galɨb | 'gallop' |

The templatic shape is maintained when vowel-initial suffixes are attached as well, showing that templatic shape will require epenthesis even when epenthesis is not independently needed for structural reasons, i.e. *yɨbarxu is not a possible Type C form even though it has one fewer epenthetic vowels than the attested form in (49a):

(49)

| | | |
|---|---|---|
| a. | yɨ-barɨx-u | they (m.) bless |
| b. | yɨ-barɨx-a | they (f.) bless |

This demonstrates that the templatic requirement outranks Anchor-R. I have labeled the templatic constraint 'Template', although it could be formalized in terms of syllables, skeletal positions or moras, perhaps as a sequence of two light syllables, for example:

(50)

| y-bark | Template | Anchor-R |
|---|---|---|
| ☞ a. yɨ-barɨx | | σ1 σ2 σ3<br>** * |
| b. yɨ-barki | *! | σ1 σ2<br>** |

This analysis receives additional support by comparing the behaviour of Type C verbs in Tigre. Recall that in Tigre, the epenthetic vowel appears between the final two consonants and not following them. The Type C verbs thus resemble Tigrinya when there are no suffixes (51a-b):

(51) **Tigre**

| | **Perfective** | **Imperfective/Jussive** | |
|---|---|---|---|
| a. | katäb-a | lɨ-katɨb | 'vaccinate' |
| b. | ħabär-a | lɨ-ħabɨr | 'join' |

However, when there are subject suffixes, the epenthetic vowel is not present, and the [a] appears in a closed syllable:

| | | | |
|---|---|---|---|
| (52) | a. | tɨ-katb-i | 'you vaccinate (fs.)' |
| | b. | tɨ-katb-o | 'you vaccinate (mp)' |
| | c. | tɨ-katb-a | 'you vaccinate (fp)' |
| | d. | lɨ-katb-o | 'they vaccinate (m)' |
| | e. | lɨ-katb-a | 'they vaccinate (f)' |

Even though the same kind of arguments put forth for Tigrinya have also been used to argue that Tigre peripheral vowels are long (Lowenstamm & Prunet 1985, 1987)[5], the

[5] In fact, the arguments are somewhat stronger for Tigre. There are minimal pairs: [ħa:l] 'maternal uncle'

Type C Tigre forms show that peripheral vowels can appear in closed syllables. This comparison lends strong support to the analysis that the extra epenthesis in Type C verbs in Tigrinya is related to the dominance of a templatic requirement, and not the impossibility of long vowels in closed syllables.

With most lexical nouns, there is no specific nominal shape, and hence no need to conform to a templatic shape. Broken plurals, on the other hand, have well-defined templatic shapes; in no case do we find epenthesis following the final consonants (Angoujard & Denais 1989):

| (53) | | **singular** | **plural** | |
|---|---|---|---|---|
| | a. | moq$^{w}$ɨħ | mäwaqɨħ | 'chains, irons' |
| | b. | mogäd | mäwagɨd | 'wave' |
| | c. | nɨgus | nägawɨs | 'king, emperor' |
| | d. | qämis | qämawɨs | 'shirt' |
| | e. | bätri | ʔabatɨr | 'stick' |
| | f. | rɨgbi | ʔaragɨb | 'pigeon' |
| | g. | bägʕi | ʔabagɨʕ | 'sheep' |

While Angoujard & Denais (1989) argue that the vowel [a] is long and therefore a form such as (53f) ʔaragbi would be avoided as the [a] would be in a closed syllable, the patterns are also consistent with the templatic form overriding normal epenthesis strategies, and furthermore do not face problems in accounting for all the long vowel counterexamples presented in Buckley (1997)[6].

vs. [ħal] 'paternal uncle', with lowered /ä/ to [a].

[6] I have found one example in Angoujard & Denais (1989) which does follow the template-induced epenthesis but fares worse on Anchor-R:

mizan mizäwɨn-ti 'scales'

Anchor-R predicts mizäwnɨti, because the second open syllable is closer to the right edge. Nevertheless, it is unclear whether the central vowel between [z] and [w] in the plural form is a typographical error, since it

In conclusion, both Tigrinya and Harari appear to prefer closed syllables at the left edge, determined by Anchor R. This accounts for the position of the epenthetic vowels. They differ only in that Tigrinya allows considerations on templatic shape to override the normal epenthesis pattern. Furthermore, the relative sonority of consonants which appear in coda-onset sequences never plays a role. I now turn to consider epenthesis in other Ethio-Semitic languages. I will begin with a discussion of Tigre and move on to Chaha.

## 4.5. Tigre Epenthesis

Tigre has the same restrictions on syllable structure as Tigrinya and Harari. It has no complex onsets or codas, and therefore disallows final CVCC syllables[7]. It also appears to have the same anchor pattern, with one difference: word-finally, the epenthetic vowel always appears between the final consonants. Unfortunately, there are very few examples in Tigre which clearly show the effect of Anchor-R. The feminine singular causative Type A passive participle (indicated by a prefix /ʔɨ-/) is one form which potentially offers two alternative positions for the epenthetic vowel to appear. The masculine form is of the shape ʔɨ-CCuC, and the feminine singular form ʔɨ-CCɨC or ʔɨ-CCɨC-ɨt with a suffix. The actual suffixed form over the unattested *ʔɨ-CɨCC-ɨt is predicted from the Anchor-R constraint:

| | | | |
|---|---|---|---|
| (54) | a. | ʔɨ-grɨf-ɨt | she who makes whip |
| | b. | ʔɨ-qtɨl-ɨt | she who orders to kill |
| | c. | ʔɨ-frɨs'-ɨt | she who makes someone kick |

is the only plural in this class which does not have [a] in that position.

[7] Raz (1983:11) states that only a cluster of two consonants is possible and only in medial position, but he acknowledges that 'owing to the stress-timed rhythm' it is possible to encounter a cluster of two or more consonants, but this is at the phonetic level. My own preliminary phonetic investigation of Tigre reveals that epenthetic vowels are extremely short and often voiceless.

Anchor-R is not sacrificed to obtain better intersyllabic sonority. A form such as *<u>ʔɨ-gɨrf-ɨt</u> would have a better coda-onset sequence in terms of sonority, but it would fare worse on the Anchor-R constraint. This case is not clear-cut, however, since the feminine singular passive causative Type A passive participle, which has a prefix /ʔɨt-/ as <u>ʔɨt-qɨtɨl-ɨt</u> or ʔɨt-gɨrɨf-ɨt has an extra epenthetic vowel in the stem. This suggests that templatic considerations may be playing a role in determining epenthesis.

Word-finally, Tigre clearly violates Anchor-R and consistently has epenthesis between final consonants:

(55)

| | | |
|---|---|---|
| a. | ʔɨgɨr | 'foot' |
| b. | kälɨb | 'dog' |
| c. | näfɨs | 'soul' |
| d. | ħɨlɨm | 'dream' |
| e. | wɨhɨr | 'bull' |
| f. | kɨrɨn | 'voice' |

Cross-linguistically, the Tigre pattern of having epenthesis between the final two consonants is more common than the Harari pattern, where epenthesis follows the two final consonants. Among languages which allow codas, the only other language I am aware of which follows the Harari/Tigrinya pattern is Sudanese Arabic. Blevins (1995) notes that word-final stray consonants have a greater tendency to become codas, while word-initial stray consonants become onsets. For example, Blevins cites the case of Lenakel (Lynch 1974) which appears to have L-R syllabification (=Anchor-R), but word-finally shows the internal epenthesis strategy ([ə] is the epenthetic vowel, but [ɨ] appears after coronals). In

(57a-d), epenthesis occurs between the initial consonants. In (57e-g), epenthesis occurs between the second and third of a word-medial triconsonantal cluster, the position predicted by left-to-right directionality. Word-finally, however, in (57h-l), epenthesis occurs between the two final consonants and not following them as in Harari or Tigrinya:

