THE UNIVERSITY OF CALGARY

A Comprehensive Analysis of Old English Breaking

by

Sandra Kitch

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE

DEGREE OF MASTER OF ARTS

DEPARTMENT OF LINGUISTICS

CALGARY, ALBERTA

FEBRUARY, 1999

0-612-38538-8

ABSTRACT

In this study, I present a comprehensive analysis of breaking in OE. This work offers a contribution in two areas. First, it accounts for the varied nature of breaking with regard to two parameters; one portraying derivative strength, and the other characterizing vowel integrity. It will be shown that breaking occurrences in OE can be systematically explained through the convergence of these parameters. Second, it identifies an approximant class of breaking conditioners, unified by the place feature [dorsal]. The diphthong formation, which is characteristic of breaking, will be demonstrated as a leftward spread of the [dorsal] feature in the consonantal conditioner to the V-Place node of the preceding vowel.

TABLE OF CONTENTS

CHAPTER ONE

Introduction and Overview.

The primary goal of this thesis is to provide a unified account of breaking in Old English (OE). Breaking is traditionally considered to be a process of assimilation resulting in the formation of a diphthong (Campbell 1959). Specifically, front vowels acquire a back offglide when followed by (*w*, *h*, *r*, *l*). Some examples include *siowan* (< *siwan*) 'to sew', *eahta* (< *ehta*) 'eight', *mearh* (< *merh*) 'mare' and *seolf* (< *self*) 'self'. While it appears reasonable to assume that assimilation effects breaking, past interpretations have encountered difficulties presenting a uniform explanation for the assimilatory nature of breaking for two reasons.

Firstly, breaking occurs to a greater or lesser extent depending on whether certain vowels are followed by one of the conditioning consonants. In effect, diphthong formation occurs to varying degrees with no apparent regularity. Therefore, a rule of assimilation that would characterize breaking has always been plagued with exceptions in order to account for the failure of diphthong formation in the presence of certain vowel and consonant combinations.

Secondly, previous breaking interpretations have never been able to identify a common feature among breaking conditioners which is not present in consonants that do not influence diphthong formation. To be sure, breaking conditioners (*w*, *h*, *r*, *l*) do not appear to form a natural class of consonants. Consequently, the formulation of an assimilatory rule that exclusively determines breaking has never been successful.

In this study, I present a comprehensive analysis of OE breaking with respect to its varied occurrence and its conditioning features. First, I will argue that only two factors are necessary to account for the varied nature of breaking occurrence in OE. To accomplish this, I establish two parameters, namely vowel integrity and derivative strength, which respectively characterize the vowels and consonants involved in breaking. Through the convergence of these parameters, a pattern of breaking occurrence will emerge, indicating what I interpret is the diachronic development of diphthong formation throughout English. Then, I present breaking conditioners as a natural class of approximant consonants, which are characterized by a common [dorsal] feature specification. Accordingly, the assimilatory nature of breaking will be demonstrated as a leftward spread of [dorsal], from the breaking conditioner to the preceding front vowel.

The theoretical frameworks on which I will base my analysis are syllable theory, as presented by Vennemann (1988), and feature organization, as determined by Clements (1991). All representations of breaking, and related processes, will be demonstrated according to the conventions of Autosegmental Phonology, as developed in Goldsmith (1990).

In the following chapter, I examine traditional interpretations of breaking, with a focus on breaking conditioners, and their traditionally assumed realizations in OE. I also discuss the characteristics of vowels involved in breaking. Then, an outline of the basic tenets of autosegmental phonology is presented. Finally, I provide representations of breaking diphthongs, and also, the assimilatory process of diphthong formation.

Chapter Three is an investigation of contemporary explanations of breaking, which focus on the weakened nature of the consonants that influence breaking due to the structural conditions of the syllable. A general synopsis of Syllable Theory according to Vennemann (1988) is provided. To follow is a discussion of the factors that contribute to the varied nature of breaking, as presented in Howell (1991) and Lutz (1994). From the proposals in these analyses, I establish two parameters, which I argue, can systematically explain the erratic nature of diphthong formation in OE breaking. To that end, a graphic representation of breaking occurrence in OE is provided.

In Chapter Four, I examine the development of Feature Theory, specifically with regard to the organizations presented by McCarthy (1991) and Clements (1991). Based on previous interpretations of breaking, the most plausible realizations of breaking conditioners are determined. I then reconstruct what I interpret are the feature representations of breaking conditioners within the framework of Clements (1991). From the establishment of conditioner structure, I determine that breaking consonants form a natural class of approximants, specified by [dorsal] place features.

Chapter Five is a presentation of my conclusions. I also outline some of the issues raised in this study that would benefit from further research, including the implication that OE is characterized by a set of guttural consonants.

CHAPTER TWO

Traditional Interpretations of OE Breaking.

2.1. Introduction.

This chapter provides a general overview of earlier breaking interpretations. Included is a basic description of breaking with textual examples, as well as an outline of some of the controversies surrounding the diphthongal nature of breaking digraphs. Also presented is an examination of breaking diphthongs with regard to length considerations. Finally, I discuss the structure of diphthongs, and represent their development in breaking within an autosegmental framework.

2.2. Description.

Breaking is a sound change that occurred in the 7th century dialect of west Saxon,[1] and is demonstrated in OE texts by the appearance of digraphs (*i*, *e*, *æ* > *io*, *eo*, *ea*) in

---

[1] Old English typically includes four dialects. Northumbrian and Mercian are considered *Anglian*, while West-Saxon and Kentish are *non-Anglian* (Campbell 1959§6). These dialects roughly correlate with Old English political boundaries. Anglian dialects occur north of the Thames while West-Saxon and Kentish are situated in the southern region of

stressed syllables. Campbell (1959§139) describes breaking as a vocalic mutation, which is conditioned by *h*, *r*, and *l* when followed by a consonant; and single *h* and *w*. Because the consonants that condition breaking are generally considered to reflect velar articulations, breaking is traditionally viewed as a process which eases the articulatory transition from a front vowel to velar consonant through the development of a back offglide. In the following sections, I provide examples of breaking before each conditioner in OE.

2.2.1. Breaking before *w*:

a) *i > io* - *niowul* 'prostrate', *siowan* 'to sew'.

b) *e > eo* - *hweowol* 'wheel', *cneowes* 'knee(gen. sg.)'.

Breaking before *w* in OE texts is relatively rare. Note that digraph formation only occurs before *w* when in isolation, in other words, *w* is never followed by a consonant in breaking. Note also that breaking only occurs in the high and mid front vowels; the low front vowel *æ* does not undergo breaking when followed by *w*.

2.2.2. Breaking before *h*:

a) *i > io* - *mioh* 'manure', *tiohhian* 'consider', *Piohtas* 'Picts'.

*ī > ī*o - *līoht*, 'light', *betīoh* 'between', *wēoh* (<*wīoh*) 'idol'.

b) *e > eo* - *cneoht* 'boy', *feoh* 'cattle', *feohtan* 'to fight', *eoh* 'horse'.

England (Lass 1987:218). Since West-Saxon was considered the standard dialect of the time, investigations of OE are generally studies of West-Saxon.

c) *æ > ea* - *hleahtor* 'laughter', *eahta* 'eight', *neaht* 'night', *seax*[2] 'knife', *seah* 'he saw', *sēon* 'to see' (< $^{+}$sexan).[3]

ǣ > ēa - *nēah* 'near', *nēa(h)lǣċan* 'approach'.

The occurrence of digraph formation before *h* is extensive in OE texts. Note that this conditioner influences breaking in each of the front vowels. Also note that both long and short vowels are conditioned by *h*. Note furthermore that breaking occurs before single *h*, and also when it is followed by a consonant.

2.2.3. Breaking before *r*:

a) *i > io* - *liornian* 'to learn', *hiord* 'herd'/'flock'.

b) *e > eo* - *heorte* 'heart', *eorþe* 'earth', *eorl* 'earl', *steorra* 'star'.

c) *æ > ea* - *bearn* 'child', *earm* 'arm', *mearc* 'boundary', *mearh* 'mare', *heard* 'hard', *wearp* 'warp', *hearg* 'temple', *wearr* 'callosity, *spearwa* 'sparrow'.

---

[2] In OE orthographic forms, <x> represents [ks]; otherwise x assumes its IPA value. OE *x* is descended from PIE $^{+}$k. The form *seax* 'knife' in OE is derived from PIE $^{+}$sok which, after the athematic noun ending (*-s*) is added, becomes $^{+}$soks. Through the workings of Grimm's Law, $^{+}$k > $^{+}$x in Gmc., which renders $^{+}$sVxs. The following is a possible derivation of PIE $^{+}$sok > OE *seax* 'knife': $^{+}$sok (PIE) > $^{+}$sVxs (Gmc.) > $^{+}$sVhs (PreOE); $^{+}$sVhs > $^{+}$sVvhs (breaking), with Vv representing a diphthong; $^{+}$sVvhs > $^{+}$sVvks (dissimilation), which occurs in response to the phonotactic problem of adjacent continuants in Gmc. languages. The cluster [ks] is then orthographically represented as *x* in OE, as seen with *seax* [sæəks].

[3] One possible development of Gmc. $^{+}$sexan > OE *sēon* 'to see' is as follows: $^{+}$sexan (Gmc.) > $^{+}$sehan (PreOE); $^{+}$sehan > $^{+}$seohan (breaking); $^{+}$seohan > $^{+}$seoan (h-loss); $^{+}$seoan > $^{+}$seon (a-loss); $^{+}$seon > *sēon* (compensatory lengthening). See also Howell (1991).

Breaking is triggered by *r* only when it is followed by another consonant. This consonant may be within the same syllable as *r*, or reside in the following syllable onset. Consequently, word-final *r* does not cause breaking. Note that breaking before *r* occurs in each of the short front vowels *i*, *e* and *æ*, but long vowels are never affected.

2.2.4. Breaking before *l*:

a) *e* > *eo* - *eolh* 'elk', *seolh* 'seal', *meolcan* 'to milk', *seolf* 'self'.

b) *æ* > *ea* - *ceald* 'cold', *heall* 'hall', *feallan* 'to fall', *eald* 'old', *eall* 'all', *weall* 'wall', *healdan* 'to hold'.

