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Verb Contraction in the West Saxon Dialect of Old English:
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The phenomena of verb contraction in the West Saxon dialect of Old English has been described in many grammars of the language. However, most of these use a traditional rule-based analysis of the sound changes which occur. This thesis re-analyzes the data in terms of Optimality Theory (OT), which uses a system of constraint ranking to account for sound changes. The advantage of using OT is that it offers a single ranking to explain sound changes that would require separate rules and ordering in a more traditional analysis. Section 1 introduces the motivation for approaching this data from OT. Section 2 outlines relevant grammatical features of Old English, and the West Saxon dialect in particular. Section 3 applies OT to the data itself. The data is organized according to the final consonant of the verb stem in order to allow a process of analysis that builds a constraint ranking able to account for the changes in all the verbs under consideration, including vowel deletion, assimilation, dissimilation, and simplification of consonant clusters. Section 4 discusses the theoretical contribution of this study and suggests related areas in which the analysis could be further applied.

Dedication

To Greg,
because I couldn't have done this without your love and support,
and Baby Girl,
who came along for the ride.

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List of Abbreviations

1sg	*first person singular*
2sg	*second person singular*
3sg	*third person singular*
acc.	*accusative*
dat.	*dative*
indic.	*indicative*
inf.	*infinitive*
nom.	*nominative*
part.	*participle*
pl.	*plural*
pres.	*present*
sing./sg.	*singular*

(1.0) INTRODUCTION

(1.1) Significance of Study

The goal of this thesis is to approach historical linguistic data from the theoretical framework of Optimality Theory (OT) (McCarthy and Prince 1993, 1995; Prince and Smolensky 1993). OT is a relatively new theoretical approach in linguistics, and therefore its efficacy is being tested in a number of linguistic fields. Although originally developed to apply to prosodic morphology, it has since also been applied with some success to other areas, such as syllable structure (McCarthy and Prince 1994) and even syntax (Grimshaw 1997). Specifically, I will apply OT to the contraction of verbs which occurred in the West Saxon dialect of Old English. Because OT is able to account for a number of different sound changes that occurred in verbs using only one ranking, rather than different sound change rules for each kind of sound change, I will demonstrate that Optimality Theory is capable of accounting for these changes and offering an independently motivated description of sound change.

(2.0) CONTRACTION PHENOMENA IN WEST SAXON DIALECT OF OLD ENGLISH

This section will give background information about contraction in Old English and the West Saxon dialect. I will first give a grammatical sketch of Old English, focusing on those characteristics that are most relevant to the analysis: geminates, stress, and verb inflection. Next I will discuss the various dialects of Old English, showing how they are related to and, more importantly, different from the West Saxon dialect that is under examination.

(2.1) Grammatical Sketch of Old English

In order to adequately describe and analyze the phenomenon which this paper targets, it is necessary that the reader without any background in Old English (or other Germanic languages) be made aware of the basic properties that are involved in the analysis. It must also be emphasized here that because Old English is an earlier version of English, it is essentially a dead language without any living speakers, there are only surviving written texts to work with, and so the sound systems are reconstructed. They are based upon the presumed sounds used in the Latin writing system when it was adopted to write Old English in about the seventh or eighth century, and also comparison with sounds in other Germanic languages, but there is the possibility that this analysis may be incomplete or incorrect. However, as there are no present-day native speakers of Old English to consult, it is only possible to use postulation and reconstruction as data.

Changes in the language occurred at different stages, and this chronology is important. For the purposes of this analysis, Proto-Germanic refers to the reconstructed language descended from Proto-Indo-European that precedes all the known Germanic language, and is believed to have developed into three branches: East, North, and West Germanic. West Germanic refers to the reconstructed language which precedes Old High German, Old Saxon, Old Low Franconian, Old Frisian, and Old English. Pre-Old English refers to Old English reconstructed from the period before written texts are recorded. Old English refers to the recorded language itself.[1]

Features of Old English that will be discussed in the following sections include geminates, stress, and verb inflection including the major sound changes which affected verb morphology. These aspects of the grammar are the ones most directly involved in the contraction of verbs under analysis in this thesis.

(2.1.1) Old English Geminates and Vowel Length

Old English distinguished phonemically between normal and geminate consonants. In most texts and also in traditional analyses, long consonants are orthographically represented by a double consonant. The following minimal pair illustrates this convention:

(1)

a.	*sete*	"set" imperative singular
b.	*sette*	"set" 1sg indicative

The problem that arises is that of determining whether the consonant in (1b) *sette* is geminate or long. A geminate would be phonemically transcribed as /sette/, while a long consonant would be transcribed as /set:e/. In Old English, consonants with the double

[1] Campbell (1959) refers to Proto-Germanic as "Primitive Germanic" and Pre-Old English as "Prehistoric Old English."

spelling consistently occur between vowels but vary in spelling when word-final, so it is generally thought best to analyze them as geminate rather than long, and transcribe them as /sette/. I will follow this convention throughout, as it also is the analysis supported by this thesis (Hogg 1992: 89; see also 119)[2]. The above examples are therefore represented as follows:

(2)

a.	/sete/	*sete*	"set" imperative singular
b.	/sette/	*sette*	"set" 1sg indicative

Old English also had phonemic short and long vowels. They are not orthographically marked in most Old English texts, but this notation has been added in "normalized" modern editions and grammars. Long vowels are represented by a macron over the vowel, and length in a diphthong is represented by a macron over the first vowel:

(3)

a.	*gān*	"go"
b.	*tēon*	"drag"

Which vowels were long and which were short has been inferred by linguists from sound changes that occurred in later periods of English (Campbell 1959: 14). In addition, it is unknown whether the difference was really one of quantity (short and long) or one of quality (tense and lax), or possibly both; there seems to be general disagreement among authors on this subject (Campbell 1959; Davis 1953; Cassidy and Ringler 1971; Freeborn 1992). This analysis draws upon many sources and texts which employ these conventions, but there is no unambiguous phonemic transcription of vowels represented

[2] An autosegmental analysis of geminates may prefer to represent a geminate consonant as /tː/. However, the nature of geminates in Old English is such that the representation I use will make analysis of some geminates more clear; see section (3.2.5.1) below.

in this way, and vowel quantity and quality are not central to this analysis. Therefore, I will represent long vowels using the traditional macron. The above words would therefore be phonemically represented in this analysis as follows:[3]

(4)

a.	/gān/	*gan*	"go"
b.	/tēon/	*tēon*	"drag"

(2.1.2) <u>Old English Stress</u>

Stress in the Germanic languages is generally fixed on the first syllable, a development that began in Proto-Germanic and was an early innovation from the more variable stress system of Proto-Indo-European. This system of stable stress contributed to the weakening or sometimes loss of unstressed vowels (Barber 1993: 92). Most Germanic languages, including Old English, preserved this system.

Old English stress was carried in the form of primary stress on certain morphemes: root morphemes of nouns, verbs, adjectives, and adverbs; noun and adjective prefixes; derivational affixes that underwent cliticization from free morphemes. Therefore, monomorphemic content words were always stressed on the first syllable:

(5)

a.	/wórd/	*word*	"word"
b.	/ýfel/	*yfel*	"evil"

Most polymorphemic words also had stress on the initial syllable, as this was often the root morpheme:

[3] Other conventions are added to most "normalized" texts, many of which are also based on later sound changes in order to disambiguate orthographic characters used to represent more than one sound in texts. For example, *g* represented both a velar sound /g/ and a palatal one /j/; *ġ* is used in normalized texts for the palatal /j/.

(6)

a.	/wér-as/	*weras*	"men"
b.	/lúf-iende/	*lufiende*	"loving"

If more than one morpheme in a word could be assigned stress, it was the left-most syllable which received primary stress:

(7)

a.	/án-jìnn/	*anġinn*	"beginning"
b.	/ún-nỳtt/	*unnytt*	"useless"
c.	/stǽf-kræ̀ft/	*stæfcræft*	"grammar"

(7a-b) carry primary stress on a left-most noun prefix, and (7c) on the first morpheme of a compound noun.

However, verbs prefixes generally did not receive stress, so stress was retained on the first syllable of the root rather than the left-most syllable:

(8)

a.	/ā-wést-an/	*āwestan*	"to lay waste"
b.	/be-sýθ-ian/	*besyðian*	"to rob (s.o. of s.t.)"

These differences in stress assignment between polymorphemic nouns and verbs lead to opposing stress in pairs of nouns and verbs composed of nearly identical morphemes (Campbell 1959: §71, 74; Hogg 1992: 99):

(9)

	noun		verb	
a.	/ánd-wỳrde/ *andwyrde*	"answer"	/and-wýrd-an/ *andwyrdan*	"to answer"
b.	/án-jìn/ *aġin*	"beginning"	/an-gínn-an/ *anginnan*	"to begin"

Note that inflectional suffixes never receive stress, as they are usually the right-most element of a polymorphemic word.

(2.1.3) Proto-Germanic Verb Inflection

The source of Old English verb inflection was the system used by Proto-Germanic. Old English, like many Germanic languages, generally inflected verbs for mood, tense, person, and number. These inflectional categories are not all relevant to the current analysis, so for simplicity we will focus on indicative mood, present tense verbs and their person and number suffixes.

The infinitive of a verb was marked by a suffix */-an/, */-on/, or */-ian/ on the verb stem; this developed into /-an/ for most Old English verbs, and in combination with the stem is the usual form given when citing verbs (see example verbs in (8) and (9) above). For person and number marking on a finite verb, the appropriate inflectional suffix was added directly to the verb stem. The present indicative verb suffixes of Proto-Germanic are shown in the paradigm below.

(10) *Present Indicative Suffixes in Proto-Germanic*

	singular	plural
1	*/-ō/	*/-anθi/
2	*/-isi/	
3	*/-iθi/	

(Campbell 1959: §731)

(2.1.4) Pre-Old English Sound Changes in Verb Stems and Suffixes

In Proto-Germanic, there were many regular sound changes which occurred after the Germanic system of word stress was developed[4], as this system affected their

[4] See section (2.1.2) above.

application differently than if they had occurred within the Proto-Indo-European stress system.

(2.1.4.1) Verb Stem Changes

We will concentrate here on those changes that directly affected the verb stems and the present indicative verb inflections and generated the later Old English forms, which are given below for the purpose of comparison with the Proto-Germanic.

(11) *Present Indicative Suffixes in Old English*

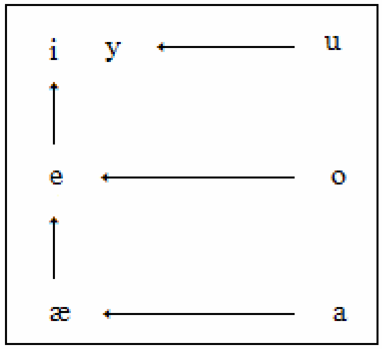
	singular	plural
1	-/e/	-/aθ/
2	-/est/	
3	-/eθ/	

(Lass 1992: 134)

(2.1.4.1.1) Umlaut

A sound change which affected some Old English verbs is known variously as vowel raising, front mutation, i-mutation, or (i-)umlaut. This change occurred in the Pre-Old English stage, and regularly affected stressed vowels, both long and short. Umlaut occurred when a vowel was harmonized with a */i/ or */j/ in the following syllable: back vowels were fronted and front vowels (except /i/) were raised. Often the syllable containing */i/ or */j/ was a suffix, so umlaut occurred only in stems with the suffix and not throughout. Diphthongs were also affected, but are omitted here for simplicity because they varied considerably by text and dialect area (Campbell 1959: §190-202). The affected vowels were changed according to diagram (12).

(12) *Umlaut Vowel Raising and Fronting*[5]



(adapted from Hogg 1992: 113)

Selected examples from the resulting Old English forms are also given to illustrate in (13). It may not be immediately clear from these examples of Old English why the umlaut occurred, as in most cases the */i/ that conditioned umlaut was subsequently lost in Pre-Old English. However, note that many of the examples have umlaut occurring in the 3sg present indicative form of a verb.

[5] Raising of the non-low back vowels was first to the round front vowels, so as /u/ raised to /y/, /o/ first raised to /ø/; however, /ø/ was regularly unrounded to /e/ during the Pre-Old English period.

(13) *Vowel Changes through Umlaut in Pre-Old English*

	Vowel Change			Example of Vowel Change in Old English			
front vowels	/æ/	>	/e/	/sæt/ "sat" past part.	>	/sett-an/[6]	"to set" inf.
	/e/	>	/i/	/kweθ-an/ "to say" inf.	>	/kwiθ-θ/	3sg pres.indic.
back vowels	/a/	>	/æ/	/far-an/ "to go" inf.	>	/fær-θ/	3sg pres.indic.
	/ā/		/ǣ/	/hāt-an/ "to call" inf.		/hǣt-t/	3sg pres.indic.
	/o/	>	/e/	/doxtor/ "daughter" nom.sg.	>	/dexter/[7]	dat.sing.
	/ō/		/ē/	/grōw-an/ "to grow" inf.		/grēw-θ/	3sg pres.indic.
	/u/	>	/y/	/burg/ "city" nom.sg.	>	/byrj/[8]	dat.sing./nom.acc.pl
	/ū/		/ȳ/	/lūk-an/ "to lock" inf.		/lȳk-θ/	3sg pres.indic.

(Davis 1953: 6)

The Proto-Germanic verb suffixes, shown in (10) above, demonstrate why this common pattern of umlaut emerges: the 2sg and 3sg suffixes began with */i/, and therefore caused umlaut to occur in the preceding verb stem syllable when it contained one of the susceptible vowels, as shown in the examples below (14). By the time of recorded Old English, however, the conditioning environment was no longer present.

(14) *Examples of Umlaut in 3sg Present Indicative Verb Construction*

Proto-Germanic Stem	Proto-Germanic 3sg Pres. Indic. Inflection	Pre-Old English Umlaut in Stem	Old English Form after Vowel Deletion
*/kweθ/	*/kweθ-iθi/	*/kwiθ-iθi/	/kwiθ-θ/
*/far/	*/far-iθi/	*/fær-iθi/	/fær-θ/
*/grōw/	*/grōw-iθi/	*/grēw-iθi/	/grēw-θ/
*/lūk/	*/lūk-iθi/	*/lȳk-iθi	/lȳk-θ/

[6] Umlaut in the infinitive but not the past part. is due to the lack of *-*i*- before the past. part. inflectional suffix (see Campbell §750, 753.9, 753.9.b.7).
[7] Umlaut of the back vowel /o/ is due to the Proto-Germanic dat. sing. ending *-*ri*; there was no vowel before final *r*, so the root vowel became subject to fronting (Campbell 1959: §629, 631).
[8] Umlaut of the back vowel /u/ is due to the Proto-Germanic dat. sing. and nom. acc. pl. endings *-*i* and *-*iz*, which were lost in Pre-Old English (see below and section (3.2.2.1.1)). The dat. sing. and nom./acc. pl. forms of *burg* /burg/ are spelled variously *byriġ* /byrij/ or *byrġ* /byrj/ (and also *burh*; see Campbell (1959): §447). Palatalization of /g/ regularly occurred after front vowels, including those fronted by umlaut; see Campbell (1959) §52, 428, 621.

(2.1.4.2) Verb Suffix Changes

The Germanic verb affixes were subject to several language-wide regular sound changes in Proto-Germanic.

(2.1.4.2.1) Deletion of Final */i/

Final */i/ was lost when preceded by two or more syllables, which would be the environment of virtually any two-syllable suffix affixed to a verb stem, including the 3sg, 2sg, and plural verb affixes given above (Campbell 1959: §331.3). This change would have affected the Germanic forms as shown in (15) below.