(57)

| | | | |
|---|---|---|---|
| | #CC --> #CVC | | |
| a. | t-n-ak-ol | tɨnágɔl | 'you (sg.) will do it' |
| b. | t-r-ep-ol | tɨrɛbɔl | 'he will then do it' |
| c. | n-n-ol | nɨnɔl | 'you (sg.) have done it' |
| d. | r-n-ol | rɨnɔl | 'he has done it' |
| | VCCCV --> VCCVCV | | |
| e. | kam-n-m̄an-n | kàmnɨm̄ánɨn | 'for her brother' |
| f. | əs-ət-pn-aan | əsɨdbənán | 'don't go up there' |
| g. | k-ar-(ə)pkom | karbəgɔm | 'they are heavy' |
| | CC# --> CVC# | | |
| h. | əpk-əpk | əbgəbək$^h$ | 'to be pregnant' |
| i. | apn-apn | abnábən | 'free' |
| j. | ark-ark | argárɨk$^h$ | 'to growl' |
| k. | r-əm-əŋn | rɨməŋən | 'he was afraid' |
| l. | n-əm-əpk | nɨməbək$^h$ | 'you (sg.) took it' |

The general tendency for languages to epenthesize inside the stem at the edges and not outside, noted in Blevins (1995), must be accounted for. While it is fairly straightforward to explain why languages do not epenthesize outside the stem at the left edge, since this would violate ONSET, this argument does not carry over to the right edge. One possible solution for the right-edge would be to relate it to the oft-stated requirement that Semitic stems end in consonants (McCarthy & Prince 1990b), incorporated in OT as FINAL-C. Some version of this constraint has been applied not just to Arabic, but to English (McCarthy 1993a) and Lushootseed (Urbancyzk 1996). However, there does not seem to be a strong underlying reason why words should wish to end in consonants. One could argue that Harari and Tigrinya do not reflect the FINAL-C requirement despite being Semitic languages, but given that FINAL-C is a violable constraint, it would simply be ranked lower than Anchor-R in those languages. Another possibility would be to require the Prosodic Word to anchor with an input segment, a constraint which was used in the Containment version of OT (McCarthy & Prince 1993) as alignment of Prosodic Word and Stem, where epenthetic segments were considered outside the stem in the output.

I propose instead that what languages are doing is avoiding consonant sequences (in this case, more specifically, coda-onset sequences since there are no complex onsets or codas). This generalizes to both edges of the word:

(55) No Consonant Cluster — No consonant sequences

This kind of constraint is grounded phonetically in the avoidance of a sequence of sounds which give less perceptual cues to distinguish the sounds. As Steriade (1996b) points out for [voice] neutralization, the best position for a voicing contrast is between vowels, with the worst in pre or post-obstruent position. Pre-consonantal consonants fare worse than word-final consonants, because there is a lack of burst and amplitude aiding the distinction among consonants. Support for this position also comes from medial coda restrictions, in which languages may allow a limited range of segments in word-medial codas, but in final position, other consonants are possible (see Itô 1986 on Diola Fogny). The restriction on consonant sequences can account for why epenthesis prefers to occur within stems at both edges of the word. Avoiding clusters is more important than alignment or even preserving the linearity of segments in a stem. This might also explain why directional syllabification has been reported in so few cases. In Itô (1986, 1989), only Cairene and Iraqi Arabic, Harari, and Temiar are discussed. Given general constraints on left-to right directionality (Anchor-R), consonant clusters and intersyllabic sonority (SyllCon), a typology of four language types is predicted. To illustrate this, consider the following hypothetical inputs and possible outputs:[8]

(59)

| **Input** | | **Output** | | **Output** |
|---|---|---|---|---|
| /yi-tnzag/ | A. | [yitnizag] | B. | [yitinzag] |
| /kalb/ | C. | [kalbi] | D. | [kalib] |
| /sabr/ | E. | [sabri] | F. | [sabir] |

Combining the four constraints in six possible rankings, we get a typology of four languages for the output combinations, indicated by the capital letters. It turns out that two languages can be generated by either of two different combinations, given the similarity of No C-C (No Consonant Clusters) and SyllCon.

[8] I have not considered initial clusters and whether they can be parsed with prothesis if the sonority contour is acceptable. This would only be allowed in languages in which ONSET was ranked low.

(57)

| **Ranking** | **Language** | **Characteristics** |
|---|---|---|
| ANCHOR > No C-C > SyllCon<br>ANCHOR > SyllCon > No C-C | ACE | Word final epenthesis, strict alignment |
| No C-C > ANCHOR > SyllCon | ADF | No consonant clusters word-finally, alignment respected word-internally |
| SyllCon > ANCHOR > No C-C | BCF | No consonant clusters word-finally if sonority bad, syllable contact respected word-internally; otherwise word-final epenthesis |
| SyllCon > No C-C > ANCHOR<br>No C-C > SyllCon > ANCHOR | BDF | No consonant clusters word-finally, syllable contact respected word internally |

Languages which have pure alignment like Tigrinya and Harari do so at the expense of having consonant clusters and syllable contact violations. This is the ACE combination. Anchor is ranked over the constraints on clusters. Languages like Tigre avoid consonant clusters at the edges, but when forced to have them word-medially, appear to obey alignment and thereby potentially violate syllable contact. The ban on consonant clusters is ranked over Anchor which is ranked above SyllCon. This is the ADF combination. Languages like Chaha, which I discuss below in §4.6, obey directionality as long as there are no intersyllabic sonority violations. SyllCon is ranked above Anchor. This produces the BCF combination, although Chaha simply has CVCC syllables and no word-final epenthesis. A language like Chaha with no CVCC syllables word-finally would behave like Fula (Paradis 1996). Paradis shows how loanwords are borrowed into Fula from French.

Epenthesis (a copy of a preceding vowel) occurs between the final two consonants if there is no SyllCon violation (61a-b); otherwise the epenthesis follows the cluster (61c-d).

(61) SyllCon violated - CC# --> CVC#

| | | | | |
|---|---|---|---|---|
| a. | mɛtr | --> | mɛɛtɛr | 'meter' |
| b. | tabl | --> | taabal | 'table' |

SyllCon not violated - CC# --> CCV

| | | | | |
|---|---|---|---|---|
| c. | kard | --> | karda | 'card (comb)' |
| d. | fɔrs | --> | fɔrsɔ | 'card' |

The typology also predicts a language like Tigre which avoids consonant clusters, but which obeys SyllCon rather than directionality word-medially: BDF. The combinations BCE and ACF cannot be generated. BCE cannot be generated since it would require ignoring sonority word-finally but not word-medially. ACF would involve ignoring sonority word-medially, but not word-finally. If the unmarked ranking is no consonant clusters over Anchor, then languages like Tigre, Chaha and Lenakel are predicted to be more common.

## 4.6. Chaha Epenthesis

Chaha epenthesis respects alignment unless there is an intersyllabic sonority violation. For this reason, epenthesis occurs between the two final consonants in case of a sonority violation and not following them. Unlike Tigre, Chaha does have final CC clusters. These are allowed only if there is a fall in sonority between the consonants. The examples from (1) are repeated in (62):

(62) **Chaha**

| | | | | |
|---|---|---|---|---|
| a. | /srt/ | --> | sɨrt | cauterize! |
| b. | /kft/ | --> | kɨft | open! |
| c. | /rt'r/ | --> | nɨt'ɨr | melt! |
| d. | /dβr/ | --> | dɨβɨr | add! |

Hayward (1988) gives the following sonority scale for Chaha, based on the epenthesis between final consonants in imperative forms:

(63)

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| f | s | d | β | m | r | w |
| t | | g | (z) | n | | y |
| x | | | | | | |
| k | | | | | | |
| t' | | | | | | |
| q | | | | | | |

The first consonant of the final CC sequence must be more sonorous than the second. However, among the obstruents, fricative-stop combinations are preferred to stop-fricative: yä-kɨft > *yä-kfɨt. I propose instead that the sonority scale has the following breakdown, although the position of [s] is difficult to pinpoint, as it is in many languages. For example, [s] can form clusters with preceding stops: niks 'bite!'

(64) Least sonorant — Most sonorant

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| t | f | s? | n | m | β | r | w |
| k | x | | | | | | y |
| t' | z | | | | | | |
| q | | | | | | | |
| d | | | | | | | |
| g | | | | | | | |

There is little evidence to separate the voiced obstruents from the voiceless ones; the main division among the obstruents is fricative vs. stop. Amongst the sonorants, there is some evidence for the particular divisions, and these will be discussed throughout this section. Recall that [β] is an approximant.