As with *r*, breaking is conditioned by *l* only when it is followed by another consonant, except if the following consonant is developed through gemination in West Germanic (WGmc.), where *l* → *ll* /_ *j*.[4] For example WGmc. ⁺halja > OE *hell* 'hell' through gemination and umlaut. It is speculated that -*ll*- is palatal, coloured by *j*, and therefore does not act as a trigger for breaking, which is generally assumed to be conditioned by velar consonants.[5] Note that OE *hell* does not undergo breaking whereas the OE form *heall* (< ⁺*hæll*) 'hall' does, as seen in b) above. Further note that the high front vowel *i* does not become diphthongal when followed by *l*, and also, only short vowels are influenced by the *l* conditioner. Finally note that *l* occurring word-finally does not condition breaking.

2.3. Background.

---

[4] See Campbell (1959:§407) for full description of West Germanic Gemination.
[5] See Jones (1989) for derivations of breaking exceptions.

In the study of OE phonology, the term 'breaking' has been used to describe any appearance of digraphs in texts throughout the OE period, including the development of diphthongs conditioned by a back vowel which is situated in the following unstressed syllable. This process is commonly referred to as back mutation (or velar umlaut), and occurs most regularly in the Mercian dialects and Kentish. Examples include: *siofan* (< *sifan*) 'seven', *beofor* (< *befor*) 'beaver', and *steaðul* (< *steðul*) 'foundation'.

Although breaking and back mutation differ with respect to dialect and conditioning environments, in some interpretations, these vowel mutations have been grouped together as the same process due to their similar diphthongal outcomes. As a result, the conditioners involved in these two processes are assumed to form a similar class of segments (velar for consonants, back for vowels), which is scribally represented by the addition of back-vowel digraph (Flom 1937, Bauer 1956, Nielsen 1984). Consequently, the quality of backness or velarity in these conditioners is determined to be the main influence in the development of diphthongs with a back offglide in OE. This overall view has been a dominant factor in breaking interpretations because the consonants that condition breaking are, to date, primarily assumed to be characterized by velar articulations.

2.4. Traditional Reconstructions of Breaking Conditioners.

It has rarely been disputed that breaking is a process of assimilation, in which a front vowel acquires a back offglide, conditioned by some quality of backness present among the consonants *w*, *h*, *r* and *l*.[6] I now present an outline of some of the earlier reconstructions of breaking conditioners with respect to their articulatory characteristics.

In OE, *h* is traditionally reconstructed as glottal [h] (< Gmc. $^+$x), when situated in word-initial position. In remaining positions, it is traditionally assumed that *h* is realized as a voiceless velar fricative [x]. Consequently, the velar quality of post-vocalic [x] in OE (< Gmc. $^+$x) has been accepted as the conditioning factor in the development of breaking diphthongs in OE.[7]

The glide *w* in OE is traditionally considered to reflect a velar articulation (Moulton 1954, Campbell 1959). Evidence for this velarity is demonstrated in Middle English (ME), where *w* merges with *g* intervocalicly, seen in such forms as OE *boga* > ME *bowe* 'bow', and *utlaga* > ME *utlawa* 'outlaw'. Colman (1983) states that the appearance of *w* for *g* in ME represents weakening in the velar fricative [ɣ]. Hence, this merger indicates a phonetic similarity between OE *g* and ME *w*, specifically that of velarity.

Liquids in Proto-Indo-European (PIE) are generally assumed to be dentals ($^+$r, $^+$l), with apical articulations in all syllabic positions.[8] However, based on the velar reconstructions of *h* and *w*, preconsonantal liquids in OE have traditionally been assigned velar characteristics to account for the development of the back offglide in breaking diphthongs. Accordingly, breaking liquids are typically referred to as velarized variants.[9]

---

[6] Campbell (1959), Kuhn & Quirk (1953/1955), Stockwell and Barritt (1951/1955/1961), Lass & Anderson (1975), Jones (1989), Hogg (1992).
[7] Moulton (1954), Campbell (1959), Kuhn (1970), Hogg (1979), Lass & Anderson (1975).
[8] See Baldi (1983) for overview of Indo-European phonemic system.
[9] Also referred to as 'dark', 'guttural', or 'retroflex' liquid variants. See Flom (1937), Bauer (1956), Kuhn (1970) and Howell (1991) for descriptions.

Lass & Anderson (1975:86) offer a slightly different interpretation of OE breaking liquids, suggesting that preconsonantal *r* was realized as a 'uvular continuant'; preconsonantal *l* in OE is characterized as a 'velarized dental lateral'. In a similar manner, Howell (1991) assumes that preconsonantal *r* in OE is distinguished by secondary pharyngeal articulations, while *l* in preconsonantal position is velarized.

Ultimately, each breaking conditioner is traditionally assumed to reflect a velar articulation, which, in distinctive feature theory proposed by Chomsky & Halle (1968), is represented by the features [+high] [+back]. Within early generative frameworks, breaking is determined to be a process of assimilation, in which a [-back] vowel assimilates to a [+back] feature in the following conditioning consonant, thereby forming a diphthong with a [+back] offglide (Lass & Anderson 1975, Anderson & Jones 1977).

That breaking is influenced by [+back] consonants in OE is undoubtedly appealing if not for one significant problem; breaking does not occur before the velars *c* and *g*, which are also specified as [+back]. Note forms such as ⁺bæc *bæc* 'back', ⁺drægan *dragan* 'drag', where *c* represents a voiceless velar stop [k], and *g* represents a voiced velar fricative [ɣ].[10] Despite this problem, most interpretations still accept the premise that breaking is caused by [+back] consonants, which act as a natural class of conditioners in the development of diphthongs characteristic of breaking. In chapter 4, a natural class of breaking conditioners that excludes velars will be presented.

---

[10]See Hogg (1979:91-96) for discussion regarding the perplexities of this issue.

2.5. Digraphs as Diphthongs.

The process of breaking appears to have produced diphthongal variants (*io*, *eo*, *ea*) of the front vowels (*i*, *e*, *æ*) in stressed syllables. However, the premise that digraphs represent diphthongs in OE breaking has been challenged by some scholars. These alternate explanations has sparked what is known as the Digraph Controversy, which is played out in a series of articles that debate the phonetic values of OE textual digraphs.[11]

Daunt (1939) and Mossé (1945) have suggested that no phonetic distinction was created between vowels and diphthongs in breaking. In other words, according to these accounts, digraphs do not represent diphthongal values. Instead, the second graph (*i<u>o</u>*, *e<u>o</u>*, *e<u>a</u>*) is viewed as a diacritic marker, similar to those used by Old Irish scribes, which indicates a velar quality of the following consonant. Therefore, within these interpretations, breaking is seen as a scribal convention rather than a diphthong formation process in OE.

Another interpretation which assumes monophthongal values for digraphs is presented by Stockwell & Barritt (1951). They contend that breaking digraphs reflect centralized allophones of front vowels [ɨ, ə, a], due to the velar influence of the following consonant. While a front vowel may acquire a velar quality from a following consonant, according to this account, no diphthong is created in breaking, thus vowels in OE remain monophthongal.

These monophthongal proposals of breaking digraphs are quite controversial and have been met with intensive criticism, mainly because they go against the traditionally

---

[11]See also Lass & Anderson (1975) for an overview of the Digraph Controversy.

established reconstruction of OE phonology, which includes both short and long diphthongs. Evidence supporting diphthongal values for digraphs is contributed by Kuhn & Quirk (1953:150-155), who demonstrate a distinction between monophthongs and diphthongs in OE minimal pairs, such as *ærn/earn* 'house'/'eagle', *fær/fear* 'journey'/'fear', and *stæl/steal* 'place'/'stall'. Furthermore, a diphthongal pronunciation exists in English place names, for example: *la Hyele* (< WS *healh*), *Fiernham* (< WS *fearn*), *Vialepitte* (< WS *fealw*). Overall, the greatest evidence that substantiates diphthongal values for OE digraphs is demonstrated by the development of similar diphthongs from vowels in other Germanic languages.[12]

Possible phonetic realizations of breaking diphthongs are presented by Kuhn (1961:524) as follows: /io/ [ɪɒ, ɪɛ], /īo/ [iɒː, iɛː]; /eo/ [ɛɒ, eɒː]; /æa/ [æɑ, æɒ], /ǣa/ [æɑː, æɒː]. Brunner (1953:249) suggests that the pronunciation for *io*, *eo*, *ea* was perhaps [iə], [eə] and [æə] respectively, which corresponds to Kuhn's view that 'the second elements of diphthongs tended to become [ə]' (1961:536).

In this section, I have examined the diphthongal aspects of breaking digraphs. Following the majority view of these interpretations, I assume that breaking involved the formation of diphthongs from monophthongal vowels in OE. I now turn to the issue of quantity in relation with breaking digraphs.

---

[12]From Howell (1991) section 0.2.

2.6. Some Quantitative Considerations of Breaking.

Breaking had a significant effect on the quantity system of OE vowels; specifically, a length distinction between diphthongs was created. Traditional accounts of breaking generally assume that short vowels rendered short diphthongs, while long vowels developed into long diphthongs. Long breaking diphthongs were then seen to merge with the original OE (< Gmc.) diphthongs that, before breaking, were considered length-neutral. In effect, a new series of short diphthongs was added to the OE phonemic system. The vowel system after this phonologization in OE would appear as follows (based on Campbell 1959):

(1)

	short:		long:
monophthong:	i y u	monophthong:	i: y: u:
	e œ o		e: œ: o:
	æ a		æ: a:
diphthong:	io, eo, ea, ie	diphthong	io:, eo:, ea:, ie:

Although a short diphthong series that developed from breaking is traditionally considered to be present in OE, phonological representations for breaking diphthongs were not provided in early interpretations. As such, the plausibility of a short diphthong development in OE was rarely disputed. However, with the advent of generative phonology, the traditionally assumed phonemic status of short diphthongs became difficult to represent within early generative frameworks.