(15) *Present Indicative Suffixes in Germanic after loss of final */i/*

	singular	plural
1	*/-ō/	*/-anθ/
2	*/-is/	
3	*/-iθ/	

(2.1.4.2.2) Reduction of Vowels to /e/

Unstressed */æ/, */e/, and */i/ in Proto-Germanic were reduced to /e/ in Pre-Old English. As stress always fell on the verb stem in Proto-Germanic and Old English, this reduction would affect all verb suffixes. However, it is important to note that this reduction must have happened after umlaut, and therefore during the Pre-Old English period; otherwise the conditioning environment that lead to umlaut in verb stems (presence of */i/ in the following syllable, usually unstressed) would not have existed. Evidence for this exists in that some very early Old English texts sometimes retain the original */i/ in suffixes, as in /hlimm-iθ/ (*hlimmith* "resound" 3sg) from the *Leiden Riddle*

(Campbell 1959: §369, 735b). This change further affected the affixes, resulting in the forms given in (16) below.

(16) *Present Indicative Suffixes in Pre-Old English after loss of final */i/ and vowel reduction*

	singular	plural
1	*/-ō/	*/-anθ/
2	*/-es/	
3	*/-eθ/	

(2.1.4.2.3) Other Sound Changes Affecting Verb Suffixes

The changes described above resulted in the 3sg suffix as seen in Old English, but do not completely explain the other Old English suffixes. The remaining three forms each underwent a further change, given in the sections below. These changes, taken together with the ones above, result in the recorded Old English verb inflection suffixes repeated from (11) above.

(17) *Present Indicative Suffixes in Old English*

	singular	plural
1	/-e/	/-aθ/
2	/-est/	
3	/-eθ/	

(Lass 1992: 134)

(2.1.4.2.3.1) 1sg: */-ō/ → /-e/

Currently there is no completely satisfactory explanation for this change based on known sound changes of the period; one common theory is that it is a simplification of the 1sg indicative suffix with the singular subjunctive suffix */-e/, as the subjunctive forms were beginning to be combined with the indicative, eventually combining with the past indicative plural /-on/ (Hogg 1992: 148-150). The loss of length, at least, can be accounted for by the shortening of unstressed long vowels during the Pre-Old English period (Bermudez-Otero 1996: 9; Campbell 1959: §355-359).

(2.1.4.2.3.2) 2sg: Cliticization of /θu/ (*þu* "thou")

In the 2sg present indicative form, the final /-t/ present in Old English seems to be best explained by syllable contact between this verb affix and the 2sg nominative personal pronoun /θu/ when it appeared directly after the verb instead of before it. For example, the construction /θu rīd-es/ (*þu rīdes* "you all ride") could be inverted to /rīd-es θu/, and then contracted to /rīd-esθ/, which by regular sound change in Old English[9] became /rīd-est/. This change apparently occurred in the West Saxon dialect area and was later spread, possibly to some extent along with the contracted forms of 2sg and 3sg detailed below (Campbell 1959: §731, 481.1; Hogg 1992: 149).

(2.1.4.2.3.3) 3sg: West Germanic Nasal Loss

This sound change occurred much earlier in the West Germanic languages, including Old English. Nasal consonants were deleted when they appeared immediately before a voiceless fricative consonant in an unaccented syllable. This regularly affected the plural present indicative affix, */-anθ/, which became the Old English form /-aθ/ (Campbell 1959: §332).

[9] For complete treatment of this sound change, see section (3.2.7) below.

(2.2) West Saxon Dialect Contraction

The morphophonemic phenomenon known as contraction, which occurred in the West Saxon dialect of Old English, is the main subject of analysis in this paper. The following sections describe the phenomenon in detail as traditionally analyzed. It will then be analyzed using Optimality Theory in section (3).

(2.2.1) Dialects of Old English

In the Old English period there were several dialect areas in England. These are usually divided into Northumbrian in the north, Mercian in the Midlands, West Saxon south and west of the Thames, and Kentish south of the Thames east of London. Although these are very general divisions and it is nearly impossible to draw definitive lines between the dialects with any great certainty, the map below gives the approximate geographic location of each of these dialects.

(18) *General Geographic Location of Major Old English Dialects*

(Freeborn 1992: 17; used with permission of the author)

One major difficulty in studying these dialects is that surviving Old English texts often use one of the dialects as a written standard rather than writing to reflect the actual dialect found in the local speech community. The dialect used depended on when and where the text was written and which was the most powerful "kingdom" of the era, as each region had its own increase in scholarly writing and learning during its period of control. This led to a greater number of texts being produced and surviving from that era and region than from the others, and so the texts available to the modern scholar of Old English vary greatly by their age.

Earliest to consolidate power were the Northumbrians, throughout much of the mid-seventh century, which led to the founding of two great monasteries, a library, and the writings of the Venerable Bede. Unfortunately, Bede wrote in Latin, not English, and Old English texts from this period mostly consist of charters, other records, and English personal and place names and glosses included in Latin texts. The notable exceptions to this include Northumbrian versions of Caedmon's Hymn and Bede's Death Song, both examples of poetry (Toon 1992).

Next, from the mid-seventh to the mid-ninth centuries were the Mercians, and so most of the available earliest texts of Old English were written in the Mercian dialect, even though there was no great Mercian writer or main center of learning that produced texts, as with the Northumbrians. Under Æthelbald and then his son Offa, the Mercians consolidated power over much of southern England and created an environment in which Old English literature and poetry flourished and records were kept in the vernacular rather than Latin, probably with the founding of a scribal center for royal use. These achievements became a base for the later developments of the West Saxons.

The power of the Mercians was compromised when the Danish invasion began, and by the mid-ninth century, the kingdoms of the east were mostly under Danish control. The West Saxons, under King Alfred the Great, eventually negotiated a treaty to establish the Danelaw, a boundary between the Danish and Saxon kingdoms. This allowed the West Saxons to remain independent, maintaining power from the mid-ninth century until the Norman invasion in the mid-eleventh century. King Alfred became a patron of learning and was responsible for a great number of texts written in the West Saxon dialect, leading to West Saxon growing to be the best represented of Old English dialects. Although at first West Saxon sometimes used the written conventions of the Mercian dialect or others, the amount of material that was produced under Alfred's sponsorship led to West Saxon itself becoming something of a written standard among scribes. It now provides the most surviving texts (and many of the most important ones) from the Old

English period. Some texts are thought to be letters and translations done by Alfred himself. These texts from the late ninth and early tenth century are generally known as "Early West Saxon." In the "Late West Saxon" period of about the late tenth to the mid-eleventh century, the best known writer was the monk Ælfric, who was part of the literary revival of English started by the Benedictines. He wrote extensively in Old English, including materials for teaching Latin using English (Campbell 1959; Kispert 1971; Toon 1992; Marsden 2004).

(2.2.2) Dialect Features of West Saxon

Of all the recorded dialects of the Old English period, the West Saxon dialect is the most distinct, exhibiting features that are not extensively found in records from the other dialects. This is probably due to geographical influences, including its longer isolation from the Danish invaders whose language had many effects on the other dialects through extended contact (Toon 1992: 417). One striking difference, usually referred to as either *syncope* of the vowel or *contraction* of the suffix, affects the 2sg and 3sg present indicative forms of West Saxon and reflects a phenomenon that does not seem to have occurred anywhere else (Kispert 1971: 197; Hogg 1992: 122). This morphophonemic process affected not only the vowel of the suffix, but also the consonants of both the suffix and the stem. For this reason I reject calling it *syncope*, as this refers, in principle, only to deletion of a medial vowel, and although vowel deletion does occur, this does not thoroughly describe the process(es) at work in the dialect. I also do not think that *contraction* is an appropriate term, although this is the one traditionally used, because the term refers chiefly to deletion and is therefore inadequate for the same reason as syncope;

neither is *reduction*, for essentially the same reason. However, as there is no one alternate term which is adequate to describe the phenomenon, and to keep with the terminology used by the vast majority of linguists, I will retain the term contraction to refer to this process.

(2.2.2.1) Verb Contraction

The phenomena of contraction consists of the deletion of the verb affix vowel in the 2sg and 3sg forms, and the assimilation, dissimilation, and/or simplification of the resulting consonant cluster formed with the coda consonants of the affix and of the last syllable of the verb stem. The occurrence of assimilation, dissimilation, and simplification, or whether they take place at all, are directly related to which consonant(s) form the coda of the verb stem and are combined with the suffix consonant. For this reason, it is possible to categorize the changes according to the coda consonants of the stem; most traditional analyses do this as well. This approach allows us to see the phenomena in isolation and will make the analysis more clear.

The development of Proto-Germanic into Old English was characterized by, among other things, a number of regular sound changes which affected verbs and verb affixes. Among Old English dialects, the West Saxon was the only dialect with a distinctive feature known as verb contraction, which seems to be unrelated to other sound changes and is morpheme-specific. Although contraction occurs in both the 2sg and 3sg forms of Old English verbs, for the purposes of this thesis, I will focus on the 3sg forms only (formed with the affix /-eθ/). Similarities to the 2sg forms will be identified and discussed in section (4.1.1) of the conclusion.

(3.0) ANALYSIS OF WEST SAXON VERB CONTRACTION WITHIN OPTIMALITY THEORY

This section forms the main analysis of contraction in West Saxon verbs within the framework of Optimality Theory (OT). First a general introduction to OT is given, explaining the method and conventions used. Next the Old English verbs that were regularly affected by West Saxon verb contraction will be sorted into 6 major related groups according to the stem-final consonant. These groups will then be analyzed, in order, using Optimality Theory to account for the sound change phenomena associated with contraction.

(3.1) Optimality Theory

OT is based on the premise that every language is a system of competing forces which determine the ultimate structure of the language. Principle among these forces, which take the form of violable constraints, are Faithfulness constraints and Markedness constraints. Faithfulness constraints prefer output that is most like, or faithful to, the input, therefore "preserving lexical contrast;" markedness constraints prefer output that is least marked cross-linguistically, producing unmarked forms. These constraints are ranked relative to each other, with higher-ranked constraints dominating lower-ranked ones. As constraints are violable, they may not all be satisfied simultaneously; therefore, higher-ranked constraints are satisfied at the expense of lower-ranked constraints, which are violated. The ranking of constraints varies by language, leading to the differences observed cross-linguistically (Kager 1999). Possible outputs, or candidates, are evaluated according to the ranking of constraints that they violate, and the candidate which satisfies the most high-ranked constraints is selected as optimal.

This evaluation is illustrated by a tableau, as shown in example tableau (1) below. Possible inputs are listed in a column to the left, and constraints are listed in a row across the top. Constraints which are strictly ranked, or necessarily ranked in relation to one another, are separated by a solid line, while constraints which are equally ranked, or not necessarily ranked in relation to one another, are separated by a dotted line. A violation of a constraint by a candidate is indicated by an asterisk (*); a violation which eliminates a candidate (a "fatal violation") is indicated by an exclamation point (!). Once a candidate has been eliminated by a violation of a high-ranked constraint, the rest of the lower-ranked constraints are shaded to indicate that they no longer matter in the evaluation.

(1)

/input/	CONSTRAINT X	CONSTRAINT Y	CONSTRAINT Z
☞ a. candidate A		*	
b. candidate B	*!		*

In this tableau, candidate A "wins" and is indicated as the optimal candidate by the symbol "☞" because candidate B fatally violates CONSTRAINT X, or violates a highly-ranked constraint not violated by another candidate, thereby eliminating itself. As constraints are by definition violable, candidates are eliminated not simply because of a violation but because of a violation of the most highly-ranked constraints; further violations by both candidates of lower-ranked constraints are thereby unimportant and are shaded.

(3.2) West Saxon 3sg Verb Contraction

Most, though not all verbs of Old English were affected by contraction in the West Saxon dialect. Verbs that were regularly not affected were class 2 weak verbs and class 1 weak verbs with the stem ending in a geminate or /r/; all strong verbs and many other class 1 weak verbs were affected. Class 2 weak verbs may have not been affected because this was the "productive" class of Old English verbs; all verbs that were borrowed into the language belonged to this class and so probably did not carry the same morphological and phonological "baggage" as the verbs that were part of the Germanic lexicon. It is unclear why some class 1 weak verbs were affected and others were not.

The following sections give examples of Old English verbs that were affected by contraction in the West Saxon dialect. These verbs are arranged into groups according to the final consonant of the verb stem. This final consonant, when brought into contact with the consonant of the 3sg verb suffix, largely determined the kinds of sound change(s) that occurred in these verbs. Groups 1-6 are based on those used by Campbell (1959) and Davis (1953) in their descriptions of Old English grammar and phonology; groups 7-11 are compiled from verbs included in Davis (1953), though the grouping is my own.[10] These 11 groups, which include the most clearly affected stem-final consonants, will then be analyzed, in order, using Optimality Theory to account for the sound change phenomena associated with contraction.

Groups 1-6 are given below; groups 7-11 are given in section (3.2.9) below.

[10] Although none of the 3sg verb forms used as data in this analysis are marked as reconstructed forms, some are. Because there are not attested forms of all verbs in the historical record of Old English, the inflectional paradigms of many verbs have been filled in based on the historical patterning of verbs in Proto-Germanic verb classes. For more on the Old English verb classes and their derivation from the Germanic verbs, see Campbell (1959): 295; Davis (1953): 25; Hogg (1992): 142.

(2) 3*sg Contracted Verb Form Groups in West Saxon*

		Infinitive		Stem and 3sg Suffix	Contracted Form	
1	/kweθ-an/	*cweþan*	"say"	/kwiθ-eθ/	/kwiθ-θ/	*cwiþþ*
2	/lǣt-an/	*lǣtan*	"let/leave"	/lǣt-eθ/	/lǣt-t/	*lǣtt*
3	/bīd-an/	*bīdan*	"wait"	/bīd-eθ/	/bīt-t/	*bītt*
4	/bidd-an/	*biddan*	"pray"	/bidd-eθ/	/bit-t/	*bitt*
5	/bind-an/	*bindan*	"bind"	/bind-eθ/	/bin-t/	*bint*
6	/ʧēos-an/	*ċēosan*	"choose"	/ʧīes-eθ/	/ʧīes-t/	*ċīest*

(These examples and those given below from Davis 1953: 25-36.)

(3.2.2) Group 1

The first data group consists of verb stems ending in /θ/, a voiceless interdental fricative. The process of contraction, which involves syncope of the suffix vowel and then assimilation, dissimilation, or simplification of the resulting coda consonant cluster, is limited in this case to just vowel syncope. No assimilation occurs because the coda consonant of the stem and the consonant of the suffix are identical; no dissimilation or simplification occurs because the geminate formed when the vowel is deleted is allowable in Old English. Therefore, only the syncope of the suffix vowel must be accounted for in the analysis of this group. Examples are given below in (3) of verbs which fall into this group:

(3) *Group 1 Contracted Verbs*

		Infinitive		Stem and 3sg Suffix	Contracted Form	
a.	/kweθ-an/	*cweþan*	"say"	/kwiθ-eθ/	/kwiθ-θ/	*cwiþþ*
b.	/mīθ-an/	*mīþan*	"hide"	/mīθ-eθ/	/mīθ-θ/	*mīþþ*
c.	/snīθ-an/	*snīþan*	"cut"	/snīθ-eθ/	/snīθ-θ/	*snīþþ*
d.	/seoθ-an/	*seoþan*	"boil"	/seoθ-eθ/	/sīeθ-θ/	*sīeþþ*

(3.2.2.1) Vowel Loss and Reduction in Dialects of Old English

The reduction and/or loss of vowels in unaccented syllables was a common process in Proto-Germanic (see section (2.1.4.2) above); this process continued into Pre-Old English and Old English (and even into Middle and Modern English), leading to a great reduction in the inventory and occurrence of unstressed vowels. In general, the loss of vowels occurred earlier than the reduction of vowels (Hogg 1992: 122). However, the fact that different dialects of Old English survive from different time periods makes an analysis of these changes more difficult. Therefore, vowel deletion will be described in terms of the dialect in which it occurred in order to clarify the known changes.