To illustrate that Chaha differs from Harari in respecting intersyllabic sonority, I will investigate cases where there is a triconsonantal word-medial cluster. Anchor-R predicts the parsing VCCCV --> VC.CV.CV. This is what is found in Harari. The following examples compare imperfective quadriliterals with passive imperfective quadriliterals which have a prefix /t-/ in Harari. The 3ms of regular quadriliterals have the underlying stem /yi-CCäCC/, the passive /yi-t-CCäCäC/. Epenthesis occurs between the second and third consonants in the tCC sequence:

(65) **Regular quadriliteral** — **Passive quadriliteral**

| | | | | |
|---|---|---|---|---|
| a. | yig.läb.t'i | c. | yit.**gi**.lä.bät' | |
| b. | yil.qal.qi | d. | yit.**li**.qa.läq | *yi.**til**.qa.läq |

In example (65d), the sonority of the coda onset sequence [t-l] violates Syllable Contact which requires that the coda be more sonorous than the onset. The unattested form with epenthesis between the [t] and [l] would produce a better coda-onset sequence, but would have the open syllables further from the right edge. This shows once again that Anchor-R overrides Syllable Contact in Harari:

(66)

| y-t-lqaläq | Anchor-R | SyllCon |
|---|---|---|
| ☞ a. yitliqaläq | σ1 σ2 σ3<br>** * | |
| b. yitilqaläq | σ1 σ2 σ3<br>*** *! | |

In Chaha, on the other hand, the position of the epenthetic vowel between the second and third consonants does not consistently follow Anchor-R. The regular quadriliterals are given on the left and contrasted with passive quadriliterals which have a prefix /t-/:

(67) **Regular quadriliteral** **Passive quadriliteral**

| | | | | | |
|---|---|---|---|---|---|
| a. | yɨ-msäkɨr | he testifies | e. | yɨ-tɨ-msäkär | it is testifying |
| b. | yɨ-fč'änɨq | he squashes | f. | yɨ-tɨ-fč'änäq | it is being squashed |
| c. | yɨ-qrät'ɨm | he cuts | g. | yɨ-t-qɨrät'äm | it is cut |
| d. | yɨ-kʷräkʷɨm | he knocks on the head | h. | yɨ-t-kʷɨräkʷäm | he is knocked on the head |

The regular quadriliterals have the same shape, and the epenthetic vowel appears between the final two consonants. The passive quadriliteral has two different forms. In (67e-f) the syllabification is yɨ.tɨC.Cä.CäC and in (67g-h) it is yɨt.Cɨ.Cä.CäC. Anchor-R syllabification predicts the form in (67g-h) only. The difference between the two shapes is that if (67e-f) obeyed Anchor-R, an intersyllabic sonority violation would result: *<u>yɨt.mɨ.sä.kär</u>. The coda [t] has lower sonority than the following onset [m], a violation of

Syllable Contact. With the actual syllabification, yi-ti-msäkär, the coda-onset sequence [m-s] is legitimate since the coda has higher sonority than the following onset. This shows that despite numerous violations of intersyllabic sonority where epenthesis is otherwise unjustified, Chaha will violate Anchor-R to satisfy intersyllabic sonority when epenthesis is required independently for structural reasons. We have already deduced that Syllable Contact outranks Anchor-R in Chaha, since a form like /sbr/ --> [sɨβɨr] and not [sɨβri]. The passive quadriliteral forms further confirm this:

(68)

| y-t-msäkär | SyllCon | Anchor-R |
|---|---|---|
| ☞ a. yɨtɨmsäkär | | σ1 σ2 σ3 *** * |
| b. yɨtmɨsäkär | *! | σ1 σ2 σ3 ** * |

### 4.6.1 2nd and 3rd person Jussive stems and sonority

I now turn to some more complicated examples in Chaha from Type A jussive stems. There are two kinds of Type A stems: CCäC (mostly intransitive) and CCC (mostly transitive). I will focus on the CCC type. As discussed in (1)/(62), Chaha breaks up CCC stems in two ways. In the 2ms imperative, where there are no prefixes or suffixes, the output is CɨCC if the final consonants form an acceptable falling sonority cluster. Otherwise there is additional epenthesis between the two final consonants: CɨCɨC. I will refer to the [CɨCɨC] pattern as Split verbs and the CɨCC pattern as Cluster verbs. Verbs which divide into these two patterns behave differently when prefixes and suffixes attach to the stem. I will first examine Split verbs. The initial epenthetic vowel is not present if there is a prefix. If there is a suffix, then the second of the two vowels is not necessary. This is illustrated below for 2ms, 3ms (with prefix yä-) and 2mpl (with suffix -o):

(69)

| | **2ms** | **3ms** | **2mpl** | |
|---|---|---|---|---|
| a. | gɨdɨf | yä-gdɨf | gɨdf-o | break the fast |
| b. | fɨqɨd | yä-fqɨd | fɨqd-o | permit[9] |
| c. | kɨtɨf | yä-ktɨf | kɨtf-o | chop |
| d. | sɨgɨd | yä-sgɨd | sɨgd-o | worship, bow |
| e. | nɨgɨd | yä-ngɨd | nɨgd-o | touch |
| f. | nɨt'ɨr | yä-nt'ɨr | nɨt'r-o | separate |

In the 2ms forms (69a-e), the second epenthetic vowel may be optionally suppressed. In fact, many split verbs show alternate patterns. I return to these variable forms in §4.6.3.

Since there is only one epenthetic vowel required to syllabify the consonants in the forms with affixes, sonority violations do result. For example, 2mpl (69e) nɨt'ro. This provides an argument that DEP must be ranked above SyllCon. If it were not, we would expect epenthesis to occur in between the unacceptable consonant cluster. This is illustrated by the following tableau:

(70)

| rt'r | DEP | SyllCon |
|---|---|---|
| ☞ a. nɨt'ro | * | * |
| b. nɨt'ɨro | **! | |

If both a prefix and a suffix are added, SyllCon violations can be minimized because there is a choice of epenthesis site. The 3mpl has both the prefix /yä/ and the suffix /-o/. There is

[9] This is a loanword from Amharic

therefore the possibility of placing an epenthetic vowel either between the first two consonants to produce yä-CɨCC-o or between the last two to produce yä-CCɨC-o. The second case obeys Anchor-R. With the verbs in (71), the epenthetic vowel appears between the 2nd and 3rd consonants, just like the 3ms forms in (69), respecting Anchor-R[10]:

(71) **3mpl**

| | | |
|---|---|---|
| a. | yä-gdɨf-o | break the fast |
| b. | yä-fqɨd-o | permit |
| c. | yä-ktɨf-o | chop |
| d. | yä-sgɨd-o | worship, bow |
| e. | yä-ngɨd-o | touch |
| f. | yä-nt'ɨr-o | separate |

We already know that the two final consonants tend not to form a good coda-onset sequence in terms of sonority, because in the 2ms form with no affixes, they have epenthesis between them. In each of the cases above, there are sonority violations between the second and third consonants:

(72)

| **C1-C2** | | **C2-C3** | |
|---|---|---|---|
| g-d | * | d-f | * |
| f-q | √ | q-d | * |
| k-t | * | t-f | * |
| s-g | √ | g-d | * |
| n-g | √ | g-d | * |
| n-t' | √ | t'-r | * |

[10] The forms in (71a-e) have alternate forms, which I return to in sections 4.5.2 and 4.5.3.

Since the C1-C2 sequence is preferable to C2-C3 in most cases, the form yä-CCɨC-o is preferred over yä-CɨCC-o. For those cases where there are sonority violations between C1 and C2 as well as between C2 and C3 (i.e. k-t and t-f), the form with better Anchoring is selected, again yä-CCɨC-o. This is more clearly seen with the verbs in (73) in which the two final consonants are either sonorant or identical. The sequence [m-r] of (73a) violates sonority and the sequence [k-m] also does. In this case, the 3mpl form is that predicted by Anchor-R.[11] The forms in (73d-e) have an exceptional form in the 2mpl - an extra epenthetic vowel to prevent two identical consonants from forming a geminate; geminates are not permitted in Chaha[12]:

| (73) | 2ms | 3ms | 2mpl | 3mpl | |
|---|---|---|---|---|---|
| a. | kɨmɨr | yä-kmɨr | kɨmr-o | yä-kmɨr-o | pile up |
| b. | dɨßɨr | yä-dßɨr | dɨßr-o | yä-dßɨr-o | add |
| c. | sɨßɨr | yä-sßɨr | sɨßr-o | yä-sßɨr-o | break |
| d. | $x^w$ɨrɨr | yä-$x^w$rɨr | $x^w$ɨrɨr-o | yä-$x^w$rɨr-o | cut off ears |
| e. | qɨfɨf | yä-qfɨf | qɨfɨf-o | yä-qfɨf-o | cut the edges |

When both consonant clusters in 3mpl are violations of SyllCon, it falls to Anchor-R to determine the correct output. This shows that, unlike the cases in Bat-El (1996), violations of SyllCon are not relative - i.e. a stop-sonorant sequence [k-m] is not judged better or worse than a sonorant-sonorant sequence [m-r]. They are both treated as violations.