2.6.1. Early Generative Representations of Breaking Diphthongs.

One of the first phonological representations of the diphthongal development in breaking is provided by Lass & Anderson (1975), within the early generative framework of Chomsky & Halle (1968). In their analysis, Lass & Anderson propose that breaking is a case of [u]-epenthesis,[13] which they equate with mora addition.[14] Hence, the quantitative values of diphthongs formed by breaking would be bimoraic from the development of short vowels [V] > [VV], and trimoraic from long vowels [VV] > [VVV]. To remedy the restriction of trimoraic nuclei in OE, Lass & Anderson apply a further rule, namely that of Trimoric Nucleus Simplification (TNS),[15] which operates as follows: [VVV] > [VV]. Note that breaking in both long and short vowels ultimately results in bimoraic diphthongs according to this epenthetic analysis.

With regard to the phonetic realizations of breaking diphthongs, Lass & Anderson (1975:81) state that 'there is no principled reason why the long and short digraphs (which were after all orthographically identical) had to represent entities that were *phonetically* different at all: so long as their underlying representations remained stable'. Therefore, in this account, all diphthongs created by breaking would be perceived as long to OE speakers.

---

[13]The epenthetic [u] then assimilates to the height of the preceding vowel (i.e., *heurte* > *heorte*). This process is termed Diphthong Height Harmony (DHH) by Lass & Anderson (1975) in chapter III, section 5.
[14]Morae are positions within the rhyme (i.e., nucleus + coda) of a syllable. They determine syllable weight. A syllable is monomoraic if it has only one position in its rhyme; bimoraic syllables have two rhyme positions. Long vowels are bimoraic while short vowels are monomoraic. See Goldsmith (1990, chapter 3) for full discussion of syllable weight.
[15]From Lass & Anderson (1975), chapter III, section 6.

The basic implication of Lass & Anderson's analysis is that there is no short diphthong series created by breaking in OE, because the processes of epenthesis and TNS render only long (i.e., bimoraic) diphthongs. In effect, they conclude that all diphthongs which developed from breaking fell together with original Gmc. diphthongs in OE. Recall that this premise is contrary to traditional breaking interpretations, which assume that only long breaking diphthongs merged with Gmc. diphthongs, as discussed in 2.6.

Another aspect of Lass & Anderson's (1975) epenthetic proposal of breaking that differs from traditional interpretations involves the diachronic development of vocalic elements in English. It is well established that, throughout English, short breaking diphthongs and short vowels undergo separate lines of development from that of long diphthongs and long vowels.[16] To be sure, the quantity of vowels, and that of their diphthongal counterparts, is preserved throughout English according to traditional OE studies. However, in order to account for monomoraic reflexes of OE diphthongs (< short vowels) in subsequent English dialects, Lass & Anderson go against the traditional views of diachronic development and argue that bimoraic diphthongs, developed by short vowel breaking, were later reverted into monomoraic vowels via the addition of phonological rules.

Overall, Lass & Anderson's (1975) epenthetic explanation for the development of breaking diphthongs creates significant quantitative problems, which have to be further corrected through additional compensatory rules. Accordingly, it would be more reasonable

---

[16]Campbell (1959), Kuhn (1970), Jones (1989), et. al.

to assume an affinity between vowels and their diphthongal counterparts with regard to quantity, as is determined in traditional interpretations.

It must be acknowledged, however, that the analysis of any problem is limited to the adequacy of the theoretical framework in which it is presented. In this respect, vowel epenthesis would be the best explanation for the creation of diphthongs within the linear confines of early generative frameworks. Recently, Lass (1994) has amended the earlier generative views of diphthongs to conform with the tenets of autosegmental phonology. Consequently, the quantitative problems encountered in Lass & Anderson's (1975) analysis are no longer relevant, because according to autosegmental theory, diphthongs may be represented as monomoraic segments. In the following sections, the structure of diphthongs, along with the process of breaking, will be represented autosegmentally.

2.6.2. An Autosegmental Representation of Diphthongs.

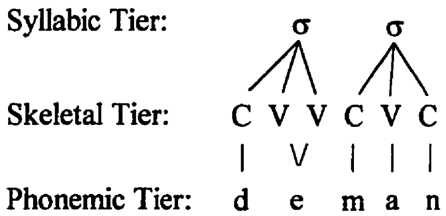
Within autosegmental representation, phonological information is situated on two or more levels, or tiers.[17] Each tier is characterized by specific phonological attributes; for example tone is represented on the tonal tier. Quantity is an aspect of the skeletal tier, which consists of timing units. These elements, also known as C- or V-slots, distinguish long from short segments, simple from complex segments, and also provide a distinction between a syllable peak (i.e., nucleus) and syllable margins (i.e., onset, coda).[18] In order for consonants and vowels to be realized, they must be associated to C- or V-slots on the

[17] See Goldsmith (1990) for detailed account of autosegmental phonology.
[18] See Clements and Keyser (1983) for outline of CV phonology.

skeletal tier. Consonantal and vocalic quality is represented on what is known as the phonemic tier, separate from the skeletal tier.

Segments within autosegmental tiers are connected by association lines. These lines may either form a one-to-one connection between tier segments, or a multiple association, where one segment on one tier is associated with two segments on another tier.[19] To represent length, a long consonant, or vowel, is associated with two consecutive C's, or V's, on the skeletal tier. Below is an autosegmental representation of the OE form *dēman* 'judge'/'deem':

(2)



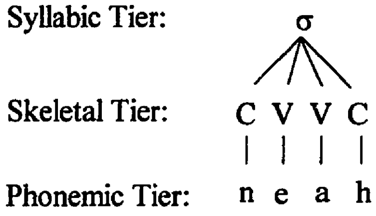
From the above example, note that *ē* is long because it occupies two V positions in the first syllable rhyme; the second vowel *a* is associated to only one V position, indicating that it is short.

Autosegmental notation is ideal for the representation of diphthongs because quantity and quality are situated on separate tiers. Diphthongs are vowels which demonstrate a quality transition within a single syllable rhyme. Structurally, they may be short (monomoraic) or long (bimoraic). The representation of a long diphthong is quite

[19]For elaboration on multiple association conventions, see Goldsmith (1990:67).

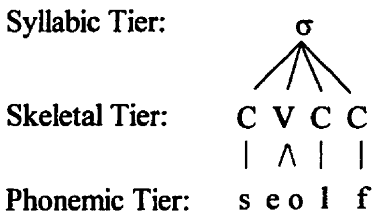
straightforward; each phonetic value is associated to one V-slot on the skeletal tier, as shown in the following breaking example *nēah* 'near':

(3)



Short diphthongs are represented with multiple association lines between the phonemic and skeletal tiers, as shown in the following:

(4)



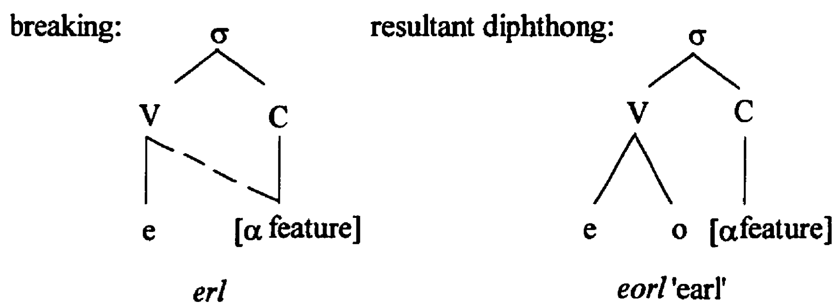
In the following section, I present my interpretation of the diphthongal changes in OE breaking within autosegmental representation.

2.7. Diphthongs Created by Breaking.

As discussed earlier in this chapter, breaking is a process of assimilation, in which a vowel becomes a diphthong due to the influence of an inherent feature in the following conditioning consonant. In autosegmental theory, the process of assimilation is represented by the addition of an association line between segments. This process is generally referred to as spreading, because the features of one segment are seen to spread to another segment along the path of the association line.

I represent the development of a diphthong from a short vowel in breaking through the addition of an association line between the terminal feature of the consonant and the V-slot on the skeletal tier, as shown in the following diagram:

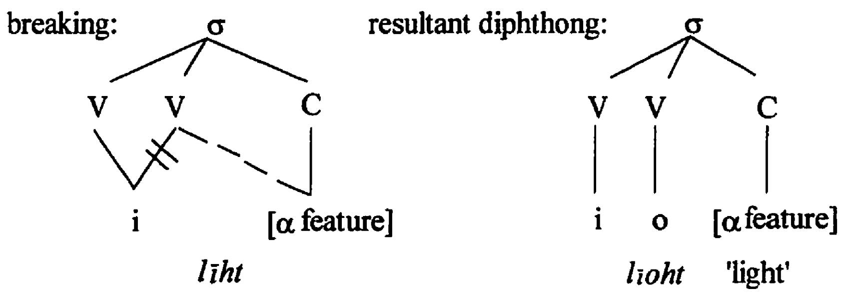
(5)



Note above that the resultant diphthong, which is created by breaking, retains its original length status.

To represent the development of a long diphthong in breaking, I add an association line to the second half of the long vowel. Consequently, this addition delinks the association line between the vowel and the second V-slot on the skeletal tier, which is indicated by the pair of transverse lines. An autosegmental representation of breaking in long vowels is shown in the following diagram:

(6)



Similar to the development of a short diphthong from a short vowel, as seen in (5), the resultant diphthong in the above diagram retains the quantitative status of the vowel from which it developed. Accordingly, breaking is a process which only affects vowel quality; the quantity of the original vowel does not change.

2.8. Summary.

In this chapter, I have presented and discussed traditional accounts of breaking in OE. I have also presented an autosegmental representation of diphthongal development in the breaking process. In the following chapter, I will examine recent breaking investigations, which have suggested that breaking is a product of both vocalic and consonantal properties. In these analyses, breaking is viewed as a diphthongal development, conditioned by consonants which are subject to syllable coda weakening. Accordingly, breaking is a combinatorial process of vowel mutation and consonantal change.

CHAPTER THREE

Syllable Structure and Parameters of Breaking.

3.1. Introduction.

Most traditional interpretations (Campbell 1959, Lass & Anderson 1975, et.al.) consider breaking to be a case of diphthongal development, conditioned by a set of consonants which reflect a velar articulation. Accordingly, breaking has been primarily viewed as a vocalic mutation, which is transparently supported by the addition of a vowel graph by the scribes. In the same regard, it would appear that the consonants which cause breaking do not undergo any transformation themselves, mainly because there is no scribal reflex that would indicate a consonantal change. However, unlike traditional interpretations, which focus mainly on the vowel changes involved in breaking, recent explanations note that the consonants which condition breaking have been also subject to substantial mutation via weakening and loss throughout the history of English.