(3.2.2.1.1) Vowel deletion and reduction in Northumbrian and Mercian

In Northumbrian and Mercian texts, one type of vowel deletion that occurred was apocope (deletion of a final vowel) of the unstressed high vowels /i/ and /u/ when preceded by either an accented heavy syllable (H́._), or a light accented syllable[11] followed by another syllable (Ĺ.L._).[12] Often, the final vowel was an inflectional suffix marking case, as on the nouns given below. These examples show both environments in which the apocope did occur (4), and those in which it did not occur (5) (Campbell 1959: §345; Hogg 1992: 121):

[11] Heavy here refers to a syllable with two or more moras, with long vowels considered to have two moras; i.e., a syllable with at least one coda consonant, or a syllable with a long vowel and/or a coda consonant. Light refers to syllables with only one mora, i.e., those with a short vowel and no coda consonant. See Hayes (1995).

[12] Other kinds of syncope and apocope also occurred, which are not detailed here. See Campbell (1959): §341-354; Hogg (1992):121-2.

(4) *Syllables in which Apocope Occurred*

H́._			Ĺ.L._		
/wór.d-u/	>	/word/	/wéo.ro.d-u/	>	/wéorod/
/ā́.r-u/	>	/ā́r/	/fí.re.n-u/	>	/fíren/
/fél.d-u/	>	/féld/			
/ḗ.t-i/	>	/fḗt/			

(5) *Syllables in which Apocope did not Occur*

Ĺ._			H́.L._		
/fá.t-u/	>	/fátu/	/hḗa.fo.d-u/	>	/ hḗafodu/
/jíe.f-u/	>	/jíefu/			
/sú.n-u/	>	/súnu/			
/ʃí.p-u/	>	/ʃípu/			

Because vowel reduction occurred later, in these dialects it only affected those vowels that had not already been deleted by apocope or syncope. For our purposes, this means that the Proto-Germanic unstressed */i/ in the 2sg and 3sg present indicative inflectional suffixes on verbs were not subject to deletion as they were not word-final. As described in section (2.1.4.2.2) above, these vowels were instead reduced to /e/ during the later Pre-Old English period, leaving the Old English inflectional suffixes repeated from above in most dialects:

(6) *Present Indicative Suffixes in Old English*

	singular	plural
1	-/e/	
2	-/est/	-/aθ/
3	-/eθ/	

(Lass 1992: 134)

(3.2.2.1.2) Vowel deletion and reduction in West Saxon

This same process of apocope and reduction occurred in the West Saxon dialect as well. However, most analyses of West Saxon sound changes propose that although this vowel deletion applied only to word-final vowels in the other dialects, while in West Saxon it was extended to include the 2sg and 3sg present indicative suffixes, no matter what the weight of the syllable that preceded it, when affixed to strong verbs or to some weak verbs of the first class. If this was indeed the case, then the vowel of the 2sg and 3sg suffixes was deleted before the later vowel reduction occurred, making the inflectional suffixes for most verbs in the West Saxon dialect something like the following:

(7) *Present Indicative Suffixes in West Saxon Dialect of Old English*

	singular	plural
1	-/e/	-/aθ/
2	-/st/	
3	-/θ/	

These forms are found extensively in West Saxon texts, and occasionally in Kentish texts, probably under influence from West Saxon, but only very rarely in Mercian or Northumbrian texts (Campbell 1959: §732-3). Although this difference between dialects is well documented, there is no clear explanation for this expansion of the vowel deletion, nor why it is so prevalent in only one dialect.

I believe this analysis, which extends apocope within a conditioned environment to syncope in nearly any environment, is a problematic one. Although both involve vowel deletion, unconditioned syncope happened *only* in these inflectional suffixes. There are no other examples from the same dialect or time period of syncope of vowels in the same environment; that is, when the final unstressed syllable is closed, it is no longer apocope, and syncope does not occur in this environment in West Saxon (Campbell 1959: §347).

(3.2.2.2) West Saxon Vowel Deletion and Optimality Theory

In order to account for the extension of vowel deletion that is found in West Saxon, it is not necessary to analyze Pre-Old English apocope and syncope. For the reasons given above, this vowel deletion is not part of any regular sound change in a conditioned environment, and is confined to the vowels of two particular inflectional suffixes in one dialect.

Therefore, instead of proposing constraints that directly address the conditioning environment of apocope that occurred in all Old English dialects, and then attempting to account for its extension into a dissimilar environment in only one dialect, it seems more logical to propose a morpheme-specific constraint that targets only the unstressed vowel of the 2sg and 3sg suffixes. Given the foregoing work in syncope with OT, the specificity of this phenomenon does not allow a conventional interpretation. In addition, morpheme-specific constraints are not without precedent, beginning with the morpheme-specific alignment constraint EDGEMOST(*um*, L) proposed in Prince and Smolensky (1993) to account for infixation of the affix *um-* in Tagalog. Finally, dealing with this unusual expansion of the vowel deletion in the simplest possible way allows us to focus on the assimilation, dissimilation, and simplification phenomena which form the heart of West Saxon verb contraction.

(3.2.2.2.1) Morpheme-Specific Vowel Deletion

To account for syncope of the unstressed vowel in West Saxon verb suffixes, I propose the following markedness constraint:

(8) **NOVOWEL(2sg3sg)**
There are no vowels in 2sg and 3sg present indicative verb suffixes.

Applying this constraint to an example of the Group 1 verbs given above yields the correct optimal candidate:[13]

(9)

input: /kwiθ-eθ/	NOVOWEL(2SG3SG)
☞ a. kwiθ-θ	
b. kwiθ-eθ	*!

Although contraction usually involves assimilation, dissimilation, and/or simplification of consonant clusters, none of these occur in group 1 stems ending in /θ/, because this segment is identical to the final segment of the suffix, forming a geminate consonant. Once constraints have been introduced to account for these phenomena, this group will be re-analyzed with that constraint ranking to ensure that the attested form shown here is still selected as the optimal candidate; see section (3.2.8.1).

[13] Throughout this analysis, I will assume the input /-eθ/ for the suffix. Although according to some analyses this deletion occurred before vowel reduction changed */i/ to /e/ in the other dialects (see section (2.1.4.2) above), West Saxon verbs which do not undergo contraction do have the suffixes /-eθ/ and /-est/, not /-θ/ and /-ist/.

(3.2.3) Group 2

The verb stems in group 2 end in /t/, a voiceless alveolar stop; deletion of /i/ creates a new consonant cluster /tθ/, which is not an allowable cluster in Old English, so assimilation occurs.

(10) *Group 2 Contracted Verbs*

		Infinitive		Stem and 3sg Suffix	Contracted Form	
a.	/lǣt-an/	*lǣtan*	"let"	/lǣt-eθ/	/lǣt-t/	*lǣtt*
b.	/bīt-an/	*bītan*	"bite"	/bīt-eθ/	/bīt-t/	*bītt*
c.	/lūt-an/	*lūtan*	"bow"	/lȳt-eθ/	/lȳt-t/	*lȳtt*
d.	/et-an/	*etan*	"eat"	/it-eθ/	/it-t/	*itt*

(3.2.3.1) Sonority Sequencing Principle

In his discussion of assimilation and dissimilation in Old English, Hickey (1984: 281-282) appeals to phonotactics in order to explain the same phenomena which are under examination here. He defines phonotactics as principles controlling syllable structure and other segment ordering, and specifically proposes using a "resonance strength scale which decreases the more one moves away from the nucleus of a syllable." This concept, described by Venneman (1972), is known as the Sonority Sequencing Principle (SSP):

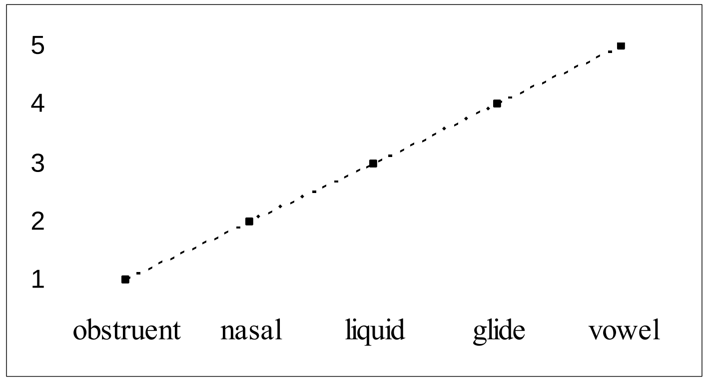
(11) **Sonority Sequencing Principle**
Sonority in a syllable must rise from the onset to the nucleus and fall from the nucleus to the coda (Kenstowicz 1994: 254)

A basic classification of sounds based on sonority can be ranked as in (12), from most sonorous to least sonorous, with corresponding numbers. These can then be graphed as in (13) to visually represent rising and falling sonority in a word, morpheme, or syllable.

(12) *Sonority Scale of Segments*

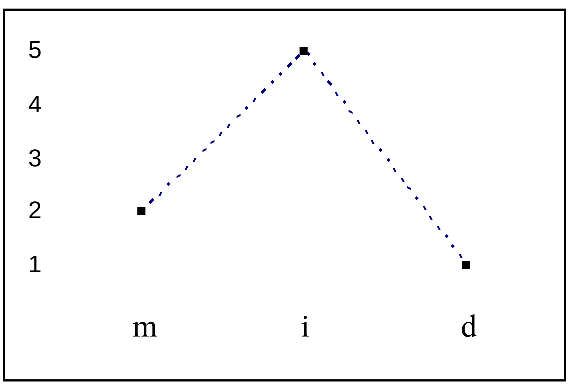
5	vowels
4	glides
3	liquids
2	nasals
1	obstruents

(13) *Sonority Chart of Segments*

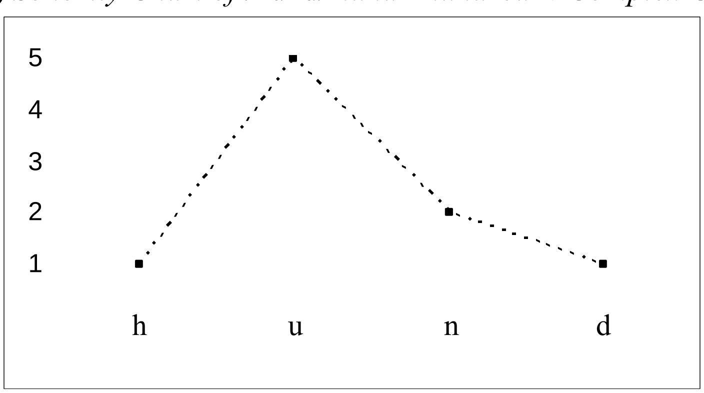


This is illustrated by the following sonority charts of Old English words which obey SSP, containing both simple and complex codas.

(14) *Sonority Chart of* /mid/ *mid "with": Simple Coda*



(15) *Sonority Chart of* /hund/ *hund "hundred": Complex Coda*



As in the example sonority chart (14) above, simple syllable margins always obey SSP because the nucleus is a vowel and all consonants are less sonorous than vowels.[14] For this reason the SSP applies most directly to syllables containing complex syllable margins, as in (15), constraining the types of consonant clusters that may be constructed. There are significant differences in the consonant clusters allowed across languages, and these differences are due to differences in sonority scale. The basic scale given above in (12) is common, but may be modified to account for different languages. This may involve dividing the sounds into more specific categories by voicing or other features. In addition, many languages have different sonority scales applied to onsets and codas, allowing consonant sequences in onsets that are not allowed in codas (Blevins 1995: 210-1, 227). In the analysis below, the focus is the sonority scale of codas in Old English, which is most directly relevant to the data under consideration.

Shepherd (2003: 5) adapts this principle into a markedness constraint suitable for application in OT:

(16) **SONSEQ**
Onsets must rise in sonority towards the nucleus and codas must fall in sonority from the nucleus.

When this constraint is applied within the OT framework to the example complex coda word from Old English used above in (15), the correct candidate, the input, is selected as optimal.

[14] This is assuming a syllable with a vowel nucleus; syllables containing a syllabic consonant as the nucleus are not addressed here.

(17)

input: /hund/	SONSEQ
☞ a. hund	
b. hudn	*!

Because SONSEQ constrains the types of syllable margins that are possible in a language, it is relevant to the contraction phenomenon demonstrated in West Saxon Old English. In this data, deletion of the nucleus vowel of the 3sg affix brings the coda consonant into contact with the coda of the verb stem, creating a new coda consonant cluster. This cluster would then be subject to the constraints of the SSP and SONSEQ, and the sonority of one segment of the cluster is changed through manner assimilation.

In considering how this new constraint should be ranked in relation to NOVOWEL(2SG3SG), it is important to remember that for the new consonant cluster to occur, deletion of the suffix vowel must also occur. NOVOWEL (2SG3SG) must consequently be highly ranked, in order to ensure that only candidates with vowel deletion and the relevant consonant cluster are selected:

(18) NOVOWEL (2SG3SG) >> SONSEQ

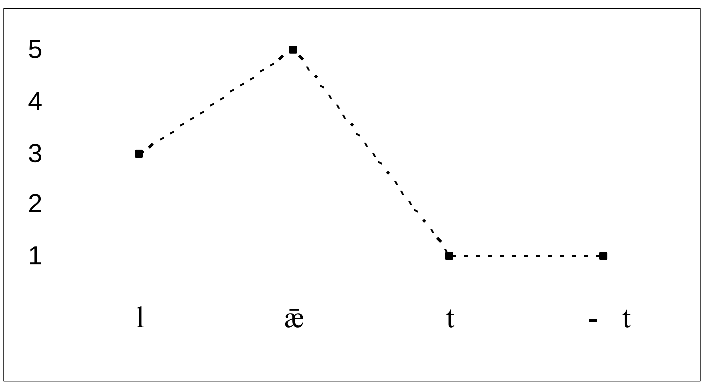
When this constraint ranking is applied to verbs showing contraction in the 3sg form, however, it does not select the optimal candidate as might be expected. As shown in tableau (19) below, which evaluates possible candidates for the output (10a) *lǣtt*, this definition of SONSEQ results in violations by both the optimal candidate (19a), and the input candidate (19b):

(19)

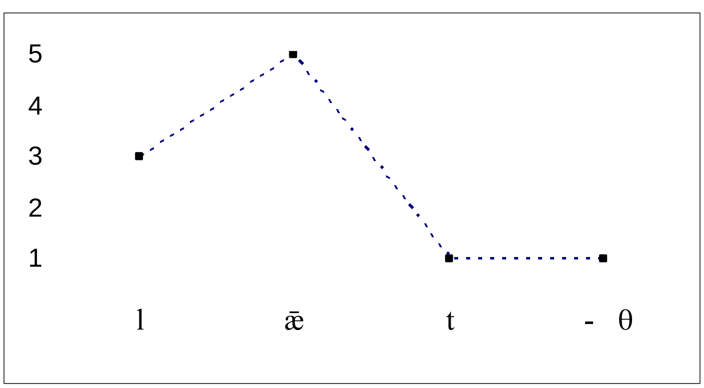
input: /lǣt-eθ/	NoVowel (2sg3sg)	SonSeq
a. lǣt-t		*!
b. lǣt-θ		*!