[11] Again, the forms in (73a-c) have alternate patterns in the 3mpl: yä-kɨmro. Those given here are the preferred forms. I return to this in 4.5.3.

[12] I assume the following rankings for Chaha: OCP > No Geminates > DEP. A language like Muher, which allows geminates, would have OCP > DEP > No Geminates. This entails that any sequence of identical consonants will be fused to form a geminate in Muher to obey the OCP.

(74)

| yä-kmr-o | DEP | SyllCon | Anchor-R |
|---|---|---|---|
| ☞ a. yä-kmɨr-o | * | * | σ1 σ2<br>* |
| b. yä-kɨmr-o | * | * | σ1 σ2<br>**! |

With the other class of verbs, the Cluster verbs, the [CɨCC] shape is maintained throughout the paradigm even with a suffix:

(75)

| | **2ms** | **3ms** | **2mpl** | **3mpl** | |
|---|---|---|---|---|---|
| a. | t'ɨßt' | yä-t'ɨßt' | t'ɨßt'-o | yä-t'ɨßt'-o | catch |
| b. | sɨrt | yä-sɨrt | sɨrt-o | yä-sɨrt-o | cauterize |
| c. | kɨft | yä-kɨft | kɨft-o | yä-kɨft-o | open |
| d. | dɨmd | yä-dɨmd | dɨmd-o | yä-dɨmd-o | join |
| e. | dɨrs | yä-dɨrs | dɨrs-o | yä-dɨrs-o | chunk |
| f. | t'ɨqs | yä-t'ɨqs | t'ɨqs-o | yä-t'ɨqs-o | nod |
| g. | t'ɨßq | yä-t'ɨßq | t'ɨßq-o | yä-t'ɨßq-o | be tight |
| h. | dɨrg | yä-dɨrg | dɨrg-o | yä-dɨrg-o | strike |

If Chaha behaved like Harari and followed blind alignment, paying no attention to intersyllabic sonority, we would wrongly predict the yä-CCɨC shape for all 3ms forms, and yä-CCɨC-o for all 3mpl forms. But that shape only occurs when the sonority contact of the first and second consonants is better than or equal to that of the second and third, as we saw in (71) and (73). With all the forms above in (75), the sonority is better between the second and third consonants, e.g. yä-dɨrg > *yädrɨg because [r-g] is a better sequence than [d-r].[13] This gives the surface effect of the 3ms matching the shape of the 2ms imperative form with respect to the location of the epenthetic vowel:

(76)

| yä-drg-o | SyllCon | Anchor-R |
|---|---|---|
| a. yä-drɨg-o | *! | σ1 σ2 * |
| ☞ b. yä-dɨrg-o | | σ1 σ2 ** |

The important aspect of all these data is the pattern found with the prefix-suffix combination. Given that there are coda-onset sonority violations found word-internally in Chaha, we might expect either yä-[CɨCC]-o or yä-[CCɨC]-o to be theoretically possible, and for Anchor-R to favour the latter. However, as opposed to many nouns, or the sequences enforced by the shape of verb stems, in the jussive, there is a choice of epenthesis. In this case, the sonority of the consonants determines the pattern selected, generally ignoring Anchor-R. When yä-[CɨCC]-o is selected, the sonority of the two final consonants produces a better coda-onset sequence than that between the first two consonants. With the yä-[CCɨC]-o forms, the sonority is poor between the final two consonants, as illustrated by their base jussive being [CɨCɨC]. But, if either combination of consonants violates SyllCon (i.e. in the form yä-kmɨr-o in (74)), the yä-[CCɨC]-o form is chosen because it follows left-to-right directionality or Anchor-R.[14] In essence, these jussive forms allow emergence of syllable contact restrictions which go otherwise unnoticed, a classic case of Emergence of the Unmarked (McCarthy & Prince 1994a), where phonologically unmarked structure (i.e. obeying SyllCon) emerges in some forms

[13] The only exception to this is the form yä-t'ɨqs-o. Sequences of stop-s are tolerated word-finally and in coda-onset sequences. As in many languages, [s] is an exception.

[14] While in many cases, it appears that the shape of the plural stem matches that of the singular, a Paradigm Uniformity analysis (Steriade 1996a) requiring such a match could not account for all the variation involved in Chaha epenthesis. For example, some quadriliterals do not show uniformity to the singular, but owe their shape to Anchor-R: nɨ-dfädɨf (1s) vs. nɨ-dfädf-ɨnä (1p) not *nɨdfädɨf-nä (see example 83).

although it is not enforced in the language as a whole. Unlike other languages, like Ponapean, which severely delimit coda-onset sequences and epenthesize or alter the consonants to conform to syllable contact, in Chaha, syllable contact violations are tolerated unless there is another available option. So, as we saw in (70) in the 2mpl imperative forms (CɨCC-o), any sequence of consonants is found, because extra epenthesis is not tolerated: *CɨCɨCo.

### 4.6.2 Consonant-initial suffixes

I will now consider 1st person plural forms which have a combination of prefix and consonant-initial suffix. In the following examples, I give the 2ms form and the 1pl imperfective and jussive forms. The imperfective has a vowel /ä/ between C1 and C2, whereas the jussive requires an epenthetic vowel in the stem, and it falls between C2 and C3 in accordance with Anchor-R. The following verbs are Split verbs. The imperfective has the shape [nɨ-CäCC-ɨnä] and the jussive has the shape [nɨ-CCɨC-nä]:

(77)

| | 2ms | 1pl Imperfective | 1pl Jussive | |
|---|---|---|---|---|
| a. | gɨdɨf | nɨ-gädf-ɨnä | nɨ-gdɨf-nä | break the fast |
| b. | nɨgɨd | nɨ-rägd-ɨnä | nɨ-ngɨd-nä | touch |
| c. | fɨqɨd | nɨ-fäqd-ɨnä | nɨ-fqɨd-nä | permit |
| d. | kɨtɨf | nɨ-kätf-ɨnä | nɨ-ktɨf-nä | chop |

The 1pl jussive forms show the only shape possible keeping epenthesis to a minimum. As for the imperfectives, if the epenthetic vowel occurred between C2 and C3 or C3 and the suffix, a violation of intersyllabic sonority would result in either case: <u>nɨ-gädf-ɨnä</u> ([d-f])

or ni-gädɨf-nä ([f-n]). Again Anchor-R selects the correct candidate. The forms with the heavy syllable in the second position are also preferred because they align the root with a heavy syllable, another Anchor constraint which I will justify more fully in §4.6.3.

With verbs whose second and third consonans are identical, the epenthesis occurs in a position to keep them from forming a geminate. The imperfective has the shape [nɨ-CäCɨC-nä] instead of [nɨ-CäCC-ɨnä] :

| (78) | | **2ms** | **1pl Imperfective** | **1pl Jussive** | |
|---|---|---|---|---|---|
| | a. | qɨfɨf | nɨ-qäfɨf-nä | nɨ-qfɨf-nä | cut the edges |
| | b. | adfɨf | na-däfɨf-nä | na-dfɨf-nä | crouch down |

Finally, if C3 of the root is [r], it assimilates with the [n] of the suffix. These cross-morphemic geminates are the only kind allowed in Chaha, and I assume that geminate structures satisfy SyllCon. In both the imperfective and the jussive, the epenthetic vowel is between C2 and C3.

| (79) | | **2ms** | **1pl Imperfective** | **1pl Jussive** | |
|---|---|---|---|---|---|
| | a. | nɨt'ɨr | nɨ-rät'ɨn-nä | nɨ-nt'ɨn-nä | separate |
| | b. | dɨßɨr | nɨ-däβɨn-nä | nɨ-dβɨn-nä | add |
| | c. | $x^y$ɨmɨr | nɨ-$x^y$ämɨn-nä | nɨ-$x^y$mɨn-nä | decorate,adorn |
| | d. | kɨmɨr | nɨ-kämɨn-nä | nɨ-kmɨn-nä | pile up |
| | e. | $x^w$ɨrɨr | nɨ-$x^w$änɨn-nä | nɨ-$x^w$rɨn-nä | cut off the ears |