Jones (1989) is one of the first explanations of breaking that addresses the issue of consonantal weakness as an influence of breaking. Instead of viewing breaking as an articulatory change which involves the assimilation of a velar feature to the preceding vowel, Jones considers the sonority relationship between vowels and their following consonants. Specifically, he contends that breaking conditioners reflect a high level of sonority, and suggests that OE speakers may have perceived these consonants as vocalic elements. The formation of diphthongs would then be an instance where 'the vowel component 'spreads' laterally into the stressed vowel space, causing that area to be perceived as a side-by-side complex of two vowel 'halves', the right-hand-side element, 'derived' via the [vowel-like consonant], sharing its positional characteristics' (1989:57).

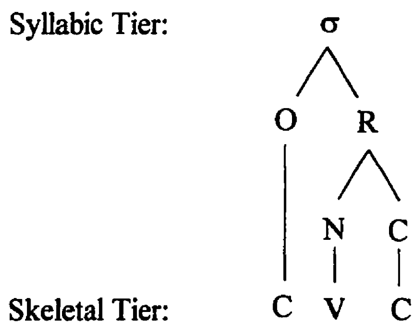
Overall, Jones (1989) determines that breaking is primarily influenced by the vocalic properties of conditioning consonants rather than specific articulatory features. This assumption is echoed in Howell (1991) and Lutz (1994), the most extensive analyses of breaking with regard to the weakened nature of breaking conditioners. The basic premise of these interpretations is that post-vocalic consonants have become weakened in articulation due to the structural conditions of the syllable coda.

In this chapter, I will examine and synthesize the analyses of breaking proposed by Howell (1991) and Lutz (1994), with regard to syllable theory presented by Vennemann (1988). Based on the factors that affect breaking identified in these works, I will then extrapolate two parameters, which represent the consonantal and vocalic aspects of the breaking process. Ultimately, I will graphically demonstrate how these parameters can explain the varied nature of breaking in OE. But first, a brief outline of syllable structure is in order.

3.2. Syllable Structure.

The structure of a syllable is organized as a hierarchy, which includes an onset (O) and a rhyme (R). The rhyme is further divided into a nucleus (N) and a coda (C). The nucleus is usually occupied by a vowel, while consonants generally reside in the onset and coda positions. Within autosegmental phonology, syllable structure is represented above the skeletal tier, and as such, onset, nucleus and coda positions are each associated to a skeletal position (Goldsmith (1990:109):

(7)



Syllables can be classified as open or closed. Open syllables do not have a coda ((C)V) whereas in closed syllables, a coda of one or more non-syllabic elements is present ((C)VC(C)). To distinguish weight, syllables are characterized as heavy or light. A heavy syllable can be defined as one which contains two (or more) rhyme positions; in other words, the rhyme is branching. Light syllables contain only one segment (a short vowel) in the rhyme.

3.2.1. Vennemann (1988).

One of the most extensive treatments of the syllable is Vennemann's (1988) preference theory, which outlines the relative preference of syllable shapes. The characteristics of preferred syllables are determined by Preference Laws which 'specify the preferred syllabic patterns of natural languages as well as determine the direction of syllable structure change' (Vennemann 1988:1). A sound change that demonstrates a more preferable syllable shape is considered a syllable structure change. Conversely, a change that worsens syllable shape is motivated by factors other than those along the parameters of syllable structure.

According to preference theory, the most preferred syllable structure has a CV shape, which is validated by the fact that this type of syllable is the most common in the world's languages. Furthermore, one of the most basic tendencies of syllables in diachronic change is to simplify complex syllables (i.e., CVC) to the preferred (CV) shape. This is demonstrated, for example, in the development from Latin to Italian, as seen in the forms *fac* > *fa* 'make!' and *dic* > *di* 'say!' (from Vennemann 1988:24).

Preference Laws are stated with reference to consonantal strength. The notion of strength refers to the articulatory and acoustic properties of speech sounds with regard to air flow and voicing. Specifically, speech sounds that are produced with an unimpeded voiced air flow (i.e., low vowels) are considered 'weak'; voiceless plosives are 'strong' speech sounds. The phonological strength correlates of speech sounds are graded according to a scale, which orders them from weakest to strongest. This general order of speech sounds is illustrated as follows:[20]

(8)

low vow mid vow high vow *j w r l* nasals +voice fric -voice fric +voice stop -voice stop →

Note that the consonantal strength scale above differentiates phonological values between individual segments within a class. For example, high vowels are stronger than low vowels, and laterals are stronger than rhotics.[21] The relevance of this differentiation will be demonstrated when breaking conditioners are ordered in relation to strength later in the chapter.

Now that consonantal strength has been outlined, I will now present Vennemann's Preference Laws. Although he formalizes several laws, only the Head Law, the Coda Law and the Contact Law, which are specifically relevant to breaking, will be mentioned.

3.2.1.1. The Head Law:

> A syllable head is the more preferred: (a) the closer the number of speech sounds in the head is to one, (b) the greater the Consonantal Strength value of its onset, (c) the more sharply the Consonantal Strength drops from the onset toward the Consonantal Strength of the following syllable nucleus.
>
> (Vennemann 1988:13).

[20]This scale is based on the one presented in Vennemann (1988). It will be noted that the glides *j* and *w* have been additionally included in the present work based on Murray & Vennemann (1983:520).

[21]Justification for individual divisions between speech sounds is argued in Murray (1989) and Cull (1994).

To clarify, an optimal syllable head contains one voiceless stop, since this segment has the greatest consonantal strength. If there is more than one segment in the onset, the most preferable cluster would be a voiceless stop (*t*) followed by a segment which is low in consonantal strength, such as a rhotic (*r*) or a glide (*j*, *w*).

3.2.1.2. The Coda Law:

> A syllable coda is the more preferred: (a) the smaller the number of speech sounds in the coda, (b) the less the Consonantal Strength of its offset, and (c) the more sharply the Consonantal Strength drops from the offset toward the Consonantal Strength of the preceding syllable nucleus.
>
> (Vennemann 1988:21-27).

A preferred coda is empty. Segments in the coda are subject to weakening (loss of occlusive articulation), where stops reduce to fricatives, fricatives weaken to glides, and so on. As such, the coda is a weakening environment. Part (c) refers to coda clusters; the most preferable cluster would be (*r*) followed by a voiceless plosive (*p*, *t*, *k*).

3.2.1.3. The Contact Law:[22]

> A syllable contact A$B is the more preferred, the less the Consonantal Strength of the offset A and the greater the Consonantal Strength of the onset B; more precisely - the greater the characteristic difference CS(B)-CS(A) between the Consonantal Strength of B and that of A.
>
> (Vennemann 1988:40-50).

---

[22]Revised from Hooper (1976) and Murray & Vennemann (1983).

The most preferred syllable contact would be Ø$C, where C is a voiceless plosive, as in the second syllable of *rho$tic*. Furthermore, the syllable contact of *bar$ter* is more preferable than that of *ban$ter*. In essence, a segment in the coda of the preceding syllable tends to weaken to improve the syllable contact.

Although there are several interpretations of syllable structure, Vennemann's preference theory will be employed in this work for the following reasons. Firstly, it is the most comprehensive treatment of the syllable with regard to diachronic change. Secondly, because lateral liquids will be shown to have a greater phonological strength than rhotic liquids in OE, the use of a strength scale in which individual segments are differentiated within major classes is a necessity.[23] Finally, it will be shown that the properties of a syllable's juncture, as explicitly outlined in the Syllable Contact Law, are paramount in the description of breaking patterns before liquids. I now turn to the breaking analyses of Howell (1991) and Lutz (1994).

3.3. Howell (1991).

In the most comprehensive breaking approach to date, Howell revolutionizes breaking studies by examining the relatedness between breaking occurrences and syllable

---

[23]Clements (1990:294) presents a strength scale which orders classes of sounds according to sonority (i.e., obstruent > nasal > liquid > glide > vowel). Obstruents are the least sonorant; vowels are the most sonorant. However, in this account, sonority is only distinguished between the major classes; there is no differentiation between individual segments within a class.

structure. Since the consonants that influence breaking are mostly situated in the syllable rhyme, Howell argues that the phonetic properties of these conditioners must reflect the fact that consonants in coda position are much more vowel-like than their syllable-initial counterparts. Specifically, he suggests that breaking conditioners have been reduced in primary articulations due to the weakening conditions of the coda. Howell describes this *articulatory reduction* as a process of weakening in which:

> 'the constriction at the primary point of articulation, that is to say, at the main source of super-glottal constriction or occlusion, tends to be weakened or stripped away altogether . . . although secondary constrictions . . . such as the pharyngealization common in rhotics may remain' (Howell 1991:41).

In effect, consonants which have undergone reduction are more vowel-like than non-reduced consonants because they lack primary oral constrictions.

To explain the development of a diphthong, characteristic of OE breaking, Howell suggests that the boundary between a vowel and its following consonant becomes nebulous if the consonant is also vowel-like, which promotes the development of a transitional glide. Overall, Howell argues that breaking is not determined by the presence of a primary articulatory feature, such as velarity, because oral articulations have been diminished, if not eliminated, in the coda. Instead, it is the lack of primary articulations in consonants that influences breaking. Thus, Howell concludes that articulatory reduction is the precursor to breaking, and supports this statement by providing an immense repertoire of examples in analogous Gmc. dialects, which demonstrate diphthong formation influenced by articulatorily weak consonants.

Howell's analysis is insightful because it is able to account for breaking failure in certain environments, which was previously inexplicable in traditional interpretations. Such exceptions include the lack of breaking before velars (*c* and *g*), and also before word-final liquids. In Howell's analysis, only segments that lack oral articulations influence the development of a diphthong. Therefore, velars and word-final liquids would not cause breaking because they retain primary constrictions; in other words, they are not articulatorily reduced variants in OE.