If SonSeq is to function as a motivating factor for the selection of (19a) as the optimal candidate it must differentiate between these two candidates, and so there must be something wrong with the way that SonSeq is defined here. In order to identify why the optimal candidate is not selected, it is necessary to look at exactly why both the output /lǣt-t/ and the candidate /lǣt-θ/ violate SonSeq. Below are sonority charts of both candidates, illustrating the change in sonority in the coda.

(20) *Sonority Chart of /lǣt-t/*



(21) *Sonority Chart of /lǣt-θ/*

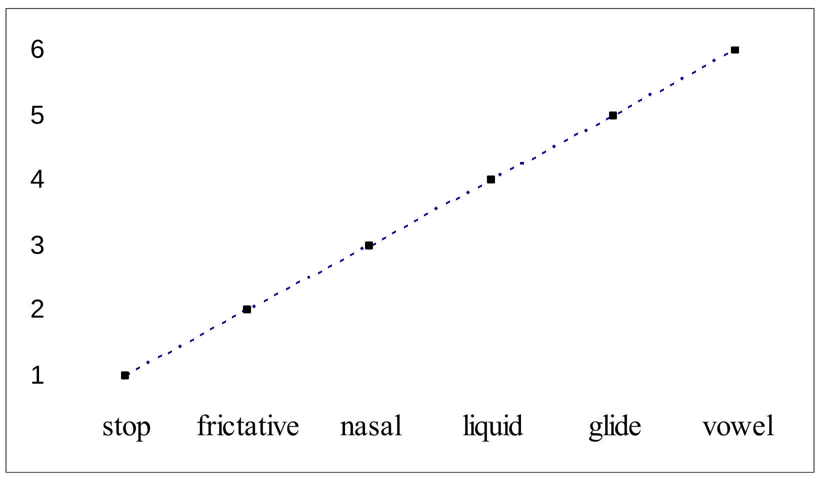


This basic sonority scale does not differentiate between the candidates, as both have a coda with two obstruents and therefore the same sonority scale. In order to eliminate one and not the other, we must distinguish between them in some way. The main difference in the two codas is that in /lǣt-θ/ the coda contains a stop consonant and a fricative consonant, while in /lǣt-t/ the coda contains two stop consonants. Although stops and fricatives are both obstruents, fricatives are more sonorous than stops (Ham 1998: 232). Therefore, we may divide the sonority of obstruents into two levels, stops and fricatives, and modify the sonority chart given in (23) as follows:

(22) *Revised Sonority Scale of Segments*

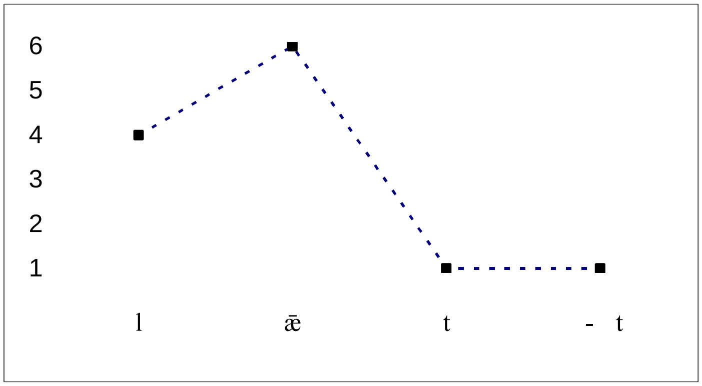
6	vowels
5	glides
4	liquids
3	nasals
2	fricatives
1	stops

(23) *Revised Sonority Chart of Segments*

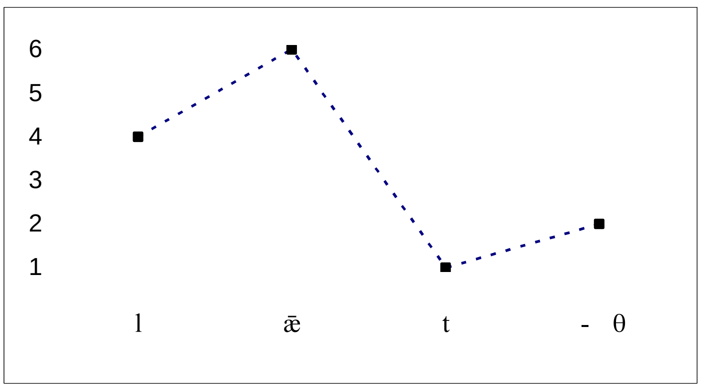


Given this revised sonority scale, we again show sonority charts for the two candidates /lǣt-t/ and /lǣt-θ/, which are now distinguished from one another by the sonority of the final coda consonant.

(24) *Revised Sonority Chart of /lǣt-t/*



(25) *Revised Sonority Chart of /lǣt-θ/*



However, even with this ability to distinguish between the candidates, both still violate SONSEQ, as neither candidate has falling sonority throughout the coda. As shown in (24), the sonority of the coda of the optimal candidate /lǣt-t/ does fall from the nucleus, but it *does not continue to fall* throughout the coda. The sequence of /t-t/ does not fall in sonority, but rather retains the same level of sonority throughout the coda. In order to exclude codas which have a rising sonority in the coda, as in the input (19b), but allow codas with the same sonority in two consecutive segments, as in the output (19a), the definition of SONSEQ must be modified slightly:

(26) **SONSEQ-CODA**
Codas must not *rise* in sonority from the nucleus.

This change in definition accomplishes the necessary discretion between ill-formed codas which have rising sonority and well-formed codas with stable sonority. With this new definition, the same candidates from tableau (19) above are repeated, illustrating how the input violates the constraint but the optimal candidate does not. This constraint now correctly selects the optimal candidate and accounts for the manner assimilation of coda consonants in contraction.

(27)

input: /lǣt-eθ/	NoVowel (2sg3sg)	SonSeq-coda
☞ a. lǣt-t		
b. lǣt-θ		*!

This constraint, however, is not enough to eliminate all possible candidates from consideration because changing the manner of articulation of the suffix consonant is not the only strategy possible to avoid violations of SonSeq-coda. Candidates that instead include insertion, deletion, and a change in articulation of the stem consonant (in other words, changing other features of the input) must also be eliminated. These changes can be prevented through use of Correspondence Theory.

(3.2.3.2) Correspondence Theory

Correspondence Theory was developed by McCarthy and Prince (1994) as a way of using faithfulness to account for phenomenon of reduplication. It formalizes the concept of faithfulness to the input into one which relates the input and output to each other in specific ways. These can be represented through the three basic faithfulness constraints of Correspondence Theory (Kager 1999: 249-250):

(28) **MAX-IO**
Every element in the input has a correspondent in the output (no deletion).

(29) **DEP-IO**
Every element in the output has a correspondent in the input (no epenthesis).

(30) **IDENT(F)-IO**
Correspondent segments have identical values for feature (F) (no change in feature).

When these faithfulness constraints are ranked higher than markedness constraints, they enforce faithfulness to the input over the appearance of less marked forms, and can be adapted to target specific input-output correspondences.

As these constraints were developed for use with reduplication, they may also appear as MAX-BR, DEP-BR, and IDENT(F)-BR, where the correspondence is between B indicating the base and R indicating the reduplicants. Because this analysis does not involve reduplication, but only correspondence between input and output, this distinction does not need to be explicitly stated in the constraint and they may be simplified as follows for use herein:

(31) **MAX**
Every element in the input has a correspondent in the output (no deletion).

(32) **DEP**
Every element in the output has a correspondent in the input (no epenthesis).

(33) **IDENT(F)**
Correspondent segments in the input and output have identical values for any feature (F) (no change in any segmental feature) (to be modified).

(3.2.3.3) Constraint Interaction

Given the above constraints, it remains to apply them to the data within OT conventions. The Old English verbs that fall together in group 2 (repeated here from (10) above) have the common feature of a voiceless stop consonant /t/ in the coda of the stem.

(34) *Group 2 Contracted Verbs*

		Infinitive			Stem and 3sg Suffix	Contracted Form	
a.	/lǣt-an/	*lǣtan*	"let"		/lǣt-eθ/	/lǣt-t/	*lǣtt*
b.	/bīt-an/	*bītan*	"bite"		/bīt-eθ/	/bīt-t/	*bītt*
c.	/lūt-an/	*lūtan*	"bow"		/lȳt-eθ/	/lȳt-t/	*lȳtt*
d.	/et-an/	*etan*	"eat"		/it-eθ/	/it-t/	*itt*

Because faithfulness to the input is violated in this data in order to achieve a less marked syllable coda, a markedness constraint must rank higher than any faithfulness constraints. This ensures that the less marked candidate is selected as optimal, not the most faithful candidate. The constraints proposed this far consist of a markedness constraint, SONSEQ-CODA, and several faithfulness constraints, MAX, DEP and IDENT(F). Following this logic and ranking the markedness constraint highest results in the following preliminary ranking:

(35) NOVOWEL (2SG3SG) >> SONSEQ-CODA >> MAX, DEP, IDENT(F)

This ranking is illustrated in tableau (36) below, containing only the output, or optimal candidate (36a), and the input, or most faithful candidate (36b) (both repeated from tableau (27) above).

(36)

input: /lǣt-eθ/	NO VOWEL (2SG3SG)	SONSEQ-CODA	MAX	DEP	IDENT(F)
☞ a. lǣt-t					*
b. lǣt-θ		*!			

Candidate (36a), the least marked candidate, is still selected as optimal because although it violates IDENT(F) by changing the manner of articulation of the affix consonant[15], it does not violate the higher ranked markedness constraint SONSEQ-CODA. Candidate (36b), although faithful to the input, does violate SONSEQ-CODA, and is therefore eliminated.

Changing a segmental feature is not the only way to prevent violation of SONSEQ-CODA, however. Unmarked but unfaithful forms may also use epenthesis, as in candidate (37c) below, or deletion, as in candidate (37d), to provide an ideal syllable coda. Tableau (37) includes these candidates and illustrates that their inclusion introduces a problem with the present ranking of constraints.

(37)

input: /lǣt-eθ/	NOVOWEL (2SG3SG)	SONSEQ-CODA	MAX	DEP	IDENT(F)
☞ a. lǣt-t					*
b. lǣt-θ		*!			
💣 c. lǣt-əθ				*	
💣 d. lǣt-Ø			*		

The input candidate (37b) is again eliminated by violation of SONSEQ-CODA, but candidate (37a) is not selected as optimal because it only violates a constraint ranked lower than SONSEQ-CODA, as do candidates (37c) and (37d), which are marked with the symbol "💣" to indicate that they are incorrectly selected as optimal. Because the three faithfulness constraints MAX, DEP, and IDENT(F) are unranked in relation to each other, the result is a tie between three candidates. As MAX and DEP are violated by the sub-

[15] Because there is no interdental stop consonant, when the interdental fricative is changed to a stop consonant in order to satisfy the requirement for equal sonority it is realized as /t/. Although this may seem at first to be a change in both manner and place of articulation, it is not as both /θ/ and /t/ are [+COR].

optimal candidates but not the optimal candidate, they must be ranked higher than IDENT(F). Therefore, the constraint ranking is modified to reflect this:

(38) NOVOWEL (2SG3SG) >> SONSEQ-CODA >> MAX, DEP >> IDENT(F)

The resulting tableau correctly selects the output as optimal and eliminates the other candidates that were incorrectly selected above.

(39)

input: /lǣt-eθ/	NOVOWEL (2SG3SG)	SONSEQ-CODA	MAX	DEP	IDENT(F)
☞ a. lǣt-t					*
b. lǣt-θ		*!			
c. lǣt-əθ				*!	
d. lǣt-Ø			*!		

It can be noted here that with the lower reranking of IDENT(F), SONSEQ-CODA no longer needs to be ranked higher than the faithfulness constraints MAX, DEP and IDENT(F) in order to eliminate candidate (39b). Instead, the optimal candidate will be selected because it does not violate any candidate ranked higher than IDENT(F). SONSEQ-CODA may therefore be ranked equal to MAX and DEP:

(40) NOVOWEL (2SG3SG) >> SONSEQ-CODA, MAX, DEP >> IDENT(F)

This yields the following tableau, with correct seletion of the optimal candidate:

(41)

input: /lǣt-eθ/	NOVOWEL (2SG3SG)	SONSEQ-CODA	MAX	DEP	IDENT(F)
☞ a. lǣt-t					*
b. lǣt-θ		*!			
c. lǣt-əθ				*!	
d. lǣt-Ø			*!		

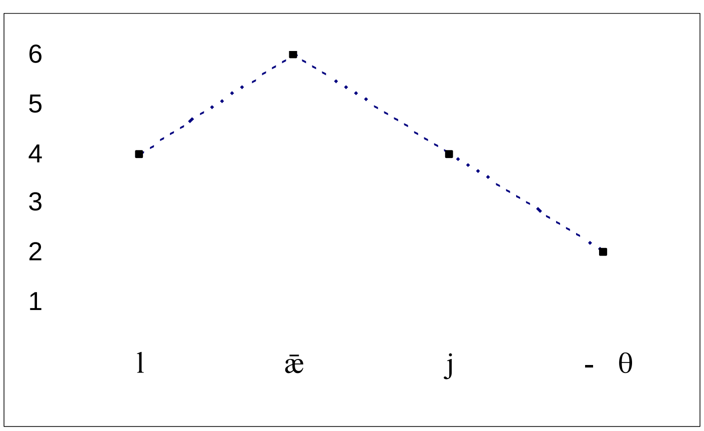
However, these are not the only possible candidates in this situation. Other candidates may attempt to resolve the conflict between markedness and faithfulness in other ways. As the constraints are defined and ranked now, other candidates may be as successful as the optimal candidate. (Candidates (41a-d) are repeated here for comparison.)

(42)

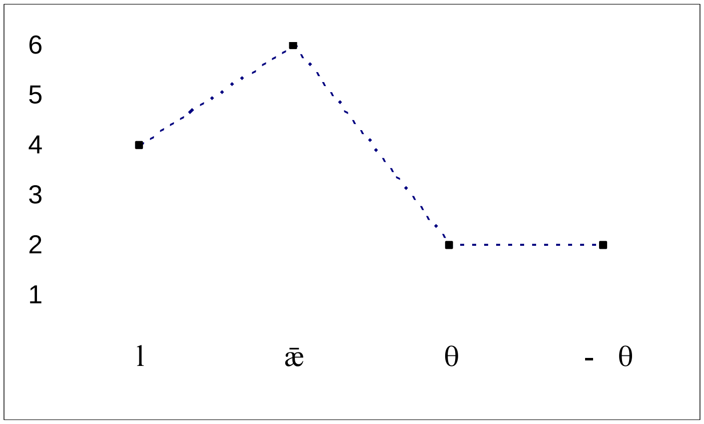
input: /lǣt-eθ/	NoVowel (2sg3sg)	SonSeq-coda	Max	Dep	Ident(F)
☞ a. lǣt-t					*
b. lǣt-θ		*!			
c. lǣt-əθ				*!	
d. lǣt-Ø			*!		
💣 e. lǣj-θ					*
💣 f. lǣθ-θ					*

In tableau (42), candidates (42e) and (42f) succeed in avoiding a violation of SonSeq-coda by changing a segmental feature of the last consonant of the stem. As a result, they also do not violate Max and Dep, and tie with the output. This is illustrated by sonority charts for candidates (42e) and (42f) given here.