As opposed to the forms in (77), the epenthetic vowel does not fall between the stem and affix in the imperfective to produce nɨCäCCɨnä, (the r-n alternation does not occur in suffixes, see Petros (in preparation). If this did occur with the forms in (79), the root-final [ṛ] would fall in an onset, thereby creating a sonority violation:

(80)

| | | |
|---|---|---|
| a. | *nɨ-rät'r-ɨnä | separate |
| b. | *nɨ-däβr-ɨnä | add |
| c. | *nɨ-x$^{y}$ämr-ɨnä | decorate,adorn |
| d. | *nɨ-kämr-ɨnä | pile up |
| e. | *nɨ-x$^{w}$änr-ɨnä | cut off the ears |

To avoid this SyllCon violation, the other epenthesis strategy is used, creating an acceptable sonority sequence:

(81)

| n-kämr-nä | DEP | SyllCon | Anchor-R |
|---|---|---|---|
| a. nɨ-kämr-ɨnä | ** | *! | σ1 σ2 σ3<br>*** * |
| ☞ b. nɨ-kämɨn-nä | ** | | σ1 σ2 σ3<br>*** ** |

This analysis is confirmed by other verbs which do not have the Split CɨCɨC jussive pattern, but do have final sonorants. The first verb is a Type A jussive of the CCäC shape, and (82b-c) are Type B verbs, whose jussive pattern is CäCC:

| (82) | **2ms** | **1pl Imperfective** | **1pl Jussive** | |
|---|---|---|---|---|
| a. | nɨxäβ | nɨ-räxɨβ-nä | nɨ-nxäβ-nä | find |
| b. | däkɨm | nɨ-jäkɨm-nä | nɨ-däkɨm-nä | strike, hit with fist |
| c. | zäkɨβ | nɨ-žäkɨβ-nä | nɨ-zäkɨβ-nä | dam, prevent passage |

Although directional syllabification would predict <u>nɨ-jäkm-ɨnä</u>, the actual output avoids the sequences [k-m], [x-β], [k-β] (recall from (64) that β has high sonority), and places epenthesis between C2 and C3.

The same kind of pattern is seen with quadriliteral forms. In (83), the sonority of the final two consonants of the stem is even or it violates sonority (83a). In both cases, sonority violations are ignored and epenthesis is positioned according to Anchor-R:

| (83) | | 2ms | 1pl Imperfective | 1pl Jussive | |
|---|---|---|---|---|---|
| | a. | däfdɨf | nɨ-dfädf-ɨnä | nɨ-däfdɨf-nä | press down slightly with hand |
| | b. | bärqɨt' | nɨ-βräqt'-ɨnä | nɨ-βärqɨt'-nä | flee in fear |
| | c. | käskɨs | nɨ-ksäks-ɨnä | nɨ-käskɨs-nä | break in pieces by force |
| | d. | sämbɨt | nɨ-sräpt-ɨnä | nɨ-sämbɨt-nä | spend some time away |

In the case of the imperfectives, if the vowel occurred between the final two root consonants, a sonority violation would result. The final obstruent root consonant would be in a coda followed by an onset [n]: *[nɨ-βräqɨt'nä]. There is no benefit to violating SyllCon <u>and</u> Anchor-R. In the jussive, there are sonority violations in all forms because of the sequence of the 4th root consonant and the [n] of the suffix. But, if the epenthetic vowel were placed elsewhere to avoid this, an additional vowel would be required to parse the consonants into syllables: *[nɨ-βärɨqt'ɨnä]. As we have seen before in (70),with forms like <u>nɨt'ro</u>, extra epenthesis is not tolerated to avoid a sonority violation: *<u>nɨt'ɨro</u>.

In the following examples in (84), the final consonant is a sonorant or the final two consonants are identical. In these cases, epenthesis is between the final two consonants.

| (84) | **2ms** | **1pl Imperfective** | **1pl Jussive** | |
|---|---|---|---|---|
| a. | gärdɨm | nɨ-grätɨm-nä | nɨ-gärdɨm-nä | break in half |
| b. | dängɨr | nɨ-dräkɨn-nä | nɨ-dängɨn-nä | throw |
| c. | däβdɨβ | nɨ-dβätɨβ-nä | nɨ-däβdɨβ-nä | patch |
| d. | därzɨz | nɨ-dräzɨz-nä | nɨ-därzɨz-nä | be blunt |

The final form, with identical consonants shows that avoidance of geminates is preferred to incurring a sonority violation. The other imperfective forms in (84a-c) show that the the nasals have lower sonority than the approximant [β]. The clusters [mn] [βm] [βn] are all acceptable (note that /mβ/ or /nβ/ --> [mb]) . If these sequences were not acceptable, we would predict a form with better alignment to be preferable, since either position of the epenthetic vowel would incur a sonority violation:

(85)

| n-dβätβ-nä | DEP | SyllCon | Anchor-R |
|---|---|---|---|
| a. nɨ-dβätβ-ɨnä | ** | **! | σ1 σ2 * |
| ☞ b. nɨ-dβätɨβ-nä | ** | * | σ1 σ2 ** |

If [r] occurs in the medial position preceding [β] or [m], we predict that Anchor-R will decide on the best form since all sequences obey SyllCon:[15]

[15]These forms display variability, too, as discussed in §4.6.3.

(86)

| | 2ms | 1pl Imperfective | 1pl Jussive | |
|---|---|---|---|---|
| a. | zɨräβ | nɨ-zärβ-ɨnä | nɨ-zräβ-nä | 'give a lot' |
| b. | xɨräm | nɨ-xärm-ɨnä | nɨ-xräm-nä | 'spend a year' |

Turning now to the Cluster verbs, we know already that the sonority cluster between C2 and C3 is licensed, and we expect this cluster to be maintained in the imperfectives. This is exactly what is found. However, for the jussives, DEP and Anchor-R predict a form with minimal epenthesis: nɨ-CCɨC-nä, no matter the sonority. But, in the 1pl jussives, there is an extra, seemingly unmotivated, epenthetic vowel between stem and affix, so the form is nɨ-CɨCC-ɨnä:

(87)

| | 2ms | 1pl Imperfective | 1pl Jussive | |
|---|---|---|---|---|
| a. | t'ɨβt' | nɨ-t'äβt'-ɨnä | nɨ-t'ɨβt'-ɨnä | catch |
| b. | sɨrt | nɨ-särt-ɨnä | nɨ-sɨrt-ɨnä | cauterize |
| c. | dɨfq | nɨ-däfq-ɨnä | nɨ-dɨfq-ɨnä | soak by pressing |
| d. | kɨft | nɨ-käft-ɨnä | nɨ-kɨft-ɨnä | open |

| | 2ms | 1pl Imperfective | 1pl Jussive | |
|---|---|---|---|---|
| e. | dɨmd | nɨ-dämd-ɨnä | nɨ-dɨmd-ɨnä | join |
| f. | dɨrs | nɨ-därs-ɨnä | nɨ-dɨrs-ɨnä | chunk |
| g. | at'ɨβq | na-t'äβq-ɨnä | na-t'ɨβq-ɨnä | make tight |
| h. | dɨrg | nɨ-därg-ɨnä | nɨ-dɨrg-ɨnä | hit, strike |

This shows that SyllCon is once again playing a role, even to the point of admitting an extra epenthetic vowel. In these cases, the predicted epenthesis strategy would create two unacceptable coda-onset sequences where the onset has higher sonority than the coda, that between C1 and C2 and that between C3 and the [n] of the suffix:

(88)

| | Actual form | | Unattested form | |
|---|---|---|---|---|
| a. | nɨ-t'ɨβt'-ɨnä | βt' > *t'β | *nɨ-t'βɨt'-nä | catch |
| b. | nɨ-sɨrt-ɨnä | rt > *sr | *nɨ-srɨt-nä | cauterize |
| c. | nɨ-dɨfq-ɨnä | fq > *df | *nɨ-dfɨq-nä | soak by pressing |
| d. | nɨ-kɨft-ɨnä | ft > *kf | *nɨ-kfɨt-nä | open |
| e. | nɨ-dɨmd-ɨnä | md > *dm | *nɨ-dmɨd-nä | join |
| f. | nɨ-dɨrs-ɨnä | rs > *dr | *nɨ-drɨs-nä | chunk |
| g | na-t'ɨβq-ɨnä | βq > *t'β | *na-t'βɨq-nä | make tight |
| h. | nɨ-dɨrg-ɨnä | dr > *rg | *nɨ-drɨg-nä | hit, strike |