3.3.1. Howell's Treatment of Liquids.

Howell suggests that the motivation behind liquid reduction in OE is related to the phonotactic difficulties that liquid+consonant (LC) clusters present in Gmc. languages. Evidence that demonstrates this phonotactic problem can be viewed in such processes as vowel epenthesis, as seen with *berg* > *berig* 'mountain', and *wylf* > *wylif* 'she-wolf' in OE (Howell 1991:9); and *r*-metathesis, as in OE *berht* > *breht* 'bright' (Howell 1991:12). Howell then determines that these processes are phonotactic repair strategies, which eliminate the immediate adjacency between liquids and consonants.

Howell (1991) further suggests that the reduction of primary constrictions in preconsonantal liquids would also serve to abate the problematic phonotactic conditions of LC clusters in Gmc. Specifically, he contends that after reduction, liquids are more similar to vocalic segments than to consonants. For example, Howell characterizes reduced *r* as 'an [ə]-, [ɔ]- or [a]-like vowel' (1991:42), while *l* reflects 'a [u]-like quality' after reduction (1991:72). Accordingly, the consonantal quality of the liquid is dissipated, which removes the problematic environment of liquid + consonant sequences. Ultimately, Howell argues that the development of a transitional glide before preconsonantal liquids (i.e., breaking), occurs in tandem with liquid reduction, in response to the phonotacticly problematic environment of LC clusters in Gmc. He further argues that after reduction, liquids retain weakly articulated constrictions, such as pharyngealization in *r* and velarization in *l*, which determine the [+back] quality of the developmental offglide in breaking diphthongs.

It would appear that according to Howell's liquid reduction analysis of breaking, the positional variants of liquids in OE are distinguished by varying degrees of consonantal constriction. Syllable-initial liquids are characterized by a strong oral constriction or occlusion, which is generally realized as an apical trill [r] in the case of *r*, or a clear apical [l] in the case of the lateral liquid. Preconsonantal liquids, on the other hand, would more closely resemble vowels, because they generally lack primary constrictions. Word-final liquids, Howell argues, are more resistant to reduction, and therefore would be more similar to syllable-initial liquids.[24]

---

[24]Refer to Howell (1991), section 1.2.2. for full discussion.

3.3.2. Howell's Treatment of *h*.

Perhaps the most divergent aspect of the analysis in Howell (1991) from that of traditional accounts of breaking is the interpretation of the realization of *h* in OE. Traditionally, *h* in OE is reconstructed as a glottal [h] word-initially, and as a velar fricative [x] in remaining environments, including breaking positions. However, Howell argues that the *h* conditioner in OE would not have been realized as a velar fricative because ⁺x tends to weaken and disappear early in Germanic, as seen in the following forms; *sēon* (< ⁺se<u>x</u>an) 'to see', *fūrum* (< ⁺fur<u>h</u>um) 'furrows'.[25] He further points out that because *h* in OE does not develop as its voiceless fricative counterparts ⁺f and ⁺þ, which become voiced variants [ß] and [ð] intervocalicly, the value of *h* would be something different than that of a velar fricative.[26] Finally, and most convincingly, Howell notes that in present West Gmc. dialects, the influence of velar fricatives on vocalic mutations is minimal. Accordingly, he postulates that a full fricative [x] quality in an OE breaking conditioner is unlikely, and ultimately contends that the *h* conditioner is realized as a weakened variant of Gmc. ⁺x. Howell supports this proposal by demonstrating that vocalic mutation is more likely when followed by weakened variants of fricatives in analogous Gmc. dialects.

After assuming that weakened fricatives are conducive to diphthong formation in Gmc. languages, Howell suggests that OE *h* (<Gmc. ⁺x) is realized as glottal [h]. Little

---

[25]Examples are from Howell (1991:87).

[26]For the sake of argument, what Howell fails to note is that PGmc. ⁺x weakens and disappears in only one environment; specifically the non-word initial, syllable onset position (i.e., intervocalicly). Hence, for Howell to assume that OE *h* is realized as something other than a velar fricative in preconsonantal or word-final positions is, in my opinion, a broad induction.

explanation is offered as to why Howell chooses an [h] realization for the *h* conditioner, except for the evidence presented in Ohala's (1974) article, which suggest that in the presence of [h], formant frequencies of vowels rise. As Ohala explains, '[a]uditorily, the shift up in the resonant frequencies would mean the vowels would appear to be lower and somewhat fronter . . .' (1974:259). However, Ohala does not assume, or even conclude, that [h] was in fact responsible for breaking (1974:259). Overall, Howell's treatment of *h* with regard to its realization in OE can be viewed as an elimination of positional variants, such that *h* in all environments resembles the word-initial variant, which is traditionally assumed to be [h].

To explain the breaking influence of the *h* conditioner in OE, Howell argues that the development of diphthongs before *h* occurs in connection with the reduction of Gmc. ⁺x to its OE reflex [h], which, if the reader recalls in the previous section, is reminiscent of liquid reduction and its consequential vowel mutation. Specifically, Howell suggests that through the reduction of ⁺x > [h], some of the pharyngeal constrictions characteristic of the original velar [sic] fricative remains.[27] He then concludes that pharyngeal constriction in *h* is the conditioning factor in the development of a [+back] offglide in OE breaking.

From my point of view, Howell's proposal regarding the development of Gmc. ⁺x > OE *h* resembles a debuccalization process, in which segments lose their oral tract articulations while their laryngeal features remain behind. Debuccalization processes are

---

[27]Because Howell states that pharyngeal constriction remains after the reduction of Gmc. ⁺x, one can only infer that Howell assumes that pharyngeal constriction was underlying present in Gmc. ⁺x, although he does not elaborate on this point.

glottalization (i.e., [tˀ] > [ʔ]), demonstrated in the English form [mɪʔn̩] 'mitten', and aspiration ([sʰ] > [h]), shown in the Spanish form [miʰmo] *mismo* 'same'.[28] Accordingly, the reduction of ⁺x > *h* proposed by Howell would be similar to the process of aspiration (i.e., [xʰ] > [h]), assuming that [h] is the pharyngeal constriction which remains after the reduction of Gmc. ⁺x. However, it is highly contentious whether or not aspiration may serve as a conditioning factor in the mutation of vowels.

It is further intriguing as to why Howell proposes that the *h* in OE breaking is realized as a glottal [h] instead of assuming a uvular articulation for this conditioner. According to Vennemann (1972), *h* in Gmc. is more than likely a uvular consonant [χ], which he describes as 'a post-velar, supra-glottal fricative' (1972:875). Surprisingly, Howell gives a similar description for the *h* conditioner in OE. Specifically he states that the *h* conditioner in breaking generates a 'velar or pre-velar source of turbulence' (1991:100). Although Howell acknowledges that after reduction, the reflex of Gmc. ⁺x could reflect a uvular realization (1991:90), he discounts a uvular realization for post-vocalic *h* in OE, and ultimately assumes that this breaking conditioner is 'an [h]-like sound with some residual pharyngeal constriction' (1991:103). Interestingly enough, uvulars are also characterized with pharyngeal constrictions, as argued in McCarthy (1991), and have also been shown to exert a backing influence on vowels in Arabic, as demonstrated in Herzallah (1990).

One of the main complications that arises in Howell's treatment of *h* with regard to its glottal [h] realization involves the retention of [+back] fricatives in later stages of the

---

[28]Examples from Clements & Hume (1995:248-49).

English language. In general, sound change is considered to be a gradual process that follows a unidirectional path. For example, a natural direction of weakening is demonstrated with the diachronic progression of PGmc. $^{+}$x in the following schematic: x > χ > h > Ø (from Vennemann, 1972). Accordingly, traditional interpretations assume that post-vocalic *h* in OE must be a velar fricative in order to account for its [+back] reflexes in ME, which are considered to be velar after back vowels.[29] Examples include OE *dohtor* > ME *doughter* 'daughter' and OE *rūh* > ME *rough* 'rough'.

However, in his (1991) study of breaking, Howell challenges the unidirectional nature of weakening, and argues that except for the final stage of reduction [h] > Ø, which he contends is irreversible, movement along the strength scale can be bidirectional. Specifically, Howell states that it is entirely possible that OE [h] could have later developed into [x] in ME. He substantiates this proposal by presenting examples in various Gmc. dialects, which demonstrate full fricative, and even stop values for reflexes of Gmc. $^{+}$x (<PIE $^{+}$k). For example, Howell notes that in the Gothic form *saihs* 'six', *h* (< $^{+}$x) is realized as [h], whereas in a later Germanic dialect, namely Modern Dutch, the reflex of Gmc. $^{+}$x has disappeared in the form *zes* (*zeØs*). He further demonstrates that in Present Day English (PDE), *x* in the form *six* [sɪks], is partially realized as a full stop [k], which Howell assumes to be a strengthened variant of Gmc. $^{+}$x ([x]).

---

[29]The consonant /h/ in ME is traditionally assumed to have the following allophonic distribution when occurring after vowels or consonants: [ç] following front vowels (*niht* [nɪçt] 'night'; [x] following consonants and back vowels (*thurh* [θurx] 'through', *thought* [θɔxt] 'thought'). Note that the spelling convention for [x] in ME is either *h* or *gh*.

Unfortunately, Howell's notion of strengthening is more likely a case of dissimilation, which eliminates the phonotactic violation of adjacent continuants (i.e., [xs]) in Gmc. languages. Nevertheless, Howell interprets the fricative [x] and/or stop [k] reflexes of Gmc. $^{+}$x in later dialects, such as PDE, as instances of strengthening, and thus contends that the diachronic development of weak reflexes from strong segments can be bidirectional, where OE [h] > ME [x] *in breaking positions.*

If the reader will recall from the previous chapter, Howell's proposal of bidirectionality in diachronic weakening is similar to Lass & Anderson's (1975) argument, in which diachronic process can be reverted to their original inputs through the application of additional rules. Recall also that it was determined that this explanation was self serving, in the sense that reversion was only necessary to support Lass & Anderson's epenthetic analysis of breaking. It would appear that Howell's incorporation of bidirectionality is a similar exercise. As such, Howell's argument for the possibility of OE [h] > ME [x], when situated in post-vocalic position, is questionable and, in my opinion, does not present a valid contradiction to the traditionally assumed monodirectional development of diachronic weakening. In the following chapter, I will argue for a uvular realization of the *h* conditioner in OE, which does not contradict the monodirectional weakening development of PGmc. $^{+}$x.