(43) *Sonority Chart of /lǣj-θ/*



(44) *Sonority Chart of /lǣθ-θ/*



In order to eliminate these as possible candidates, it is necessary to identify how they are different from the optimal candidate. The difference is that they change the consonant of the stem rather than the consonant of the affix. IDENT(F) can be modified to exclude them but not the output by distinguishing between faithfulness to the stem and faithfulness to the affix. In this case, as the optimal candidate is more faithful to the stem than to the affix, the constraint should prefer faithfulness to the stem.

(45) **IDENT(F)-STEM**
Correspondent segments the input and output of the stem have identical values for any feature (F).

Making this change to tableau (46), shown below, results in selection of the optimal candidate over all other reasonable candidates:

(46)

input: /lǣt-eθ/	NoVowel (2sg3sg)	SonSeq-coda	Max	Dep	Ident(F)-stem
☞ a. lǣt-t					
b. lǣt-θ		*!			
c. lǣt-əθ				*!	
d. lǣt-Ø			*!		
e. lǣj-θ					*!
f. læːθ-θ					*!

Candidates (46e) and (46f) are now eliminated by violation of IDENT(F)-STEM, which the optimal candidate (46a) does not violate because it preserves faithfulness to the stem but not the affix. Therefore, the correct optimal candidate is selected from the input. The complete final ranking is:

(47) NOVOWEL (2SG3SG) >> SONSEQ-CODA, MAX, DEP >> IDENT(F)-STEM

(3.2.3.4) Ranking of NOVOWEL (2SG3SG)

These tableaux demonstrate that the constraint NOVOWEL (2SG3SG) must be the highest ranked constraint in order to ensure that vowel deletion occurs and creates the environment in which the coda consonant of the verb stem and the coda consonant of the suffix are combined into a new consonant cluster. Therefore, in order to simplify the evaluation of groups 3-11, NOVOWEL (2SG3SG) will not be included in tableaux or constraint rankings in the remaining sections. However, it is to be assumed that it remains the most highly-ranked constraint, and candidates which would violate it will not be included in the possible candidates for evaluation. The ranking above is adapted below according to this convention:

(48) SONSEQ-CODA, MAX, DEP >> IDENT(F)-STEM

(3.2.4) Group 3

Verb stems in group 3 end in /d/, a voiced alveolar stop; when the consonant cluster /dθ/ is formed through vowel deletion, voicing assimilation in addition to manner assimilation as in group 2 occurs.

(49) *Group 3 Contracted Verbs*

	Infinitive			Stem and 3sg Suffix	Contracted Form	
a.	/bīd-an/	*bīdan*	"want"	/bīd-eθ/	/bīt-t/	*bītt*
b.	/rīd-an/	*rīdan*	"ride"	/rīd-eθ/	/rīt-t/	*rītt*
c.	/bēod-an/	*bēodan*	"offer"	/bīed-eθ/	/bīet-t/	*bīett*
d.	/drǣd-an/	*drǣdan*	"fear"	/drǣd-eθ/	/drǣt-t/	*drǣtt*

The constraint ranking used above to select the optimal candidate in group 2 is not effective in selecting the optimal candidate in group 3, as shown in tableau (50) below with possible candidates for the output (49a) *bītt*, because of the addition of voicing assimilation of the stem-final consonant. Therefore, constraints must be introduced that are violated by the sub-optimal candidate (50c) in order to account for the data.

(50)

input: /bīd-eθ/	SONSEQ-CODA	MAX	DEP	IDENT(F)-STEM
☞ a. bīt-t				*!
b. bīd-θ	*!			
💣 c. bīd-t				

(3.2.4.1) Voicing Markedness Constraint

A sequence of two obstruents with different values for voice is universally more marked than a sequence that agrees in voice. This markedness is responsible for voicing assimilation in many languages. A voicing markedness constraint has been proposed by more than one author[16], but here I adapt the one used by Bakovíc (2006):

(51) **SEQ(voice)**
Sequential obstruents must agree in [±voice].

When this constraint is applied to a consonant cluster of two obstruents, it allows for two possible outputs: either both consonants may be voiced, or both may be voiceless. It does not specify the direction of assimilation as either progressive or regressive, only that assimilation must occur in order to avoid a violation. As shown below with hypothetical consonant clusters, two different candidates could be selected as optimal:

(52)

input: /dt/	SEQ(voice)
☞ a. /tt/	
☞ b. /dd/	
c. /dt/	*!

Therefore, it seems that some faithfulness constraint must also be at work in order to eliminate one of these candidates. In the Old English data, the voicing assimilation is always regressive (assimilating the coda consonant of the stem to the voicing of the suffix consonant). One possibility then is to assume that faithfulness to the affix is ranked higher than faithfulness to the stem. However, McCarthy and Prince (1994, cited in McCarthy and Prince 1995: 116) suggest a metaconstraint, or universal ranking of constraints, which asserts the opposite:

(53) **Root-Affix Faithfulness Metaconstraint**
Root-Faith >> Affix-Faith

---

[16] In addition to Bakovíc (2006), Haspelmath (ROA-302: 2) proposes SAMEVOICE: Sequences of obstruents within a syllable must agree for voicing; Lombardi (1996) proposes Agree: Obstruent clusters should agree in voicing (also cited in Borowsky (ROA-362: 3).

This is based on the fact that "roots are never unmarked relative to affix" as seen in vowel harmony and other phenomena. Therefore, ranking faithfulness to the affix above faithfulness to the stem (in Old English, the verb root is also the stem) is not a logical possibility to account for the data and restrict the direction of voicing assimilation. Instead, because voiced is more marked than voiceless, Lombardi (1996) proposes another markedness constraint that interacts with SEQ(voi) to constrain the output:

(54) ***LAR**
No laryngeal features (no voicing).

Because all segments have a laryngeal feature, this constraint could also disallow voicing of vowels. Although voiceless consonants are less marked cross-linguistically, making this a reasonable markedness constraint, voiceless vowels are more marked. In addition, voiceless sonorants are also more marked. I propose a change in the constraint to restrict it to obstruent consonants only:

(55) ***LAR(C)**
No laryngeal features on obstruent consonants (no voicing).

This constraint will result in the selection of candidates that lack voicing in obstruent consonants, regardless of the direction of assimilation this produces. Because the optimal candidate (52a) does not violate either SEQ(voice) or *LAR(C), as both consonants are voiceless, they may remain unranked relative to each other:

(56) SEQ(voice), *LAR(C)

This is illustrated in tableau (57), which repeats the hypothetical candidates from (52) above:

(57)

input: /dt/	SEQ(voice)	*LAR(C)
☞ a. /tt/		
b. /dd/		*!*
c. /dt/	*!	*

As all voicing assimilation in the Old English data set is devoicing, these constraints should be effective in selecting the optimal candidate. The candidates exhibiting the voicing patterns used as examples in tableaux (57) above are given here, along with the candidate most faithful to the input and a candidate with all consonants devoiced:

(58)

input: /bīd-eθ/	SEQ(voice)	*LAR(C)
☞ a. bīt-t		*!
b. bīd-d		*!**
c. bīd-t	*!	**
d. bīd-θ	*!	**
💣 e. pīt-t		

However, the optimal candidate is not selected, because the verb stem still contains a voiced obstruent consonant. Because voicing assimilation in this data should only occur in obstruent consonants of the coda, not the entire word, it is necessary to modify *LAR(C) so that it applies only to coda consonants, and not all consonants:

(59) ***LAR(C)-CODA**
No laryngeal features on obstruent consonants in the coda (no voicing).

The optimal candidate does not violate this constraint, and neither does candidate (58e). Candidate (58e) does incur more violations of IDENT(F)-STEM, causing it to be eliminated. When the above candidates are again evaluated with this new version of the constraint and IDENT(F)-STEM, which is left unranked here,[17] the correct optimal candidate with voicing assimilation in the coda only is selected:

(60)

input: /bīd-eθ/	SEQ(voice)	*LAR(C)-CODA	IDENT(F)-STEM
☞ a. bīt-t			*
b. bīd-d		**!	
c. bīd-t	*	*!	
d. bīd-θ	*	*!	
e. pīt-t			**!

(3.2.4.2) Ranking of SEQ(voice) and *LAR(C)-CODA with Existing Constraints

As all the same changes occur in group 3 as did in group 2, it is necessary to combine SEQ(voice) and *LAR(C)-CODA with the constraint ranking achieved in section (3.2.3.4) above in order to achieve selection of the optimal candidate from group 3. These constraints, as ranked, are repeated here:

(59) SONSEQ-CODA, MAX, DEP >> IDENT(F)-STEM

In order to rank SEQ(voice) and *LAR(C)-CODA relative to these constraints, it is necessary to identify which constraints, if any, are violated by the optimal candidate. These constraints must be ranked low to avoid the elimination of this candidate. Tableau (50) is repeated from above for this purpose.

[17] For ranking of IDENT(F)-STEM relative to these constraints, see the next section (3.2.4.2).

(62)

input: /bīd-eθ/	SONSEQ-CODA	MAX	DEP	IDENT(F)-STEM
☞ a. bīt-t				*!
b. bīd-θ	*!			
💣 c. bīd-t				

Since the optimal candidate (62a) violates only IDENT(F)-STEM, while the suboptimal candidate (62c) does not, the constraints requiring voicing assimilation must be ranked higher than IDENT(F)-STEM. However, because all the constraints ranked above IDENT(F)-STEM will be violated by candidates other than the optimal candidate, SEQ(voice) and *LAR(C)-CODA do not need to be ranked in relation to them. This yields the following ranking:

(63) SONSEQ-CODA, MAX, DEP, SEQ(voice), *LAR(C)-CODA >> IDENT(F)-STEM

When the candidates from tableau (60) above are again evaluated with this new ranking, the optimal candidate is selected.

(64)

input: / bīd-eθ /	SONSEQ-CODA	MAX	DEP	SEQ (voice)	*LAR(C)-CODA	IDENT(F)-STEM
☞ a. bīt-t						*
b. bīd-θ	*!			*	*	
c. bīd-t					*!	
d. bīd-d					*!*	
e. pīt-t						**!

In tableaux (65), additional candidates are evaluated with this constraint ranking to confirm correct selection of the optimal candidate; candidates (64a-d) are repeated from tableau (64) above.

(65)

input: /bīd-eθ/	SONSEQ -CODA	MAX	DEP	SEQ (voice)	*LAR(C) -CODA	IDENT(F) -STEM
☞ a. bīt-t						*
b. bīd-θ	*!			*	*	
c. bīd-t					*!	
d. bīd-d					*!*	
e. bīd-Ø		*!			*	
f. bīθ-θ						**!
g. bīt-θ	*!					*
h. bīd-əd			*!			

(3.2.5) Group 4

Verb stems of group 4 end in /dd/ or /tt/, a geminate of the alveolar stop. All the phenomena analyzed above apply: manner assimilation (and voicing assimilation in the case of the voiced stop), as in group 3; however, because the geminate forms a cluster of three consonants, consonant cluster simplification also occurs.

(66) *Group 4 Contracted Verbs*

	Infinitive			Stem and 3sg Suffix	Contracted Form	
a.	/bidd-an/	*biddan*	"pray"	/bidd-eθ/	/bit-t/	*bitt*
b.	/sett-an/	*settan*	"set"	/sitt-eθ/	/sit-t/	*sitt*

Given the assimilation phenomena that occur in the verbs of groups 2 and 3, the form *bittt* /bitt-t/, however improbable-looking, would be predicted through the following linear representation, indicated here by the symbol (➝), of the sound changes that occur in the examples above:

(67) *bidd-an ➝ bidd-eþ ➝ bidd-þ ➝ bidd-t ➝ bitt-t*

Nevertheless, this form does not occur due to simplification of the coda consonant cluster into a standard geminate form: *bitt*. The first question that arises is that of which consonant in the final triple cluster is lost. Because in these verbs the cluster is a group of three identical segments, it is impossible to tell. However, simplification of consonant clusters which include geminates is found in other environments in Old English. Examination of these examples in the next section will help to clarify what is occurring.

(3.2.5.1) Simplification of Consonant Clusters Containing Geminates in Old English

Geminates were normally simplified in the orthography of Old English when appearing before or after another consonant; in other words, when a geminate consonant was part of a consonant cluster. One common situation where this occurred was the addition of a derivational or inflectional suffix to a content word which ended in a geminate, as in (68a) below. A geminate could also be created through concatenation when the root ended in a consonant cluster with the final consonant being the same as the first consonant of the suffix, as in (68b-c).

(68) *Creation and Simplification of Geminate Consonant Clusters through Suffixation*

	Root		Suffix	Cluster with Geminate	Simplification
a.	*eall*	"all"	*-ne*	**eall-ne*	*eal-ne*
b.	*diern*	"secret"	*-ne*	**diern-ne*	*dier-ne*
c.	*ġeorn*	"eager"	*-nes*	**ġeorn-nes*	*ġeor-nes*

(Campbell 1959: §458, 476)

Another situation in which these consonant clusters were simplified was created by metathesis of /r/ before a geminate, creating a consonant cluster with a geminate, as in examples (69a-e) below:

(69) *Creation and Simplification of Geminate Consonant Clusters through Metathesis*

	Pre-Old English	Metathesis: Cluster with Geminate	Simplification	
a.	**rinnan*	**irnnan*	*irnan*	"run"
b.	**cresse*	**cersse*	*cerse*	"cress"
c.	**wrenna*	**wærnna*	*wærna*	"wren"
d.	**brannian*	**bærnnian*	*bærnan*	"cause to burn"
e.	**rannian*	**ærnnian*	*ærnan*[18]	"cause to run"

(Campbell 1959: §476, 193(d))

All of the above examples include geminate consonant clusters with different segments, thereby making it possible to see which segment was deleted in order to simplify the cluster. In every example, including those not given above, the geminate is reduced to a single segment, rather than deleting the non-geminate consonant from the cluster. It is possible to extend this to the simplification of geminate consonant clusters in the group 4 verbs, and assume that in these cases as well that simplification of the original geminate, rather than deletion of the suffix, is the process at work. The optimal candidate, then is /bitØ-t/, not /bitt-Ø/.

(3.2.5.1.1) Geminate Simplification in Optimality Theory

In applying the constraints and ranking repeated from above in (63) to output (66a) *bitt*, however, it is seen that they are not sufficient to select the optimal candidate from group 4, as shown below. In this group the simplified coda consonant cluster violates MAX, while the unsimplified cluster does not, leading to incorrect selection of (71c) as the optimal candidate.

(70) SONSEQ-CODA, MAX, DEP, SEQ(voice), *LAR(C)-CODA >> IDENT(F)-STEM

[18] Changes in the vowels of (69c-e) are due to umlaut; see Campbell (1959): §193.

(71)

input: /bidd-eθ/	SONSEQ-CODA	MAX	DEP	SEQ (voice)	*LAR(C)-CODA	IDENT(F)-STEM
☞ a. bitØ-t		*!				**
b. bitt-Ø		*!				**
💣 c. bitt-t						**

Because the optimal candidate is eliminated by a violation of MAX, the first option seems to be to rerank the constraints so that MAX is ranked lower and candidate (71a) is selected. MAX must be ranked lower than or even equal to IDENT(F)-STEM, as this is the only constraint violated by candidate (71c):

(72) SONSEQ-CODA, MAX, DEP, SEQ(voice), *LAR(C)-CODA >> IDENT(F)-STEM, MAX

This ranking does not eliminate (73c), because it violates IDENT(F)-STEM the same number of times as candidate (73a), and does not violate MAX:

(73)

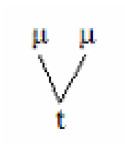
input: /bidd-eθ/	SONSEQ-CODA	DEP	SEQ (VOICE)	*LAR(C)-CODA	IDENT(F)-STEM	MAX
☞ a. bitØ-t					**	*!
b. bitt-Ø					**	*!
💣 c. bitt-t					**	

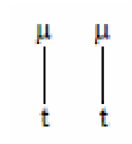
Simply changing the ranking of existing constraints does not allow selection of the optimal candidate, because they all violate IDENT(F)-STEM an equal number of times, and the optimal candidate also violates MAX. In order to distinguish between optimal candidate (73a) and candidates (73b) and (73c), we must find a difference in the deletion that occurs, which in both cases currently violate MAX.