The fact that the 1pl. nɨ-CɨCC-ɨnä pattern has extra epenthesis but the 2pl CɨCC-o does not, and the 1pl quadriliterals in (84) do not, raises a difficult problem. In analyzing cases like <u>nɨt'ro</u> in (70), I motivated the ranking of DEP > SyllCon, since if the ranking were reversed, we would expect an extra epenthetic vowel to appear between [t'] and [r]. But, the 1pl forms of the shape nɨ-CɨCC-ɨnä suggest that the ranking should be SyllCon > DEP, since having an extra epenthetic vowel allows SyllCon violations to be eliminated. This is shown in the following tableau:

(89)

| n-dmd-nä | SyllCon | DEP | Anchor-R |
|---|---|---|---|
| a. nɨ-dmɨd-nä | **! | ** | σ1 |
| ☞ b. nɨ-dɨmd-ɨnä | | *** | σ1 σ2 σ3 *** * |

We are thus faced with a ranking paradox. On the one hand there are forms which suggest the ranking DEP > SyllCon and in (89), we have forms which suggest the opposite ranking of SyllCon > DEP. My proposed solution to this paradox is to allow the constraints to be unranked with respect to each other and to calculate their violations as if they were one constraint. In other words, the violations of both constraints are pooled together and collectively assessed. The candidate which has the least violations of both constraints is the winning candidate. If there is a tie, it falls to the next-ranked constraint to decide the winning candidate (see Fitzgerald 1997). So far in Optimality Theory, constraints are assumed to be indeterminately ranked when there is no candidate which is preferred based on one ranking versus the other. A typical scenario is that given in (90), where there is a third candidate which violates neither of the unranked constraints:

(90)

| | X | Y | Z |
|---|---|---|---|
| a. Candidate A | | *! | |
| b. Candidate B | *! | | |
| ☞ c. Candidate C | | | * |

The problem the Chaha data present is not of this variety. In this case, there are no arguments which determine the ranking as one way or another. But, there is no third candidate which fares better on the constraints. Each candidate incurs some violations. I will show how this proposal works by comparing the extra epenthesis case with one where there is no epenthesis, and one where there is a balance between SyllCon and DEP. In the tableau in (91), pooling the violations of DEP and SyllCon favours candidate (91a). Candidate (91a) has three violations of both DEP and SyllCon, whereas (91b) has four violations when both kinds of violations are pooled.

(91)

| n-dmd-nä | DEP | SyllCon | Anchor-R |
|---|---|---|---|
| ☞ a. nɨdɨmdɨnä | *** | | σ1 σ2 σ3<br>*** * |
| b. nɨdmɨdnä | ** | **! | σ1<br>* |

This is compared to a form which has equal violations of SyllCon. In that case, the pooling of violations will result in a form with minimal epenthesis, because it has less DEP violations:

(92)

| n-kmr-nä | DEP | SyllCon | Anchor-R |
|---|---|---|---|
| a. nɨkɨmrɨnä | ***! | * | σ1 σ2 σ3<br>*** * |
| ☞ b. nɨkmɨnnä | ** | * | σ1<br>* |

When there is a tie on DEP and SyllCon, it falls to Anchor-R to determine the winning candidate:

(93)

| n-särβt'-nä | DEP | SyllCon | Anchor-R |
|---|---|---|---|
| ☞ a. nɨsämbɨt'nä | ** | * | σ1 σ2<br>*** |
| b. nɨsärɨβt'ɨnä | *** | | σ1 σ2 σ3<br>****! *** * |

Anchor-R also decides in a case like nɨt'ro > nɨt'ɨro. Since nɨt'ɨro has no closed syllables, it fatally violates Anchor-R:

(94)

| rt'r -o | DEP | SyllCon | Anchor-R |
|---|---|---|---|
| a. nɨt'ɨro | ** | | σ1 σ2 σ3<br>*!* * |
| ☞ b. nɨt'ro | * | * | σ1 |

Finally, this analysis can account for epenthesis between final consonant clusters, as presented in (62) and repeated here:

(95) **Chaha**

a. /srt/ --> sɨrt cauterize!

b. /kft/ --> kɨft open!

c. /rt'r/ --> nɨt'ɨr melt!

d. /dβr/ --> dɨβɨr add!

I assume that the word-final consonant in a CC cluster is an appendix[16], since it is only in word-final position that CVCC syllables are allowed. Appendices are penalized by a constraint NO APPENDIX. Since appendices are tolerated in Chaha in (95a-b), this constraint must be ranked below DEP, as shown in (96):

[16] Alternately, it could be treated as the onset of an empty syllable. Note that No Complex Coda does not do the trick here since we must distinguish between word-final complex codas and word-medial complex codas which are always ruled out.

(96)

| srt | DEP | No Appendix |
|---|---|---|
| ☞ a. sɨrt | * | * |
| b. sɨrɨt | **! | |

The data in (95c-d) suggests that SyllCon should be ranked above DEP, since an appendix is not tolerated if there is a SyllCon violation:

(97)

| str | SyllCon | DEP | No Appendix |
|---|---|---|---|
| a. sɨtr | *! | * | * |
| ☞ b. sɨtɨr | | ** | |

The ranking in (97) is the same problematic ranking that arose in (89) for the forms with extra epenthesis such as ni-dɨmd-ɨnä. However, if there is no ranking between SyllCon and DEP, then No APPENDIX will determine the winning candidate:

(98)

| str | DEP | SyllCon | No Appendix |
|---|---|---|---|
| a. sɨtr | * | * | *! |
| ☞ b. sɨtɨr | ** | | |

When there are no SyllCon violations, the appendix is tolerated and the pooling of DEP and SyllCon violations will produce the same result as in (96), a form with minimal epenthesis. I include a form with final epenthesis in (99c) to show that even a well aligned Anchor-R candidate will fail due to the unnecessary epenthesis:

(99)

| srt | DEP | SyllCon | No Appendix |
|---|---|---|---|
| ☞ a. sɨrt | * | | * |
| b. sɨrɨt | **! | | |
| c. sɨrti | **! | | |

The pooling of violations analysis is therefore able to connect the ranking paradox presented by CVCC with that presented by forms such as <u>nɨ-dɨmd-ɨnä</u>. Any other means of solving this problem would have to treat these two cases separately. One such analysis is Local Conjunction (Smolensky 1993, 1995, Alderete 1997), in which constraints are conjoined and ranked over independent constraints. If SyllCon were locally conjoined with itself and ranked above DEP, two violations of SyllCon would cause a candidate to fail. This would solve the ranking paradox presented by the extra epenthesis cases:

(100)

| n-dmd-nä | $SyllCon^2$ | DEP | SyllCon |
|---|---|---|---|
| a. nɨ-dmɨd-nä | *! | ** | ** |
| ☞ b. nɨ-dɨmd-ɨnä | | *** | |

However, this analysis fails to generalize to the ranking paradox created by the CVCC forms. In conclusion, the pooled violations seems the most general and optimal way to solve the ranking paradox. In addition, pooled violations directly captures the observation that there is a trade-off between epenthesis and syllable contact violations.

### 4.6.3 Variation

Before concluding, I will briefly deal with the variation which many of the split verb roots display.[17] There are two basic types: those which disallow seemingly acceptable sequences such as [rm] and those which allow seemingly unacceptable sequences such as [kt] or [tf]. As we saw in §4.6.2, the cluster verbs, do not show any variation:

| (101) | | **2ms** | **3ms** | **2mpl** | **3mpl** | |
|---|---|---|---|---|---|---|
| | a. | kɨft | yä-kɨft | kɨft-o | yä-kɨft-o | open |
| | b. | dɨmd | yä-dɨmd | dɨmd-o | yä-dɨmd-o | join |

The cluster verbs which do not show variation are roots of the shape obstruent-sonorant-obstruent (i.e. dɨmd) or consonant-fricative-stop (i.e. kɨft) as in (101a). Thus, when the final two consonants are high sonority-low sonority, there is no variation.