At this point, I would discuss Howell's interpretation of breaking before *w*, except that an analysis of this particular breaking conditioner is omitted in Howell (1991). Although it is acknowledged that instances of breaking occur before *w*, Howell does not explain how this glide affects breaking, or how it is related to the other *h*, *r* and *l* conditioners. In this regard, Howell's interpretation of breaking, as a whole, is inadequate because he fails to take into account all instances of breaking before every conditioner.

A final problem with Howell's analysis of OE breaking is that overall, it does not provide a unified account of the breaking process. Howell assumes that the quality of the developmental offglide in breaking diphthongs is conditioned by the features of the residual secondary constrictions that remain after the reduction of a consonant, specifically pharyngealization in *h* and *r*, and velarization in *l*. As such, breaking appears to be triggered by different conditioning features (i.e., pharyngealization and velarization) which ultimately produce the same diphthongal effect in vowels. However, since breaking patterns as one process of assimilation, in which front vowels become diphthongal due to the influence of a specific set of conditioners, it is only reasonable to assume that breaking conditioners form a natural class of consonants, unified by a common feature(s).

3.4. Lutz (1994).

The main focus of Lutz's article falls on the process of *r-Wirkungen*, an Early Modern English (EME) sound change in which vowels + /r/ develop into long vowels and diphthongs. For example, a short vowel + *r* developed into long monophthongs, as seen in the following Modern English forms *hard*, *bird*, *corn* etc., and most long vowels + /r/ developed into diphthongs, as seen with *fear*, *bear*, *poor* etc. (Lutz 1994:167). This change had a significant effect on the inventory of vowels after the Great Vowel Shift (GVS) by extending the system of complex vowel phonemes in EME. In addition to an interpretation of *r-Wirkungen*, Lutz also provides a provocative analysis of breaking in OE, specifically with regard to factors that condition breaking.

The basic premise of Lutz's article is that seemingly unrelated vowel changes in English, such as the development of short diphthongs in OE breaking, and the extension of long vowels and diphthongs in EME (< *r-Wirkungen*), are really 'successive stages of one coherent and directed consonantal development' (Lutz 1994:168). In particular, Lutz identifies this consonantal development throughout English as that of vocalization; a diachronic change in which a consonant weakens to become a vowel.[30] She argues that the vocalization of a segment may be explained with reference to the factors of inherent and positional strength, such that consonants are more likely to vocalize if they reflect a low consonantal strength, and also occur in weak phonotactic positions (i.e., the coda of the syllable).[31] Ultimately, Lutz concludes that the vocalization of post-vocalic consonants is responsible for causing the phonemic changes in vowel inventories in the history of English. She also suggests that OE breaking and *r-Wirkungen* in EME should not be primarily

---

[30]Colman (1983:32-33) defines the process of vocalization as *nucleation*; a structural development in which a weak consonant (i.e., an approximant) moves into the nucleus of a syllable to function as a vowel. If, however, a consonant is stronger than an approximant, it will undergo *lenition*, a process which weakens its consonantal properties, before vocalization takes place. In Lutz's (1994) article, *vocalization* refers to consonantal weakening; *total vocalisation* refers to the transformation of a consonant into a vowel (i.e., nucleation).

[31]Lutz also incorporates accent and phrase positions into the determination of positional strength; however, these factors are less relevant for her analysis than syllable position.

considered as vowel changes, but rather as successive indications of the development of consonantal vocalization throughout English.

To demonstrate the relationship between inherent and positional strength in vocalization, Lutz charts the development of inherently weak consonants (*j*, *w*, *h*, *r*, *l*) throughout English. She first observes that each of these consonants has been subsequently weakened in the coda to become vocalized within the nucleus. The result of this vocalization is that *j*, *w*, *h*, *r* and *l* are gradually restricted to the onset position of the syllable. Accordingly, the chronological development of this consonantal vocalization can be stated as follows: *j* was the first to exclusively occur in the onset position in OE to very early ME, then *w* was the next to vocalize in late OE to early ME. Following that, *h* was onset-restricted in ME to EME. In r-less dialects of English, post-vocalic *r* became fully vocalized in very late ME to EME. Lutz (1994) also assumes that *l* is in the earliest stages of vocalization because it is onset-restricted in only one dialect of PDE; namely that of Cockney.

Ultimately, Lutz determines that the order of onset restriction in consonants throughout English reflects the inherent strength of each consonant. To be sure, this development of vocalization suggests that *j* reflects the lowest consonantal strength, as it is the first to be vocalized, while *l* possesses the highest level of consonantal strength, because it is the last be restricted to the onset position in English.

Lutz further examines the development of *h*, *r*, and *l* in accented syllable codas throughout English, and observes that vocalization is more likely to occur when the consonant is 1) in preconsonantal position rather than word-finally, 2) occurs after short vowels, and 3) follows open vowels rather than closer vowels.[32] From these observations, Lutz outlines five factors that she argues can account for the varied nature of breaking instances in OE. According to Lutz, the factors of breaking which concern consonants are *inherent strength*, *phonotactic position*, and *velarity*.[33] The factors which characterize vowels in breaking are *degree of aperture* and *quantity* (1994:177).

Overall, Lutz's (1994) interpretation of breaking is mainly a descriptive treatment, which outlines certain factors that are more or less salient in the determination of breaking variation. For example, Lutz argues that breaking is extensive before *w* and *h* due to velarity, which is inherently present in these consonants; breaking is more restricted before *r* and *l* because they are only positionally velar. Similarly, breaking is seen to occur more pervasively when followed by *w* and *h* because these consonants are inherently weaker in consonantal strength than *r* and *l*. To elaborate, the factor which would be most important in the explanation of why breaking fails before word-final liquids, according to Lutz (1994), would be that of phonotactic position, while degree of aperture would be the most significant factor in demonstrating why breaking does not occur in OE forms where *l* follows the high vowel *i*. Furthermore based on Lutz (1994), quantity would be the significant factor in the explanation of why breaking occurs in vowels when followed by *w* and *h*, but not *r* or *l*.

---

[32]Lutz also observes a tendency for vocalization to occur earlier in Northern dialects of English.
[33]Unlike Howell (1991), Lutz (1994) follows traditional interpretations of which assume that breaking conditioners are distinguished by velar articulations.

Although Lutz (1994) identifies some important and valid variables in OE breaking, she does not provide a unified analysis of how each individual instance of breaking in OE is affected, or not, by her breaking factors. In other words, what Lutz's interpretation fails to capture is the relationship between vowels and consonants in the breaking process, specifically with regard to the factors she suggests. In the following sections, I will present a discussion and criticism of the five factors of breaking proposed by Lutz (1994). I will also argue that only two factors are necessary to explain the varied nature of breaking in OE.

3.5. Breaking Parameters.

As determined by Howell (1991) and Lutz (1994), breaking is an indication of a weakening development in consonants throughout English due to the structural conditions of the syllable coda. To be sure, the development of diphthongs characteristic of breaking is a consequence of this consonantal weakening. Therefore, breaking can be viewed as an interactive process between a vowel and its conditioning consonant. Accordingly, I argue that an optimal explanation of breaking should include only two factors, or parameters, if you will; one that reflects the nature of consonants, and one that characterizes vowels. I will develop these parameters of breaking according to the breaking interpretations of Howell (1991) and Lutz (1994), with reference to Vennemann's (1988) Preference Laws. Ultimately, I will present an analysis of the varied nature of breaking in OE with reference to only two parameters; derivative strength and vowel integrity.

3.5.1. Inherent and Positional Strength of Breaking Consonants.

As previously discussed, the most significant development in the explanation of OE breaking is that the vowel mutation typical of breaking is effected by consonants which have been weakened in articulations due to the structural conditions of the syllable coda (Jones 1989, Howell 1991, Lutz 1994). In other words, breaking conditioners are weak consonants which, according to the order of speech sounds determined by Vennemann (1988), would reflect low levels of consonantal strength. Recall from section 3.2.1. that consonantal strength is graded in the following scale:

(9)

low vow mid vow high vow *j* *w* *r* *l* nasals +voice fric -voice fric +voice stop -voice stop →

Note above that vowels reflect the lowest levels of consonantal strength, then glides (*j*, *w*) and liquids (*r*, *l*), which can be collectively classed as approximants. Nasals reflect a medial level of consonantal strength, then fricatives. Stops reflect the highest levels of consonantal strength.

Within Lutz's (1994) proposal, it is argued that the relative inherent strength values of consonants which undergo vocalization could be determined based on the order of onset restriction throughout English, such that the weakest of the consonants (*j*) was the first to occur exclusively in the onset to the syllable, then *w*, *h*, *r*, and lastly *l*. Correspondingly, the order of breaking conditioners in relation to their inherent strength values would be identical to the order of consonants which undergo onset restriction in English, since, as Lutz (1994) proposes, breaking is an early stage of the weakening development of consonants (i.e., vocalization) which ultimately restricts consonants to the onset position of syllables. In the following, I present a schematic of the consonants involved in vocalization throughout English in relation to inherent strength:

(10)

weakest *j* → *w* → *h* → *r* → *l* strongest

Based on the determination that vocalization throughout English occurs at different rates according to the varied strengths of post-vocalic consonants, Lutz (1994) further suggests that inherent strength is a factor which can account for the diverse nature of breaking in OE. In other words, the degree of inherent strength a consonant reflects determines the extent of diphthong formation characteristic of OE breaking. So, because *w* and *h* are inherently weaker than *r* and *l*, breaking should occur to a greater degree before *w* and *h* than before liquids. This assumption is verified with regard to the phonotactic positions breaking conditioners occupy. For example, breaking before *w* and *h* is extensive because these conditioners influence the formation of diphthongs when situated in several phonotactic positions; breaking is less extensive before *r* and *l*, since these liquids only condition diphthong formation when they occur in preconsonantal position.

It is well documented that certain syllable positions are more conducive to breaking than others. By observing the development of *r* in English, Lutz (1994) determines that vocalization is more likely to occur when post-vocalic *r* is in preconsonantal position (*ea<u>r</u>m* 'arm', *eorþe* 'earth') than when it occurs in word-final position (V*r*#). Furthermore, she concludes that *r* in unaccented syllable heads (V.*r*) is more resistant to weakening because this position reflects a higher positional strength grade than that of an accented syllable coda (V*r*.). From these statements, it can be generalized that the coda position is more conducive to breaking than a syllable onset- or a word-final position, which is consistent with the Coda Law (see above p. 27) in Vennemann's (1988) syllable preference theory.