(3.2.5.1.2) "True" versus "Fake" Geminates and MAX

Rose (2000) discusses how autosegmental theory made it possible to distinguish between two different types of geminates.[19] A "true" geminate, or tautomorphemic geminate, is underlying and is the result of a segment being doubly linked, as in (74a). A "fake" geminate, or heteromorphemic geminate, on the other hand, is the result of concatenation of morphemes or syncope of a vowel, as in (74b).

(74)

a. 

b. 

(Rose 2000: 109)

Given the autosegmental representations above, a violation of MAX through deletion can occur in two different ways. In (74a), simplification of the geminate would involve deletion of the underlying mora (μ), but not deletion of the underlying consonant segment (t). However, in (74b), simplification would involve deletion of both the mora and the segment. We can therefore divide MAX into two more specific constraints (Rose 2000):

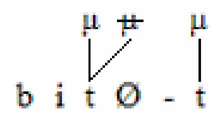
(75) **MAX-C**
Every segment (C) in the input has a correspondent in the output (no deletion of C).

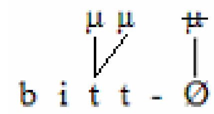
(76) **MAX-μ**
Every mora (μ) in the input has a correspondent in the output (no deletion of μ).

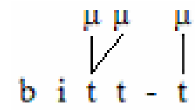
Returning now to candidates (73a) /bitØ-t/ and (73b) /bitt-Ø/ from above, and comparing them to the unsimplified geminate consonant cluster (73c) /bitt-t/, we can represent them to show that one involves simplification of a true geminate (77a), and the other of a false geminate (77b):

[19] See also Broselow (1995) and Perlmutter (1995).

(77)

a. 

b. 

c. 

Simplification of a true geminate, in (77a), deletes a mora but does not delete the segment, and therefore violates only Max-μ. Simplification of a false geminate (77b), however, deletes both a mora and a segment, thereby violating both Max-μ and Max-C. The unsimplified consonant cluster (77c) violates neither constraint, as no deletion occurs.[20] This is illustrated in tableau (78) below.

(78)

input: /bidd-eθ/	Max-C	Max-μ
☞ a. bitØ-t		*
b. bitt-Ø	*	*

Since the optimal candidate, /bitØ-t/, violates Max-μ but not Max-C, ranking Max-μ lower than Max-C should eliminate the sub-optimal candidate:

(79) Max-C >> Max-μ

[20] Although I adopt the analysis of Rose (2000), the use of moras to account for geminate simplification is problematic. One major issue is that there is more than one theory which uses moras, but not necessarily in the same way. This analysis assumes that a geminate is doubly linked and bimoraic, whereas other analyses, namely weight-by-position (Hayes 1995), assume a geminate is doubly linked but monomoraic, linked simultaneously to the coda of one syllable (which may be assigned a mora) and also the onset of the next syllable (which may not be assigned a mora). I chose to use the analysis of Rose here because it is a comparatively simple approach and fits more neatly with the Obligatory Contour Principle (OCP; see section 3.2.7.1). As it also does not deal directly with syllable boundaries, it does not require analysis of the syllable loss which is a direct result of the morpheme-specific vowel deletion in these forms, as the weight-by-position approach would. An alternate approach that does not use moras, not taken here, may be use of the markedness constraints *CCC and/or NoGem-stem in combination with faithfulness constraints. Further progress on a unified theory of moras and syllable weight may provide a better analysis.

(80)

input: /bidd-eθ/	MAX-C	MAX-μ
☞ a. bitØ-t		*!
b. bitt-Ø	*!	*

Returning to the ranking of the existing constraints, we must decide how this ranking fits into that one:

(81) SONSEQ-CODA, MAX, DEP, SEQ(voice), *LAR(C)-CODA >> IDENT(F)-STEM

MAX has been converted into two new constraints, and so can be eliminated. Because the optimal candidate violates IDENT(F)-STEM but not MAX-C, MAX-C must be ranked higher than IDENT(F)-STEM (but not necessarily lower than the other constraints). It does violate MAX-μ, so MAX-μ must be ranked equal to or lower than IDENT(F)-STEM, giving us the following ranking:

(82) SONSEQ-CODA, DEP, SEQ(voice),*LAR(C)-CODA, MAX-C >> IDENT(F)-STEM, MAX-μ

This ranking is evaluated in the following tableau, which includes candidates (80a-b) from above, as well as the most faithful candidate:

(83)

input: /bidd-eθ/	SONSEQ -CODA	DEP	SEQ (voice)	*LAR(C) -CODA	MAX -C	IDENT(F) -STEM	MAX-μ
☞ a. bitØ-t						**	*!
b. bitt-Ø					*!	**	*
💣 c. bitt-t						**	

Unfortunately, although the sub-optimal candidate (83b) is eliminated, the optimal candidate is not selected. Candidate (83c), which does not simplify the geminate consonant cluster and therefore does not violate either MAX-C or MAX-μ, wins. No change in ranking of the existing constraints can allow the elimination of this constraint and not also the optimal one. Therefore, a new constraint must again be introduced in order to eliminate this sub-optimal candidate.

(3.2.5.1.3) Consonant Clusters and Geminates

There are many languages which do not allow consonant clusters. This is explained by the following markedness constraint, proposed by Prince and Smolensky (1993):

(84) ***COMPLEX**
No complex syllable margins.

There are also many languages which do not allow geminates, modern English among them. This is also explained with a markedness constraint (Itô and Mester 1996a,b; Rose 2000: 102):[21]

(85) **NO-GEM**
Long consonants are disallowed.

In both cases, when these constraints are high-ranking, they serve to prohibit these forms from appearing in the output of the language. Old English, unlike modern English, allowed geminates, and also allowed complex syllable margins. Therefore, neither of these constraints could have been highly ranked, and will not even be included any tableaux after the example below. What Old English did not allow, which has been analyzed here, is a complex syllable margin with a geminate and another consonant, or a geminate consonant cluster. Therefore, I propose a new constraint combining these two into a markedness constraint prohibiting geminates in combination with a consonant cluster, but not prohibiting either geminates or complex margins in isolation:

[21] For more on NO-GEM, see section (3.2.7.1.1) below.

(86) ***COMPLEX(GEM)**
Geminates in consonant clusters are disallowed.

Each of these three constraints prohibits a different construction, as shown in the example tableau (87) below. Candidate (87a) violates *COMPLEX because it is a consonant cluster, and candidate (87b) violates NO-GEM because it is a geminate consonant. Neither candidate violates *COMPLEX (GEM) because neither combines both a consonant cluster and a geminate consonant. Candidate (87c) violates *COMPLEX, NO-GEM and also *COMPLEX (GEM) because it contains both a geminate and a cluster.

(87)

input: /ntt/	*COMPLEX	NO-GEM	*COMPLEX (GEM)
a. /nt/	*		
b. /tt/		*	
c. /ntt/	*	*	*

The constraint *COMPLEX (GEM) is violated by the suboptimal candidate that was incorrectly selected above in tableau (83), but satisfied by the optimal candidate:

(88)

input: /bidd-eθ/	*COMPLEX(GEM)
☞ a. bitØ-t	
b. bitt-t	*!

The optimal candidate violates only IDENT(F)-STEM and MAX-μ, but not *COMPLEX(GEM), so *COMPLEX(GEM) must be ranked higher than IDENT(F)-STEM and MAX-μ. However, because the only other candidate that also violates only IDENT(F)-STEM and MAX-μ is eliminated by *COMPLEX(GEM), it does not necessarily need to be more highly ranked than the other constraints. This leads us to the following ranking:

(89) SONSEQ-CODA, DEP, SEQ(voice),*LAR(C)-CODA, MAX-C, *COMPLEX(GEM) >>

IDENT(F)-STEM, MAX-μ

This ranking is illustrated in the following tableau. It correctly selects the optimal candidate over all sub-optimal candidates.

(90)

input: /bidd-eθ/	SONSEQ-CODA	DEP	SEQ (voice)	*LAR(C)-CODA	MAX-C	*COMPLEX (GEM)	IDENT(F)-STEM	MAX-μ
☞ a. bitØ-t							**	*
b. bitt-Ø					*!		**	*
c. bitt-t						*!	**	

In tableaux (91), additional candidates are evaluated with this constraint ranking to confirm correct selection of the optimal candidate; candidates (190a-c) are repeated from tableau (90) above.

(91)

input: /bidd-Vθ/	SONSEQ-CODA	DEP	SEQ (voice)	*LAR(C)-CODA	MAX-C	*COMPLEX (GEM)	IDENT(F)-STEM	MAX-μ
☞ a. bitØ-t							**	*
b. bitt-Ø					*!		**	*
c. bitt-t						*!	**	
d. bidd-θ	*!		*	**		*		
e. bidd-d				*!**		*		
f. bidd-t			*!	**		*		
g. bidd-əθ		*!		**				
h. bidØ-d				*!*			*	*

(3.2.6) Group 5

Verb stems of group 5 end in /nd/, a consonant cluster of an alveolar nasal and a voiced alveolar stop. In this group, as in group 4, a cluster of three consonants is formed, and so consonant cluster simplification must also occur.

(92) *Group 5 Contracted Verbs*

	Infinitive			Stem and 3sg Suffix	Contracted Form	
a.	/bind-an/	*bindan*	"bind"	/bind-eθ/	/bint/	*bint*
b.	/find-an/	*findan*	"find"	/find-eθ/	/fint/	*fint*
c.	/stand-an/	*standan*	"stand"	/stand-eθ/	/stent/	*stent*
d.	/wend-an/	*wendan*	"turn/go"	/wend-eθ/	/went/	*went*

(3.2.6.1) Geminate Consonant Cluster Simplification in Fake Geminates

The consonant cluster formed in group 5 includes a geminate, as in group 4. This can be seen in the linear representation of assimilation shown below:

(93) *bind-an* → *bind-eþ* → *bind-þ* → *bind-t* → *bint-t*

Geminate consonant cluster simplification, then, also applies here. However, unlike in group 4, this geminate is not a true geminate but rather a fake geminate that is the result of concatenation of the suffix consonant with the final consonant of the stem as in (94a). When this geminate is simplified, both the underlying (t) and the underlying (μ) are deleted, as in (94b):

(94)

a. 

b. 

Therefore, when the optimal candidate with a simplified consonant cluster is evaluated according to the constraint ranking given above in (89), it is not selected:

(95)

input: /bind-eθ/	SONSEQ-CODA	DEP	SEQ (voice)	*LAR(C)-CODA	MAX-C	*COMPLEX (GEM)	IDENT(F)-STEM	MAX-μ
☞ a. bint-Ø					*		*	*!
💣 b. bint-t						*	*	
c. bind-θ	*!		*	*				

Candidate (95b) violates *COMPLEX (GEM) by retaining the geminate consonant cluster, while (95a) violates MAX-C through simplification of the geminate. In order to correctly select the optimal candidate, these constraints must be ranked relative to each other, with MAX-C ranked lower than *COMPLEX (GEM):

(96) SONSEQ-CODA, DEP, SEQ(voice),*LAR(C)-CODA, *COMPLEX(GEM) >> MAX-C >>

IDENT(F)-STEM, MAX-μ[22]

Evaluation of the candidates with this ranking leads to the correct selection of the optimal candidate (97a).[23]

(97)

input: /bind-eθ/	SONSEQ-CODA	DEP	SEQ (voice)	*LAR(C)-CODA	*COMPLEX (GEM)	MAX-C	IDENT(F)-STEM	MAX-μ
☞ a. bint-Ø						*	*	*
b. bint-t					*!		*	
c. bind-θ	*!		*	*				

In tableaux (98), additional candidates are evaluated with this constraint ranking to confirm correct selection of the optimal candidate; candidates (97a-c) are repeated from tableau (97) above.

[22] Although being unranked relative to each other would make no difference in the evaluation of these candidates, MAX-C must still be ranked higher than IDENT(F)-STEM to maintain selection of the optimal candidate in other groups; see (3.2.5.1.2) above.

[23] The question of which part of the concatenated geminate is deleted comes up again here. Deleting the first segment of the geminate leads to an additional violation of IDENT(F)-STEM, making the candidate with the second segment deleted optimal. It may seem that deleting the second segment, and thereby the suffix, would eliminate the inflection; however, because it is a geminate, the remaining segment is identical and in the output retains the inflection.

(110)

input: /bind-eθ/	SonSeq-coda	Dep	Seq (voice)	*Lar(C)-coda	*Complex (Gem)	Max-C	Ident(F)-stem	Max-μ
☞ a. bint-Ø						*	*	*
b. bint-t					*!		*	
c. bind-θ	*!		*	*				
d. biØt-t						*	**!	*
e. biØd-t			*!	*		*	*	*
f. biØd-d				*!*		*	*	*
g. biØd-θ	*!		*	*		*	*	*

(3.2.7) <u>Group 6</u>

Verb stems of group 6 end in /s/, a voiceless alveolar fricative. When vowel deletion occurs, the consonant cluster /sθ/ is formed. Because both consonants are fricatives, no manner assimilation occurs, and because both consonants are voiceless, no voicing assimilation occurs. There is no geminate in the consonant cluster, so no consonant cluster simplification occurs. However, because the two fricatives are not the same segment and therefore do not form a geminate, manner dissimilation occurs.

(99) *Group 6 Contracted Verbs*

	Infinitive			Stem and 3sg Suffix	Contracted Form	
a.	/ʧēos-an/	*ċēosan*	"choose"	/ʧīes-eθ/	/ʧīest/	*ċīest*
b.	/(*a*)*rīs* -an/	*(a)rīsan*	"(a)rise"	/(a)rīs-eθ/	/(a)rīst/	*rīst*
c.	/hrēos-an/	*hrēos-an*	"fall"	/hrīes-eθ/	/hrīest/	*hrīest*
d.	/lēos-an/	*lēos-an*	"lose"	/līes-eθ/	/līest/	*līest*

(3.2.7.1) The Obligatory Contour Principle (OCP)

The Obligatory Contour Principle was originally proposed by Leben (1973) to account for dissimilation in tone languages. It was later adopted by McCarthy (1986) to apply to segmental features and explain the dissimilation of adjacent consonants found in many languages. Although the original version of the OCP specifically referenced the melodic level, as it was used with tone, but a more general form was later used by McCarthy (1988):

(100) **Obligatory Contour Principle**
Adjacent identical elements are prohibited.

The OCP was adopted by Suzuki (1998: 42, 64) as Generalized OCP, a violable constraint for use within Optimality Theory:

(101) **Generalized OCP (GOCP)**
***X…X:** A sequence of two Xs is prohibited.
Where
X $\in$ {PCat, GCat}
"…" is intervening material.
(In the scheme *X…X where "…" is intervening material, a sequence of two Xs is prohibited in some domain *D*.)

X may be phonological categories (PCat), like features, nodes, or even syllables, or grammatical categories (GCat) like morpheme or word. The structure of this constraint, with X able to represent a wide range of categories, not just features, makes GOCP more versatile than "traditional" OCP. The "intervening material" is also unspecified, and could be any number of phonemes, a sequence (X…X), or nothing, a strict sequence (X~X).