#### 4.6.3.1 Obstruent final

When the final two consonants are of the same general category, either two stops or stop-fricative, Chaha appears to optionally tolerate that sequence. However, because fricative-stop is always judged a better sequence than both stop-stop and stop-fricative, a form which ends in those consonants does not vary. Examples of the variable forms are given below:

[17] The variable forms come from Degif Petros (p.c.) who is from Yeseme, but my other Chaha consultant, Woldemariam Fujie, who is from a different village, Yemehorat, does not have the same variation.

| (102) | | **2ms** | **3ms** | **3mpl** | **1pl** | |
|---|---|---|---|---|---|---|
| | a. | kɨtɨf / | yä-ktɨf / | yä-ktɨf-o / | nɨ-ktɨf-nä / | chop |
| | | kɨtf | yä-kɨtf | yä-kɨtf-o | nɨ-kɨtf-ɨnä | |
| | b. | sɨgɨd / | yä-sgɨd | yä-sgɨd-o | nɨ-sgɨd-nä | worship |
| | | sɨgd | yä-sɨgd | | | |

In examining the variable forms yä-kɨtf-o and yä-ktɨf-o, there seems no benefit to the form yä-kɨtf-o in light of the constraints proposed so far. It violates SyllCon and fares worse on Anchor-R whereas yä-ktɨf-o only violates SyllCon, but fares better on Anchor-R. On the sonority scale, we expect [tf] to be judged worse than [kt] as it climbs in sonority while a stop-stop sequence does not. The only seeming benefit to yä-kɨtf-o is that the basic verb stem, minus affixes, takes the same shape as the 2ms stem with no affixes when kɨtf is judged acceptable. In other words, the root is aligned with a heavy syllable no matter what kind of affixes are attached, just like all the non-variable forms like yä-dɨmd:

(100) **Anchor-L Root** Any element at the left edge of the root corresponds to an element at the left edge of a heavy syllable.

The variable forms result from the ranking of this constraint above Anchor-R and No Appendix:

(104)

| ktf | DEP | SyllCon | Anchor-L Root | No Appendix |
|---|---|---|---|---|
| ☞ a. yäkɨtf | * | * | | |
| b. yäktɨf | * | * | *! | |

(105)

| n-ktf-nä | DEP | SyllCon | Anchor-L Root | Anchor-R |
|---|---|---|---|---|
| ☞ a. nɨkɨtfɨnä | *** | * | | σ1 σ2 σ3 *** * |
| b. nɨktɨfnä | ** | ** | *! | σ1 |

With the root √kft, either way Anchor-L Root and Anchor-R are ranked, the CɨCC shape will always be selected, because it does not violate SyllCon and has fewer DEP and SyllCon violations:

(106)

| kft | DEP | SyllCon | Anchor-L Root | Anchor-R |
|---|---|---|---|---|
| ☞ a. yäkɨft | * | | | σ1 * |
| b. yäkfɨt | * | *! | * | σ1 |
| c. yäkɨfɨt | ** | | | σ1 σ2 σ3 ** * |

(107)

| n-kft-nä | DEP | SyllCon | Anchor-L Root | Anchor-R |
|---|---|---|---|---|
| ☞ a. nɨkɨftɨnä | *** | | | σ1 σ2 σ3 *** * |
| b. nɨkfɨtnä | ** | **! | * | σ1 |

#### 4.6.3.2 Sonorant final

Turning now to the sonorant final forms, when the root ends in a sequence of two sonorants, no clusters are allowed word-finally, as seen in the 2ms and 3ms forms. But, there is some variability word-medially with all sequences, as seen in the 3mpl and 1pl:

(108) obstruent-sonorant-sonorant

| | 2ms | 3ms | 3mpl | 1pl | |
|---|---|---|---|---|---|
| a. | t'ɨrɨβ | yä-t'rɨβ | yä-t'rɨβ-o / | nɨ-t'rɨβ-nä / | whip |
| | | | yä-t'ɨrβ-o | nɨ-t'ɨrβ-ɨnä | |
| b. | sɨrɨβ | yä-srɨβ | yä-srɨβ-o / | nɨ-srɨβ-nä / | spin |
| | | | yä-sɨrβ-o | nɨ-sɨrβ-ɨnä | |
| c. | sɨβɨr | yä-sβɨr | yä-sβɨr-o / | nɨ-sβɨn-nä | break |
| | | | yä-sɨβr-o | | |
| d. | qɨmɨr | yä-qmɨr | yä-qmɨr-o / | nɨ-qmɨn-nä | kill lice |
| | | | yä-qɨmr-o | | |
| e. | qɨrɨm | yä-qrɨm | yä-qɨrm-o | nɨ-qrɨm-nä / | insult |
| | | | | nɨ-qɨrm-ɨnä | |

Leslau (1964) lists [rβ] as well as [rm] as possible final clusters for the 2ms, but Petros (1996) disputes this, and allows these clusters only in word medial position, as seen above for the 3mpl form. The [r] does have higher sonority than [β] as the sonorants are ranked in the order n > m > β > r, so the coda-onset sequence [r-m] should be legitimate. Despite this, it appears as if no sonorants are allowed as appendices. A special constraint to that effect, ranked higher than DEP and SyllCon will rule out all sonorant appendices, whether they violate SyllCon or not:

(109)

| qrm | No sonorant appendix | DEP | SyllCon | Anchor-L Root |
|---|---|---|---|---|
| a. qɨrm | *! | * | | |
| ☞ b. qɨrɨm | | ** | | * |

This constraint accounts for two properties: 1) why [r-m] is a good sequence medially but not finally and 2) why fricatives are allowed as appendices following both sonorants (i.e. qɨrf) and optionally following obstruents (i.e. kɨtf).

The variable ranking of Anchor-R and Anchor-L Root will allow variable forms when the sonority across syllables is not falling as with the root √qmr. If Anchor-L Root ranks high, the form in (110a) is chosen, but if Anchor-R ranks higher, then (110b) would be selected:

(110)

| qmr | DEP | SyllCon | Anchor-L Root | Anchor-R |
|---|---|---|---|---|
| ☞ a. yäqɨmr-o | * | * | | σ1 σ2 ** |
| b. yäqmɨr-o | * | * | *! | σ1 σ2 * |

This is contrasted with the the root √qrm, which has the same consonants, but the order of the sonorants is reversed. In this case, there is no variability and only the 'cluster' shape is selected. This is because the sequence [r-m] does not violate SyllCon:

(111)

| qrm | DEP | SyllCon | Anchor-L Root | Anchor-R |
|---|---|---|---|---|
| ☞ a. yäqɨrm-o | * | | | σ1 σ2 ** |
| b. yäqrɨm-o | * | *! | * | σ1 σ2 * |

However, this particular verb does show variablity in the 1pl form, unlike other cluster verbs. This is because the sequence [m-n] is acceptable and SyllCon/DEP cannot decide the winning candidate. Thus, it falls to either of the two Anchor constraints, which when ranked variably, allow variation. In (112), the ranking Anchor-L > Anchor-R is shown:

(112)

| qrm | DEP | SyllCon | Anchor-L Root | Anchor-R |
|---|---|---|---|---|
| ☞ a. nɨ-qɨrm-ɨnä | *** | | | σ1 σ2 σ3 *** * |
| b. nɨ-qrɨm-nä | ** | * | *! | σ1 |

In contrast the 1pl forms of verbs which end in [r] show no variability in the 1pl forms. This is because the geminate [nn] is always a better sequence and DEP / SyllCon will select the winning candidate:

(113)

| qmr | DEP | SyllCon | Anchor-L Root | Anchor-r |
|---|---|---|---|---|
| a. nɨ-qɨmr-ɨnä | *** | *! | | σ1 σ2 σ3 *** * |
| ☞ b. nɨ-qmɨn-nä | ** | * | * | σ1 |

Finally, to lend support to the Anchor-L Root constraint as the one causing variability and not some other constraint, no variability is seen with verbs in which no candidate can satisfy the Anchor-L Root constraint:

(114)

| df | DEP | SyllCon | Anchor-L Root | Anchor-R |
|---|---|---|---|---|
| ☞ a. nɨ-dfädf-ɨnä | ** | ** | * | σ1 σ2<br>* |
| b. nɨ-dfädɨf-nä | ** | ** | * | σ1 σ2<br>**! |
| c. nɨ-dɨfädf-ɨnä | *** | * | * | σ1 σ2 σ3 σ4<br>**!** *** * |

Finally, the forms in (115) all conform to the expected directional pattern and do not show variability even though other cluster verbs in (88) have the form nɨ-CɨCC-ɨnä. This is once again due to sonority. Since the initial consonant is sonorant, the C1-C2 sequence is acceptable:

(115)

| | | | | |
|---|---|---|---|---|
| a. | nɨqs | nɨ-räqs-ɨnä | nɨ-nqɨs-nä | limp |
| b. | nɨks | nɨ-räks-ɨnä | nɨ-nkɨs-nä | bite |
| c. | nɨqt' | nɨ-räqt'-ɨnä | nɨ-nqɨt'-nä | kick |

In conclusion, I have argued that Chaha epenthesis shows emergence of the unmarked with respect to intersyllabic sonority. While on the surface, it appears as if Chaha doesn't care about heterosyllabic sonority violations, these data reveal that that is only true if the language has no choice of epenthesis sites. Furthermore, I have argued for a method of dealing with a ranking paradox which involves unranked constraints and pooling of their violations.