Howell (1991) arrives at similar conclusions regarding the development of *r* in Gmc., and constructs a 'continuum of environments', which indicates the increasing order in which a consonant is less likely to be reduced in articulations. This scale is presented in the following diagram (from Howell 1991:59):

(11)

*r*C. → *r*.C → *r*# → .*r* → #*r*

Note that weakening is more likely to occur in coda positions than in onset positions, which is expected according to the Coda Law. Note further that the reduction of *r* is most resistant in word-initial position, which is consistent with the Head Law (see above p.26). Finally, note that *r* is more likely to be weakened in articulations when followed by an onset-positioned consonant than when it occurs word-finally. Howell (1991) justifies this phenomenon according to the Syllable Contact Law (see above p.27), which results in a tendency to increase the value differentiation between an offset and its following onset. While segments weaken in accordance with the Coda Law, it appears that the Contact Law provides a stronger motivation for liquids to reduce in the coda of internal syllables due to the presence of the following consonant in onset position. This would account for the lesser degree of weakening in word-final positions than in word-internal (coda) positions.

Howell more generally accounts for the lack of breaking before word-final liquids (i.e., *hwæl* 'whale, *bær* 'she bore') by stating that liquid reduction, which he argues is the precursor to breaking, 'may have never extended to word-final position in the OE period' (1991:59). According to Lutz's (1994) interpretation, word-final liquids would not condition breaking on account of their relatively strong inherent strength in this position, which serves to indicate the relationship between the strength and position of a conditioner in the process of breaking.

I now provide a presentation of breaking occurrence, indicated in boldface, which focuses on the correlation of inherent strength and phonotactic position:

(12)

a) Coda Cluster: *VwC* ***VhC*** ***VrC*** ***VlC*** →
Consonantal Strength

b) Syllable Contact: *Vw-C* ***Vh-C*** ***Vr-C*** ***Vl-C*** →
Consonantal Strength

c) Word-Final: *Vw#* ***Vh#*** *Vr#* *Vl#* →
Consonantal Strength

d) Syllable Onset: ***V- w*** ***V- h*** *V- r* *V- l* →
Consonantal Strength

Note in (12) above that the descending environments (i.e., coda cluster, syllable contact, etc.) are ordered parallel to Howell's 'continuum of environments'; the scale previously seen in diagram (11), which demonstrates the progression of environments in which consonantal weakening is less likely to occur. In the following section, I will argue that inherent strength and phonotactic position can be compressed into one variable due to their intrinsic relationship.[34]

3.5.2. A Consonantal Parameter of Breaking.

Although Lutz (1994) identifies inherent strength and phonotactic position as two separate factors of breaking, these factors are intrinsically related because a consonant's strength is dependent not only on its inherent phonological properties, but also on its position within the syllable, as determined by preference theory (Vennemann 1988). To elaborate, each of the breaking conditioners (*w*, *h*, *r*, *l*) is able to influence breaking due to their inherently weak, vowel-like qualities (Lutz 1994:171). As such, all breaking conditioners would be expected to influence the diphthongal mutation characteristic of breaking due to their relatively low consonantal strength. However, breaking does not always occur before every breaking conditioner, and therefore, one cannot solely refer to a consonant's inherent strength to explain breaking.

For example, liquids reflect a relatively low degree of strength, but they do not always condition the diphthong formation characteristic of breaking. Instead, they are only

[34] I am grateful to Vincent Dansereau for pointing out the legitimacy of variable compression.

able to cause breaking when occurring in certain phonotactic positions. To be sure, a liquid's inherent strength is lessened in preconsonantal position as directed by the Coda and Contact laws. So although a liquid is inherently weak with respect to consonantal strength, the weakening properties of the coda further weakens the liquid, thus creating a strength distinction between syllable-onset and -offset liquid variants. It is the weaker of the two liquid variants that causes breaking.

Ultimately, inherent strength and phonotactic position are indivisible factors of breaking conditioners, since they determine the maximal level of consonantal strength a consonant may reflect in order to influence vowel mutation in breaking. Accordingly, I suggest that the factors of inherent strength and phonotactic position should be unified into a more general consonantal factor, which characterizes the conditioners that influence breaking.

In the development of a consonantal parameter that integrates both the inherent strength and phonotactic positions of breaking conditioners, the individual properties of the two factors must first be outlined. To demonstrate inherent strength values in breaking conditioners, I follow the strength scale presented by Vennemann (1988), which orders speech sounds according to increasing grades of consonantal strength. Breaking conditioners are ordered in relation to consonantal strength in the following schematic:

(13)

w *h* *r* *l* →

Consonantal Strength

If the reader will recall, this order of breaking conditioners relative to increasing strength was determined based on the development of onset restriction of the consonants *j*, *w*, *h*, *r*, and *l* through the process of vocalization in English (Lutz 1994:171).

In order to present a parameter which characterizes the phonotactic positions in which breaking conditioners are more or less influential in the breaking process, I return to Howell's (1991) continuum of increasing syllable positions, in which a consonant is less likely to be reduced in primary articulations. In the following diagram, I present an increasing order of phonotactic positions in which a breaking conditioner is less likely to influence vowel mutation. Breaking conditioners are indicated by 'B' and neighbouring consonants are represented by 'C' (B may equal C):

(14)

BC.	B.C	B#	.B	→
1	2	3	4	

Note that I have assigned increasing numerical values to each consecutive phonotactic position of breaking conditioners. This will serve as a measure of reference when the parameters of inherent strength and phonotactic position are combined; an exercise to which I will now turn.

To establish a consonantal parameter that reflects the factors of inherent strength and phonotactic position, I conflate the scalar properties of each factor, which have been outlined in diagrams (13) and (14). I refer to the resulting strength a consonant manifests due to the combinatorial influence of both inherent strength and phonotactic position as 'derivative strength', because it is a product of both the aforementioned variables. In the following scale, the order of breaking conditioners in relation to derivative strength is presented:

(15)

w(1) w(2) w(3) w(4) h(1) h(2) h(3) h(4) r(1) r(2) r(3) r(4) l(1) l(2) l(3) l(4)

derivative strength →

Note in the above scale that the inherent strength of breaking conditioners is differentiated by the letter symbols (*w*, *h*, *r*, *l*). The increasingly restrictive phonotactic positions in which breaking conditioners influence diphthongal mutation is indicated by the numerals (*1*, *2*, *3*, *4*). In the following sections, I will suggest that the vocalic factors of breaking, namely degree of aperture and quantity, as identified in Lutz (1994), can also be integrated into a single parameter; one that characterizes breaking vowels according to their varying resistance to mutation.

3.5.3. Vowel Quality and Quantity in Breaking.

Within the breaking process, front vowels become diphthongs due to the influence of post-vocalic conditioning consonants. However, even when a vowel is followed by consonantal conditioner in optimal environment for the expected formation of a diphthong, vowel mutation in breaking does not always occur. For example, breaking fails in the high front vowel *i* when followed by an *lC* cluster, which is a favourable environment for a consonant to influence breaking.[35] Ergo, it would appear that in addition to the conditioning force of consonants, breaking is also determined to some degree by the nature of vowels. Put another way, vowels may reflect properties which are more or less conducive towards the tendency of mutation.

Howell (1991) proposes that the height of a vowel in relation to that of its conditioning consonant is a dependant factor of breaking occurrence. To account for the restrictive nature of breaking before *l*, Howell (1991:79) assumes that glide development in breaking is more likely to occur between segments which are the least similar, specifically with regard to height. This premise is reminiscent to that of traditional breaking interpretations, in which the development of a diphthong with a back offglide eases the articulatory transition between dissimilar segments, namely front vowels and back consonants. Although it has been determined that breaking is best explained with reference to the weakened nature of conditioning consonants rather than their articulatory features,

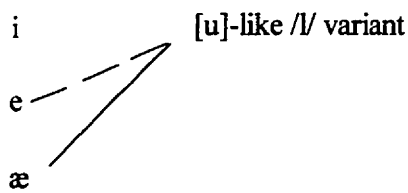
---

[35]Recall from the schematics in diagram (12) that preconsonantal breaking conditioners, whether tauto- or hetero-syllabic, have a greater influence on diphthong formation than conditioners which render breaking in other syllabic positions.

Howell's account of breaking failure before *l* is insightful with regard to the interaction between vowels and consonants in the breaking process.

As outlined in section 3.3., Howell assumes that after the process of reduction, the *l* conditioner in breaking resembles a 'u-like' sound, which reflects both high and back vowel properties. Accordingly, glide development in breaking occurs to the greatest extent when the *l* conditioner follows the low front vowel *æ* due to the significant level of height differentiation between these segments. Breaking occurs to a lesser extent when *l* follows the mid front vowel *e*; and to the least extent when following the high front vowel *i*. This relationship is more clearly demonstrated in Howell (1991:80) as follows:

(16)



Overall, Howell suggests that breaking before *lC* clusters is not only dependent on the reduced properties of the *l* conditioner and its backness, but 'also on the height of the preceding vowel relative to the height of the conditioner' (Howell 1991:80).

One problem with Howell's determination that glide development is more likely to occur between segments which reflect maximally different height features is demonstrated with breaking examples before *w*. Recall that breaking only occurs in the high and mid front vowels *i* and *e* when followed by *w*; the low front vowel *æ* is never affected. According to the notion of maximal differentiation, a vowel would be the most likely to undergo mutation when conditioned by a consonant which comparably reflects the most disparate features. Therefore, because *w* is specified with both high and back features, similar to those reflected by reduced *l*, one should expect the same breaking distribution in vowels when followed by both *l* and *w* conditioners. In other words, breaking should occur to the greatest extent in *æ*, and to the least extent in *i*, when followed by *w*. However, this is not the case; vowel mutation does not occur in *æ* when preceding *w*. Therefore, it would appear that glide development in breaking is not dependent on height features which are maximally different between a vowel and conditioning consonant.