In Old English, dissimilation occurs only between adjacent consonants, so I will adopt the following version of GOCP, hereafter called OCP, as a constraint:

(102) **OCP**
***X~X:** A strict sequence of two Xs is prohibited.
X ∈ {PCat, GCat}

(3.2.7.1.1) OCP and Geminates

Given the above constraint, it seems that an occurrence of a geminate could violate *X~X. If X were specified for root node (Rt), the OCP constraint *Rt(C)~Rt(C) would prohibit geminate consonants, and *Rt(V)~Rt(V) would prohibit vowels (Suzuki 1998: 69). He supposes that this constraint could replace the already postulated constraints NOGEMINATE (NO-GEM) (Itô and Mester 1996a,b) and NOLONGVOWEL (Rosenthall 1994, Alderete 1996, 1997).

However, Rose (2000) disputes this claim, as Suzuki assumes that geminates are a sequence of two identical root nodes. As discussed in section (3.2.5.1.2) above, this is not always the case; fake and true geminates have different phonological structures, so *Rt(C)~Rt(C) would not apply equally in all cases. In addition, although the two kinds of geminates have different *phonological* structures, they have identical *phonetic* behavior. That is, regardless of the underlying phonological structure of a geminate, whether a single consonant linked to two moras or two identical moraic consonants in sequence, the phonetic realization is the same: a consonant with long duration.

This has two effects: first, Rose retains NO-GEM as a constraint separate from the OCP in order to maintain this distinction. NO-GEM applies to both true and fake geminates:

(103) **NO-GEM**
Long consonants are disallowed (Rose 2000: 102).

The second effect is that geminates, whether true or fake, are not subject to the OCP:

(104) Any surface C_iC_i sequence in a given domain is a geminate and does not violate the OCP (Rose 2000: 101).

The relative ranking of these two constraints, NO-GEM and *X~X, determine when dissimilation will occur.[24] This can be demonstrated with the evaluation of the hypothetical consonant clusters /ss/ and /sθ/ using these rankings, as shown below.

Ranking (105) is evaluated in tableaux (106) and (107), while ranking (108) is evaluated in tableaux (109) and (110). In Old English verb contraction, geminates do occur in the optimal candidates of many of the groups. Because we want dissimilation to occur but not affect geminates, ranking (106) will be adopted below.

(105) Dissimilation of all Identical Categories including Geminates:
NO-GEM >> *X~X

(106)

input: /ss/	NOGEM	*X~X
a. /ss/	*!	*
☞ b. /st/		

(107)

input: /sθ/	NOGEM	*X~X
a. /sθ/		*!
☞ b. /st/		

[24] This is assuming that both types of geminates are allowable in a language, as in Old English. This depends on the ranking of NO-GEM in relation to the faithfulness constraints MAX -C and MAX-μ, which in a language with both true and fake geminates is MAX-C, MAX-μ >> NO-GEM, or MAX-μ >> NO-GEM >> MAX-C. See Rose (2000): 105 and section 3.2.5.1.2 above.

(108) Dissimilation of Identical Categories unless a Geminate:
*X~X >> NO-GEM

(109)

input: /ss/	*X~X	NOGEM
☞ a. /ss/		*
b. /st/	*!	

(110)

input: /sθ/	*X~X	NOGEM
a. /sθ/	*!	
☞ b. /st/		

(3.2.7.1.2) OCP and Dissimilation in Old English Verb Contraction

Returning to the group 6 verb stems, we must determine the type of dissimilation that occurs in order to specify the category of X in the OCP constraint *X~X.

(111)

Stem + Suffix	Vowel Deletion	Contracted
/ʧēos-iθ/	/ʧīes-θ/	/ʧīes-t/

The /sθ/ consonant cluster dissimilates in manner, as both consonants are fricatives. The /θ/ becomes /t/, a stop consonant. The feature that specifies manner in fricatives and stops is [±continuant]; fricatives are specified [+cont], and stops are specified [-cont]:

(112)

/s/	/θ/	/t/
[+cont]	[+cont]	[-cont]

The OCP constraint can therefore be specified for category as follows:

(113) **[cont]~[cont]**
A strict sequence of two identical [cont] is prohibited.

Given the presence of geminates in Old English, the ranking above in (106) must be used with the specified OCP constraint:

(114) *[cont]~[cont] >> NO-GEM

In order to rank these two constraints relative to the existing ranking, repeated here, it is best to first consider the ranking of NO-GEM.

(115) SONSEQ-CODA, DEP, SEQ(voice),*LAR(C)-CODA, *COMPLEX(GEM) >> MAX-C >> IDENT(F)-STEM, MAX-μ

Because geminates are allowable in Old English, NO-GEM must be ranked very low. We therefore rank it last, below all other constraints, and rank *[cont]~[cont] right above it, equal with IDENT(F)-STEM and MAX-μ. This yields the following ranking:

(116) SONSEQ-CODA , DEP, SEQ(voice),*LAR(C)-CODA, *COMPLEX(GEM) >> MAX-C >> IDENT(F)-STEM, MAX-μ, *[cont]~[cont] >> NO-GEM

This ranking is then used to evaluate the candidates in group 6:

(117)

input: /tʃīes-eθ/	SONSEQ-CODA	DEP	SEQ (voice)	*LAR(C)-CODA	*COMPLEX (GEM)	MAX-C	IDENT(F)-STEM	MAX-μ	*[cont]~[cont]	NO-GEM
☞ a. tʃīes-t										
b. tʃīes-θ									*!	
c. tʃīes-s										*!
d. tʃīes-Ø						*!		*		
e. tʃīeØ-θ						*!	*	*		

(3.2.8) Evaluation of all Candidates in Groups 1-6

In order to be sure that this final ranking is correct, all candidate from groups 1-6 must be evaluated using it to confirm that the optimal candidate is still selected in each case.

(3.2.8.1) Group 1

In evaluating group 1, a sub-optimal candidate is selected over the optimal candidate because the optimal candidate (118a), which undergoes no changes other than vowel deletion, has a geminate. The sub-optimal candidate (118b) undergoes dissimilation.

(118)

input: /kwiθ-eθ/	SONSEQ-CODA	DEP	SEQ (voice)	*LAR(C)-CODA	*COMPLEX (GEM)	MAX-C	IDENT(F)-STEM	MAX-μ	*[cont]~[cont]	NO-GEM
☞ a. kwiθ-θ										*!
💣 b. kwiθ-t										
c. kwiθ- Ø						*!		*		

In order to correctly select the optimal candidate, a constraint which prohibits changes to the suffix must be introduced. The faithfulness constraint IDENT(F) was changed in section (3.2.3.3) above to apply only to the stem (IDENT(F)-STEM). The affix counterpart to this constraint, IDENT(F)-AFFIX, may be introduced here to eliminate changes to the suffix in this group.

The metaconstraint given above in (53) is repeated here:

(119) **Root-Affix Faithfulness Metaconstraint**
Root-Faith >> Affix-Faith

Therefore, IDENT(F)-AFFIX must be ranked lower than IDENT(F)-STEM. In addition, in order to eliminate candidate (118b), IDENT(F)-AFFIX must be ranked higher than NO-GEM. This yields the following ranking:

(120) SONSEQ-CODA >> DEP, SEQ(voice),*LAR(C)-CODA, *COMPLEX(GEM) >> MAX-C

>> IDENT(F)-STEM, MAX-μ, *[cont]~[cont] >> IDENT(F)-AFFIX >> NO-GEM

Again evaluating the candidates from group 1 with this new ranking, the optimal candidate is now selected:

(121)

input: /kwiθ-eθ/	SONSEQ-CODA	DEP	SEQ (voice)	*LAR(C)-CODA	*COMPLEX (GEM)	MAX-C	IDENT(F)-STEM	MAX-μ	*[cont]~[cont]	IDENT(F)-AFFIX	NO-GEM
☞ a. kwiθ-θ											*
b. kwiθ-t										*!	
c. kwiθ-Ø						*!		*		*	

(3.2.8.2) <u>Group 2</u>

In evaluating group 2 with the new ranking, the correct optimal candidate, (122a), is selected.

(122)

input: /lǣt-eθ/	SonSeq-coda	Dep	Seq (voice)	*Lar(C)-coda	*Complex (Gem)	Max-C	Ident(F)-stem	Max-μ	*[cont]~[cont]	Ident(F)-affix	No-Gem
☞ a. lǣt-t										*	
b. lǣt-θ	*!										
c. lǣt-əθ		*!									
d. lǣt-Ø						*!		*		*	
e. lǣj-θ							*!				
f. lǣθ-θ							*!				*

(3.2.8.3) <u>Group 3</u>

In evaluating group 3 with the new ranking, the correct optimal candidate, (123a), is selected.

(123)

input: /bīd-eθ/	SonSeq-coda	Dep	Seq (voice)	*Lar(C)-coda	*Complex (Gem)	Max-C	Ident(F)-stem	Max-μ	*[cont]~[cont]	Ident(F)-affix	No-Gem
☞ a. bīt-t							*			*	*
b. bīd-θ	*!			*							
c. bīd-t			*!	*						*	
d. bīd-d				*!*						*	
e. bīd-Ø				*!		*		*		*	
f. bīθ-θ							*!*				*
g. bīt-θ	*!						*				
h. bīd-əd		*!		**						*	

(3.2.8.4) Group 4

In evaluating group 4 with the new ranking, the correct optimal candidate, (124a), is selected.

(124)

input: /bidd-eθ/	SONSEQ-CODA	DEP	SEQ (voice)	*LAR(C)-CODA	*COMPLEX (GEM)	MAX-C	IDENT(F)-STEM	MAX-μ	*[cont]~[cont]	IDENT(F)-AFFIX	NO-GEM
☞ a. bitØ-t							**	*		*	*
b. bitt-Ø						*!	**	*		*	*
c. bitt-t					*!		**			*	*
d. bidd-θ	*!		*	**							*
e. bidd-d				*!**						*	*
f. bidd-əd		*!		***						*	*
g. bidØ-d				*!*			*			*	

(3.2.8.5) Group 5

In evaluating group 5 with the new ranking, the correct optimal candidate, (125a), is selected.

(125)

input: /bind-eθ/	SonSeq-coda	Dep	Seq (voice)	*Lar(C)-coda	*Complex (Gem)	Max-C	Ident(F)-stem	Max-μ	*[cont]~[cont]	Ident(F)-affix	No-Gem
☞ a. bint-Ø						*	*	*		*	
b. bint-t					*!		*			*	*
c. bind-θ			*!	*	*						
d. biØt-t						*	**!	*		*	*
e. biØd-t			*!	*		*	*	*		*	
f. biØd-d				*!*		*	*	*		*	*
g. biØd-θ	*!			*		*	*	*			

(3.2.8.6) <u>Group 6</u>

In evaluating group 6 with the new ranking, the correct optimal candidate, (126a), is selected.

(126)

input: / ʧĩes-eθ/	SonSeq-coda	Dep	Seq (voice)	*Lar(C)-coda	*Complex (Gem)	Max-C	Ident(F)-stem	Max-μ	*[cont]~[cont]	Ident(F)-affix	No-Gem
☞ a. ʧĩes-t										*	
b. ʧĩes-θ									*!		
c. ʧĩes-s									*!	*	*
d. ʧĩes-Ø						*!		*		*	
e. ʧĩeØ-θ						*!	*	*			

(3.2.9) Evaluation of other verb stems

The verbs in groups 1-6 are usually described in grammars of Old English as those most typically affected by verb contraction. However, other verb stems also undergo sound changes when vowel deletion creates a new coda. Although the constraint ranking illustrated above was developed using only verbs in groups 1-6, all of which have a stem ending in a coronal obstruent, this ranking is also effective in accounting for sound changes in some verbs with other stem-final consonants. These verbs are divided into groups 7-11 based on the coda consonant(s) of the stem, as shown in (127) below. These groups are not exhaustive, as there are other verbs which undergo other sound changes or no changes at all which are not dealt with because they are beyond the scope of this thesis. Groups 7-9 are evaluated using the constraint ranking, which is shown to correctly account for the sound changes which occur and select the optimal candidate. Groups 10-11 are evaluated, and although the correct optimal candidate is not selected, modifications are suggested which, if implemented, could result in a correct account of the changes. These modifications are not done in full detail; such an analysis is also beyond this scope of this thesis, so these are suggestions for further analysis.

(127) *Contracted Verb Form Groups of Other Stems in West Saxon*

	Infinitive			Stem and 3sg Suffix	Contracted Form	
7	/heald-an/	*healdan*	"hold"	/hield-eθ/	/hielt-Ø/	*hielt*
8	/feall-an/	*feallan*	"fall"	/fiell-eθ/	/fiel-θ/	*fielþ*
9	/far-an/	*faran*	"go"	/fær-eθ/	/fær-θ/	*færþ*
10	/lif-an/	*lifan*	"remain"	/lif-eθ/	/lif-θ/	*lifþ*
11	/rīp-an/	*rīpan*	"reap"	/rīp-eθ/	/rīp-θ/	*rīpþ*

(Davis 1953: 25-36)

(3.2.9.1) <u>Group 7</u>

Verb stems in group 7 end in a consonant cluster, and the final consonant in the cluster is a coronal consonant, as in groups 1-6.

(128) *Group 7 Contracted Verbs*

		Infinitive		Stem and 3sg Suffix	Contracted Form	
a.	/heald-an/	*healdan*	“hold”	/hield-eθ/	/hielt-Ø/	*hielt*
b.	/weorθ-an/	*weorþan*	“become”	/wierθ-eθ/	/wierθ-Ø/	*wierþ*
c.	/swelt-an/	*sweltan*	“die”	/swilt-eθ/	/swilt-Ø/	*swilt*
d.	/feoxt-an/	*feohtan*	“fight”	/fiext-eθ/	/fiext-Ø/	*fieht*
e.	/berst-an/	*berstan*	“burst”	/bierst-eθ/	/bierst-Ø/	*bi(e)rst*

These verbs are essentially affected in the same way as verbs in group 5: voicing assimilation (if stem-final consonant is voiced), manner assimilation (if stem-final consonant is a fricative), and consonant cluster simplification. In the tableaux below, the correct optimal candidate is selected.

(129)

input: / hield-eθ/	SonSeq-Coda	Dep	Seq (voice)	*Lar(C)-Coda	*Complex (Gem)	Max-C	Ident(F)-stem	Max-μ	*[cont]~[cont]	Ident(F)-affix	No-Gem
☞ a. hielt-Ø						*	*	*		*	
b. hield-Ø				*!		*		*		*	
c. hield-θ	*!		*	*							
d. hield-t			*!	*						*	
e. hield-d				*!*	*					*	*
f. hielt-t					*!		*			*	*

(3.2.9.2) <u>Group 8</u>

Verb stems in group 8 end in a nasal or liquid geminate consonant.

(130) *Group 8 Contracted Verbs*

	Infinitive			Stem and 3sg Suffix	Contracted Form	
a.	/winn-an/	*winnan*	"fight"	/winn-eθ/	/win-θ/	*winþ*
b.	/swimm-an/	*swimman*	"swim"	/swimm-eθ/	/swim-θ/	*swimþ*
c.	/feall-an/	*feallan*	"fall"	/fiell-eθ/	/fiel-θ/	*fielþ*
d.	/fyll-an/	*fyllan*	"fill"	/fyll-eθ/	/fyl-θ/	*fylþ*
e.	/kwell-an/	*cwellan*	"kill"	/kwell-eθ/	/kwel-θ/	*cwelþ*

These verbs are also essentially affected in the same way as verbs in group 5, as consonant cluster simplification occurs by reduction of the geminate. In this case, however, the geminate is part of the stem instead of being created through concatenation of the stem and the suffix. The correct optimal candidate is selected in tableau (131).