## 4.7 Conclusion

In this chapter I presented new and revealing data about epenthesis in Ethio-Semitic. While it is recognized that Tigrinya and Harari have general left-to-right directionality of syllabification (Kenstowicz & Kissberth 1970, Itô 1986 for Harari, Berhane 1991 for Tigrinya), the two languages have not been explicitly compared, nor has the role of intersyllabic sonority been considered. The data presented here from Chaha show that even in a language which has numerous violations of intersyllabic sonority, it may still be relevant under particular conditions: epenthesis which occurs for structural reasons.

# Chapter 5

# Conclusions

This study examined several topics in a number of modern Ethiopian Semitic languages (Tigre, Tigrinya, Harari, Amharic, Soddo, Chaha, Muher) from a comparative viewpoint within Optimality Theory, a constraints-based approach to phonology. This dissertation provides a body of new data and generalizations and establishes new theoretical claims concerning the data. The comparative approach has allowed me to better analyze the subtle and intriguing ways in which Ethio-Semitic languages differ from each other, particularly within the Gurage dialect group, which the study of a single language often disregards.

On the theoretical level, the dissertation makes several contributions. The study of mobile morphology reveals the limits and targets of palatalization and labialization and the functional role that allomorphy and stem alternations may play in the realization of morphological categories. Many of the constraints required are language specific, suggesting that phonological theory should provide for both universal and language-particular constraints. In chapter 3 I reject the concept of long distance geminates and provide a number of arguments why reduplicative copying is to be preferred. This is an important result, first because long-distance geminates and Tier Conflation are artifacts of a serial derivational model, and second, because it denies that geminates and long-distance geminates behave similarly because of their common linked structure. By treating 'long-distance' geminates as reduplication, they behave like other reduplicants towards a new, important generalization which I predict to be valid in other languages of the world - double reduplications are avoided, unless compelled to appear by constraints on morphological realization or templatic size conditions. In the study of epenthesis, the use of violable constraints reveals how intersyllabic sonority plays a role in epenthesis even in a language which generally ignores it. In addition, I show how a ranking paradox can be resolved by allowing constraints to be unranked and pooling their violations together, achieving a balance between two constraints which counteract each other.

On an empirical level, this dissertation makes new contributions to the study of the rich morphology and phonology of Ethiopian Semitic languages. While general descriptions of many of the languages are available, in certain areas I have worked with native speakers to flesh out the amount of data, and in so doing, have discovered some new generalizations. The study of palatalization in chapter 2 is important from a comparative viewpoint, because it gives insight into how palatalization developed in each of five languages, and how it came to be the sole exponent of a morphological category in Gurage. A complete description of the 2nd person singular feminine affix, including variation, is provided not only for Chaha, but also for Muher. The study of a-final verbs in Muher and Chaha shows how the raising of the final vowel is not directly the result of the floating affix as previously analyzed (Rose 1992, Lowenstamm 1996), but is an allomorphic stem variation triggered by a certain class of suffixes. The discussion of reduplication in chapter 3 provides new data on double reduplications in both Tigrinya and Chaha, and shows how each Ethio-Semitic language differs in the function and form of the frequentative verb form and the acceptability of double reduplications. The epenthesis chapter provides the first in-depth study of Harari and Chaha epenthesis and reveals for the first time the role of sonority versus that of directionality in the choice of epenthesis sites.

This dissertation adds to the small but growing body of research on Ethiopian Semitic which is of both a descriptive and theoretical nature (i.e. Prunet 1996a,b, Chamora 1997, Petros 1996, in preparation). There is still much research to be done working closely with native speakers of the languages. It is only through this method that we can arrive at a deeper understanding of how these languages function, and how they may contribute in a meaningful way to linguistic theory and to the study of Semitic in general.

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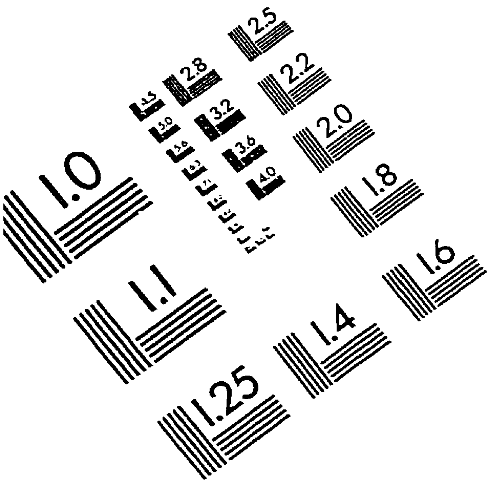

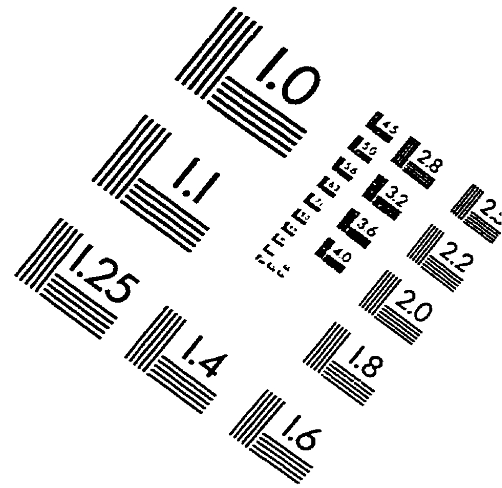

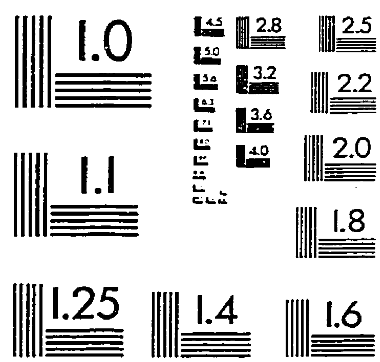


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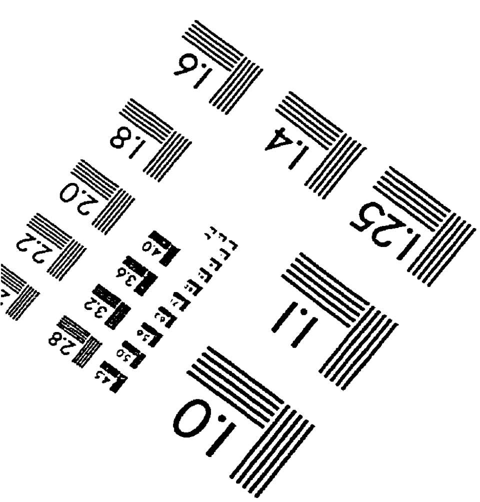

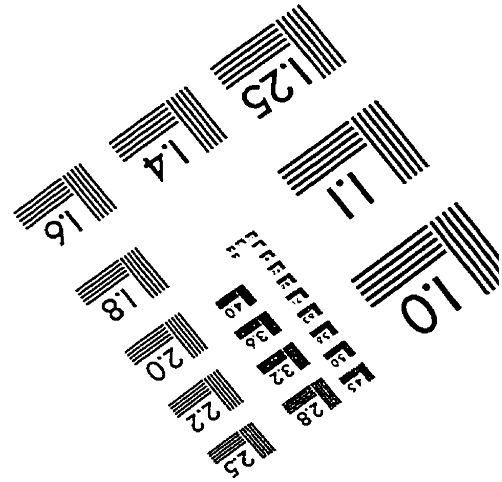

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