(131)

input: / winn-eθ/	SonSeq-Coda	Dep	Seq (voice)	*Lar(C)-Coda	*Complex (Gem)	Max-C	Ident(F)-Stem	Max-μ	*[cont]~[cont]	Ident(F)-Affix	No-Gem
☞ a. winØ-θ							*	*			
b. winn-θ					*!						*
c. winn-d				*!	*					*	*
d. winØ-d				*!		*	*	*		*	
e. winn-Ø						*!		*		*	*

(3.2.9.3) <u>Group 9</u>

Group 9 verb stems end in a nasal, liquid, or glide consonant (not including geminate nasals or liquids, which are considered part of group 8).

(132) *Group 9 Contracted Verbs*

		Infinitive		Stem and 3sg Suffix	Contracted Form	
a.	/nim-an/	*niman*	"take"	/nim-eθ/	/nim-θ/	*nimþ*
b.	/iern-an/	*i(e)rnan*	"run"	/iern-eθ/	/iern-θ/	*i(e)rnþ*
c.	/far-an/	*faran*	"go"	/fær-eθ/	/fær-θ/	*færþ*
d.	/stel-an/	*stelan*	"steal"	/stil-eθ/	/stil-θ/	*stilþ*
e.	/grōw-an/	*grōwan*	"grow"	/grēw-eθ/	/grēw-θ/	*grēwþ*

These verbs are essentially unaffected by any sound changes, and the most faithful candidate is selected as optimal:

(133)

input: /nim-eθ/	SonSeq-Coda	Dep	Seq (voice)	*Lar(C)-Coda	*Complex (Gem)	Max-C	Ident(F)-Stem	Max-μ	*[cont]~[cont]	Ident(F)-Affix	No-Gem
☞ a. nim-θ											
b. nim-Ø						*!		*		*	
c. nim-t										*!	
d. nim-d				*!						*	
e. niØ-θ						*!	*	*			

(3.2.9.4) Group 10

Group 10 verb stems end in the consonant /f/.

(134) *Group 10 Contracted Verbs*

		Infinitive		Stem and 3sg Suffix	Contracted Form	
a.	/lif-an/	*lifan*	"remain"	/fær-eθ/	/lif-θ/	*lifþ*
b.	/drīf-an/	*drīfan*	"drive"	/drīf-eθ/	/drīf-θ/	*drīfþ*
c.	/delf-an/	*delfan*	"dig"	/dilf-eθ/	/dilf-θ/	*dilfþ*
d.	/ʧeorf-an/	*ċeorfan*	"cut"	/ʧierf-eθ/	/ʧierf-θ/	*ċierfþ*

Given the manner dissimilation that occurs in group 6 verbs, where a sequence of two fricatives is prohibited, we might expect the same thing to happen here. In that case, the final /θ/ would become /t/ to dissimilate from the fricative /f/, giving the predicted forms below:

(135) *Predicted Group 10 Contracted Verbs*

	Stem and 3sg Suffix	Contracted Form	
a.	/fær-eθ/	*/lif-t/	**lift*
b.	/drīf-eθ/	*/drīf-t/	**drīft*
c.	/dilf-eθ/	*/dilf-t/	**dilft*
d.	/tʃierf-eθ/	*/tʃierf-t/	**ċierft*

In fact, these are the forms that are incorrectly selected as optimal by the current constraint ranking:

(136)

input: /lif-eθ/	SonSeq-Coda	Dep	Seq (voice)	*Lar(C)-Coda	*Complex (Gem)	Max-C	Ident(F)-stem	Max-μ	*[cont]~[cont]	Ident(F)-affix	No-Gem
☞ a. lif-θ									*!		
💣 b. lif-t										*	
c. lif-Ø						*!		*		*	
d. liØ-θ						*!	*	*			
e. lip-θ	*!						*				
f. lip-t							*!		*	*	

Why do these verbs not undergo dissimilation? The answer may lie in similarity effects, whereby segments only dissimilate if they share more than one feature. In this case, the two [+cont] fricative consonants do not have the same place feature, as /f/ is [LAB] and /θ/ is [COR]. In group 6 above, both [+cont] consonants, /s/ and /θ/, were specified for place feature [COR], and therefore dissimilation occurred. See Suzuki (1998: 73-80) for more on how similarity effects are accounted for in OT through local conjunction.

(3.2.9.5) Group 11

Group 11 verb stems end in an stop consonant with the place feature specification [LAB] or [DOR] (i.e., not [COR]).

(137) *Group 11 Contracted Verbs*

	Infinitive			Stem and 3sg Suffix	Contracted Form	
a.	/rīp-an/	*rīpan*	"reap"	/rīp-eθ/	/rīp-θ/	*rīpþ*
b.	/help-an/	*helpan*	"help"	/hilp-eθ/	/hilp-θ/	*hilpþ*
c.	/sak-an/	*sacan*	"quarrel"	/sæk-eθ/	/sæk-θ/	*sæcþ*
d.	/stīg-an/	*stīgan*	"ascend"	/stīg-eθ/	/stīg-θ/	*stīgþ*
e.	/driŋk-an/	*drincan*	"drink"	/driŋk-eθ/	/driŋk-θ/	*drincþ*
f.	/spriŋg-an/	*springan*	"spring"	/spriŋg-eθ/	/spriŋg-θ/	*springþ*

In group 2-6 verbs, the Sonority Sequencing Principle and the constraint SONSEQ disallow a coda sequence that rises in sonority. The sequence of a stop consonant and a fricative consonant violates that principle, so it might be predicted based on the manner assimilation that occurred in groups 2-6 that manner assimilation would also occur in these verbs. However, as shown in the tableau below, not only does this ranking not select the optimal candidate, it also does not select the candidate that undergoes manner assimilation (138b). Rather, two candidates are selected: candidate (138b), which assimilates /θ/ to /t/ as predicted, and also candidate (138f), which changes both /θ/ to /t/ and also /p/ to /f/:

(138)

input: /rīp-eθ/	SonSeq-coda	Dep	Seq (voice)	*Lar(C)-coda	*Complex (Gem)	Max-C	Ident(F)-stem	Max-μ	*[cont]~[cont]	Ident(F)-affix	No-Gem
☞ a. rīp-θ	*!										
💣 b. rīp-t									*	*	
c. rīp-d			*!	*						*	
d. rīf-θ							*		*!		
e. rīp-Ø						*!		*		*	
💣 f. rīf-t							*			*	

Although a change in the relative ranking of IDENT(F)-STEM and *[cont]~[cont] could select the optimal candidate, it seems likely that similarity effects may again have something to do with why the incorrect candidate is selected (Suzuki 1998). In addition, because the stem-final consonants are specified [LAB] or [DOR], and the suffix consonant is [COR], assimilation does not form geminates but rather other consonant clusters that may not be allowable in the language. More extensive analysis of this group is needed in order to adequately explain this phenomenon.

(4.0) CONCLUSION

In this thesis, data from Old English verb contraction has been analyzed from the perspective of Optimality Theory in order to attempt to account for sound changes in terms of a ranking of constraints rather than the traditional approach of describing linear sound changes in isolation. First, background on the language and the phenomena under consideration were reviewed. Then, this data was organized into groups based on the final consonant(s) of the verb stem, and these groups were systematically analyzed in terms of OT. The constraint ranking postulated to explain the initial data set was then expanded to successfully apply to many verbs with other stem-final consonant(s), and possible changes were suggested to allow successful analysis of an even larger data set of Old English verbs than was initially considered. In the following sections I suggest ways in which this analysis could be expanded or applied to other data in the future that may be aided by the outcome of this thesis, and discuss the theoretical contribution of this analysis.

(4.1) 2sg Present Indicative Verb Contraction in West Saxon

As mentioned in section (2.2.2.1), both the 2sg and 3sg verb suffixes underwent vowel deletion in the West Saxon dialect of Old English, with similar processes of assimilation, dissimilation, and consonant cluster simplification in the 2sg as in the 3sg forms. Although these forms can be classified according to the stem-final consonant(s), as in the 3sg forms, and many of the changes are similar, the consonant cluster /st/ found in the coda of the 2sg suffix interacts differently with the stem-final consonant(s) than does the consonant of the 3sg. Some of these differences can be seen in the comparison chart for groups 1-6 below:

(1) *Comparison of 3sg and 2sg Contracted Verb Form Groups in West Saxon*

	Infinitive		3sg Contracted Form (/-eθ/)		2sg Contracted Form (/-est/)	
1	/kweθ-an/	"say"	/kwiθ-θ/	*cwiþþ*	/kwi(θ)-st/	*cwi(þ)st*
2	/lǣt-an/	"let/leave"	/lǣt-t/	*lǣtt*	/lǣt-st/	*lǣtst*
3	/bīd-an/	"wait"	/bīt-t/	*bītt*	/bīt-st/	*bītst*
4	/bidd-an/	"pray"	/bit-t/	*bitt*	/bit-st/	*bitst*
5	/bind-an/	"bind"	/bin-t/	*bint*	/bint-st/	*bintst*
6	/ʧēos-an/	"choose"	/ʧīes-t/	*ċīest*	/ʧīes-t/	*ċīest*

(Davis 1953: 26-7)

There are several problems with analyzing the 2sg forms in the same manner as the 3sg forms. First, the orthography does not seem to be as clear of a representation of the probable phonemic forms. In addition, many of the coda consonant clusters seem to violate the Sonority Sequencing Principle and the Obligatory Contour Principle. It is possible to interpret these clusters without a violation by assuming that the first /t/ is actually deleted, making the forms something like /bi-st/ and /bin-st/. However, when a speaker of Modern English attempts to pronounce these apparently impossible consonant clusters, there seems to be a glottal stop /ʔ/ inserted for the first /t/, yielding /biʔ-st/ and /binʔ-st/, although admittedly this could have very little to do with the historical pronunciation and still creates syllable structure violations. These problems make an analysis of the 2sg forms much more difficult than that of the 3sg forms. Nevertheless, the current ranking could at least be a starting point for accounting for them within the framework of OT.

(4.2) Application to Sound Changes in Other Words

Although the sound changes that occur in verb contraction are usually described in isolation in grammars of Old English, there are similar diachronic sound changes that occur in other words during roughly the same time period in which contraction appeared and throughout the dialects of Old English. Many of these are grouped together by Campbell (1959: 192) as "Assimilation of Consonants and Kindred Changes." Some selected examples of these can be seen below:

(2) *Sound Changes Similar to 3sg Verb Contraction*

regressive voicing assimilation	/d/ > /t/	*med-trum* > *met-trum* "infirm"
	/g/ > /k/	*ange* "anxiously" > *anc-sum* "troublesome"
manner dissimilation	/sθ/ > /st/	*nosþyrl* > *nosterl* "nostril"
manner assimilation[25]	/tθ/ > /tt/	*midþy* > *mitty* "when" *lād-þēow* > *lat-teow* "leader"

(Campbell 1959: §480.2-3, 481.1,3)

In addition to the examples given above, which are identical to the changes seen in 3sg verb contraction, there are a number of changes that are less similar but involve some of the same principles, such as assimilation and dissimilation in consonant clusters, both within and across syllable boundaries. Some of these sound changes are given below:

(3) *Other Sound Changes in Old English*

/fθ/ > /ft/	*tweolf-þ-a* > *tweolfta* "twelve"
/θs/ > /ss/	*blīþs* > *bliss* "bliss" *līþs* > *liss* "kindness"
/fs/ > /ps/	*wǣfs* > *wæps* "wasp"
/ðl/ > /tl/	*boðl* > *botl* "building" *seðl* > *setl* "seat"
/ðm/ > /dm/	*fæðm* > *fǣdm* "embrace" *mæðm* > *mādm* "treasure"

(Campbell 1959: §481.2; Hickey 1984: 287-290)

[25] Note that these forms are often also examples of regressive voicing assimilation.

It seems likely that some of these sound changes may be at least partially attributable to the constraint ranking given for contraction. If so, an analysis accounting for all these changes with one ranking would be a more unified way of describing sound change in Old English.

(4.3) Diachronic Language Change within Optimality Theory

Optimality Theory was originally proposed as a way to describe synchronic rather than diachronic processes of language. However, because OT accounts for language variation through a ranking of constraints, it seems that diachronic sound change can be explained by a change in ranking, leading to the selection of a different optimal candidate. This principle could be applied to the ranking above that accounts for 3sg verb contraction.

How constraints "move" (rerank) and at what speed has been the focus of a number of studies in OT which could be applied to this ranking (Antilla and Cho 1998; Ham 1998; Bermudez-Otero 1996, 2005; Crist 2001; Haspelmath ROA-302). Using the ranking given above to represent a single point in time, it may be possible to account for both the appearance and disappearance of the contraction phenomena by a reranking of constraints. The ultimate result may be an account of the diachronic development of English over time in terms of changes that, although they may affect different and seemingly unrelated aspects of the language, are actually driven by common forces of change.

(4.4) Comparison to Sociolinguistic Analysis

Although language change is often described as an isolated, seemingly unmotivated event, in reality the development and change of a language is driven by the people who speak it, and is subject to very real social, political, religious, and economic factors. Verb contraction is no exception. The development of the various known dialects of Old English and the creation and/or preservation of texts recording them, described in section (2.2.1), was influenced by many of these factors. If a more clear analysis of related sound changes in all the dialects can be achieved through the use of OT, this may enable us to better see the interaction that the dialects had with each other. This could lead to a better understanding of the sociolinguistic factors at work, despite the lack of apparent historical evidence of such factors.

(4.5) Theoretical Contribution

In order to analyze verb contraction in Old English, it was necessary to combine information from a variety of disparate theoretical approaches. As a result, this analysis draws from traditional descriptions of the language going back more than a century, as well as much more recent work in phonology and Optimality Theory, which had to be merged in new ways. I have used constraints based on a wide array of sources, including Correspondence Theory (McCarthy and Prince 1994), the Sonority Sequencing Principle (Venneman 1972; Kenstowicz 1994), and the (Generalized) Obligatory Contour Principle (Leben 1973; McCarthy 1988; Suzuki 1998) as well as a number of other constraints postulated by OT researchers, some of which I have modified, including SONSEQ (Sheherd 2003), IDENT(F) (McCarthy and Prince 1994), SEQ(voice) (Bakovíc 2006 and others), and *LAR (Lombardi 1996). In addition, I have postulated for the first time two new constraints, NOVOWEL(2SG3SG) and *COMPLEX(GEM), in order to adequately describe verb contraction.

Although this is probably the first application of OT to this data, the significance of this thesis does not lie solely in the analysis of the Old English verb data set within the OT framework. OT has been successfully applied to sound changes in vowels in Old English, Middle English, and Early Modern English by Kwon (2003), who also used the OCP and showed that a reranking of constraints can explain diachronic language change, but consonant change was not analyzed. It is unlikely that anyone has yet combined these varied concepts and constraints into one single ranking to account for sound change, and the modifications I have made may also be useful to explain other data; but this proposed analysis successfully tests the capability of OT and may serve as a starting point for other possible analyses of sound change in Old English and further research that uses this method. I have successfully shown that OT is capable of accounting for this sound change in terms of a ranking of constraints that applies to all the data concurrently. This is an improvement over the traditional analysis, which requires a different sound change rule to account for the phenomenon found within each group. An analysis of these changes using this traditional pragmatic approach yields a long list of sound changes in isolation, and prevents the development of a more holistic view of related sound changes. OT, on the other hand, allows these changes to be viewed as the effects of a common motivation for sound change, in the form of a single constraint ranking of the language.

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