From a different point of view, it could be theorized that the restricted nature of breaking before *l* is not dependent on the height features of a reduced consonant in relation to those of its preceding vowel, but is determined instead by certain characteristics of a vowel which makes it more or less resistant to diphthong formation. So, according to diagram (16) above, as presented in Howell (1991), it could be stated that low vowels would be the most likely to undergo diphthong formation when followed by *l*; mid vowels would be less likely, and high vowels would be the least likely to become diphthongs before the *l* conditioner in the breaking process.

To further the discussion of vowel properties which may possibly determine the tendency toward diphthong formation, I refer back to Vennemann's (1988) consonantal strength scale, previously presented in diagram (9). Recall that the notion of strength is related to an ordering of the phonological correlates of speech sounds in a language.

Specifically, Vennemann (1988:8) states that '[t]hese correlates may be projected on a phonetic parameter of degree of deviation from unimpeded (voiced) air flow called Universal Consonantal Strength'. In relation to consonantal strength, vowels are graded accordingly:

(17)

low vowels   mid vowels   high vowels

——————————————————→

Consonantal Strength

Note that in the above scale, height features and consonantal strength are correlated. Since the restricted nature of breaking before *l* and *w* cannot be satisfactorily explained with reference to height features in vowels, then perhaps one can refer to the degree of unimpeded air flow during the production of vowels to explain the differing frequencies of vowel mutation in breaking.

In Lutz's (1994) article, it is suggested that the degree of aperture reflected by a vowel is a conditioning factor in vowel mutation, which also includes the diphthong formation characteristic of breaking. Rather than refer to vowel height, Lutz describes vowels as 'open' or 'closer', which refers to the degree of aperture of the mouth during the production of vowels. For example, the values of open vowels would be [æ, a]; closer vowels would be [i, u]. Specifically she determines that the vocalization of coda consonants, of which OE breaking is a successive stage, has 'earlier and more far-reaching changes . . . after open vowels than after closer vowels' (Lutz 1994:173). More clearly stated, the process of vocalization, which ultimately results in the incorporation of weak consonants into the nucleus of the syllable, is more conducive when the pre-existing nuclear segment is an open vowel rather than a closer one.

Lutz (1994) exemplifies the tendency of vocalization to occur earliest in open vowels by making reference to the distribution of breaking before *w*. She explains that when following the short open vowel, /w/ in coda position is already fully vocalized, and 'the resulting diphthong joins in the development of Gmc. *au* to OE *ēa*' (Lutz 1994:178). Therefore, breaking before *w* in OE 'can only be observed in those vowels [namely *e* and *i*] after which total vocalisation of all four consonants sets in particularly late' (Lutz 1994:178). To additionally support the notion that open vowels are primarily influenced by the vocalization of coda consonants, Lutz (1994) refers to the fifteenth century South-East Midland private letters, in which *r*-less spellings for coda /r/, which would indicate total vocalization (i.e., *haad* 'hard'), first appear after short open vowels (172-173).

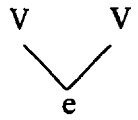
So, based on the determinations in Lutz (1994), specifically that consonants are more likely to become vocalized after open vowels, and also that breaking is a successive stage of the vocalization process, one may assume that the vowels involved in breaking would undergo diphthong formation in the following consecutive order:

(18) *æ* → *e* → *i*

It may also be theorized that the low vowel *æ* is the least resistant to the nucleation of a consonant, while the high vowel *i* is the most resistant to the incorporation of a following consonant within its nucleus, which is the ultimate stage of vocalization.

Lutz (1994) also determines that vowel quantity is another factor which can explain the varied nature of breaking, based on the observation that consonants are less likely to undergo vocalization when following long vowels (1994:173). Recall that within autosegmental phonology, long vowels are represented as follows:

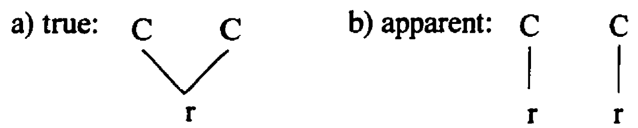
(19)



Note above that the long vowel *e* consists of a single vowel segment, which is doubly associated with two consecutive V positions on the skeletal, or timing tier.

Long vowels and consonants are also known as geminates. In Goldsmith (1990), geminates are referred to as true geminates, which are multiply associated to one consonant or vowel segment, or apparent geminates, which are singly associated to two segments.[36] The distinction between true and apparent geminates is demonstrated in the following:

(20)



Unlike apparent geminates, which are simply two adjacent and identical segments which typically arise through morpheme concatenation, true geminates typically possess properties that are more likely to resist the application of certain phonological rules;

[36]For reference to the special properties of geminates, see discussion in Goldsmith (1990, chapter 2).

specifically those which would separate or alter their underlying structure. For example, epenthetic processes do not generally occur between true geminates because the insertion of a vowel would separate the two halves, or C-slots, of its structure on the skeletal tier. Moreover, phonological processes which would alter or modify the quality of a segment, such as palatalization, are also less likely to apply to true geminates, since only half of the geminate would be affected.

A true geminate's resistance to the application of certain modifiable processes goes to characterize its properties of integrity or inalterability.[37] If these properties were to be graded, it could be stated that (true) geminates reflect high levels of integrity or inalterability, while non-geminate, or short, segments reflect lower degrees of resistance to the application of phonological processes. So, because breaking is a process of partial assimilation, which modifies the second half of a front monophthong into a back offglide, then it is not surprising that breaking is more likely to occur in short vowels than in long vowels due to the high level of muıational resistance displayed by geminates. In the following section, I will propose that vowel quality and quantity can be incorporated into one vocalic parameter, which is graded according to the varying resistance to diphthong formation reflected by a vowel.

---

[37]See Goldsmith (1990), 2.2.5.

3.5.4. A Vocalic Parameter of Breaking.

As with the development of a single consonantal parameter, which indicates the inherent strength and phonotactic positions of breaking conditioners, I argue that only one parameter is necessary to characterize the vocalic properties of quality and quantity in breaking. In the previous section, I suggested that the lack of breaking in certain vowels was perhaps due to particular properties which render a vowel more or less resistant to mutation. For example, open vowels are more likely to undergo breaking than closer vowels, and short vowels are more conducive to diphthong formation than long vowels. Recall that the resistance a long vowel displays to the application of phonological processes that would separate or modify the underlying structure of the geminate has been referred to as integrity, or inalterability. Recall also that since breaking modifies the structure of a front monophthong to that of a diphthong with a back offglide, it was suggested that long vowels would be more resistant to breaking due to their (true) geminate structure. Put another way, one could surmise that long vowels are less likely to undergo breaking on account of their high level of integrity. In the same vein, it could be postulated that open vowels are more conducive to diphthong formation due to their low level of integrity. Accordingly, I propose that the degree of integrity a vowel possesses is a dependent factor in the breaking process.

In the development of a vocalic parameter which indicates varying grades of vowel integrity, I will therefore need to outline both the qualitative and quantitative properties of the vowels involved in breaking. Based on Lutz's (1994) determination that breaking occurs earliest in open vowels, the order in which diphthong formation occurs in front vowels is presented as follows:

(21)

æ → *e* → *i*

Based also on the observations in Lutz (1994), breaking is less likely to occur in long vowels, which can be indicated in the following schematic:

(22)

$V \rightarrow \bar{V}$

The incorporation of qualitative and quantitative properties of breaking vowels into one parameter, which characterizes varying grades of mutational resistance, is therefore presented as follows:

(23)

æ *e* *i* *ǣ* *ē* *ī* →

vowel integrity

In the following section, I will construct a graphic representation of breaking occurrence in OE based on my proposed parameters of vowel integrity and derivative strength.

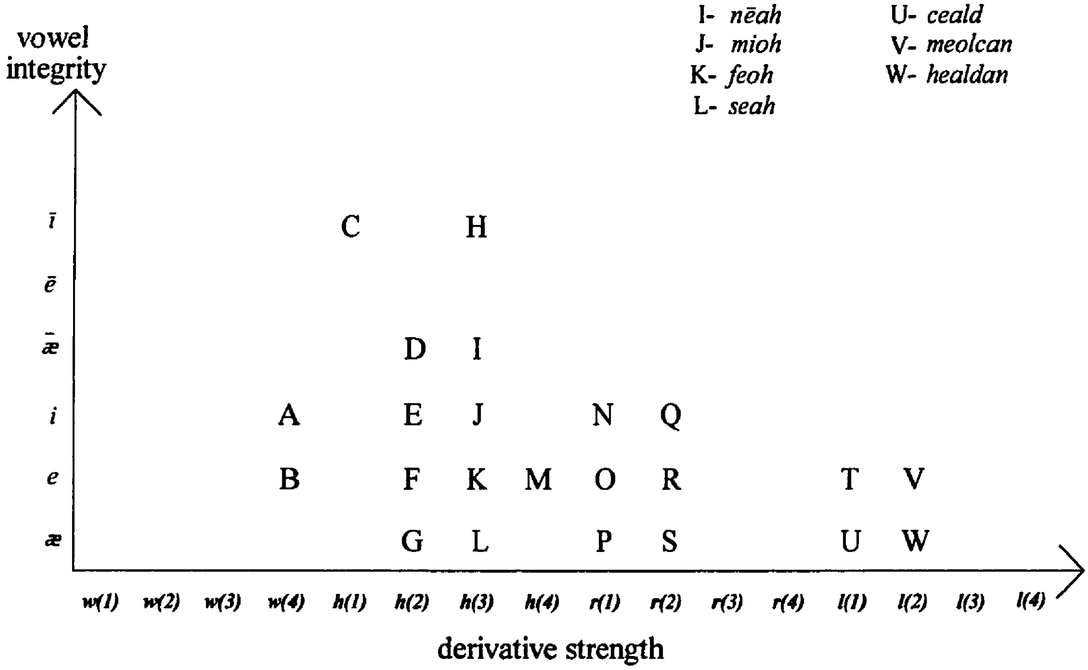
3.5.5. The Interaction of Breaking Parameters.

One characteristic of breaking in OE is that its occurrence appears to be erratic. For example, in some optimal environments for the formation of a breaking diphthong, such as when *i* is followed by an *lC* cluster, breaking does not occur. On the whole, breaking seems to manifest itself to a greater or lesser degree according to certain vowel+consonant combinations. Although previous breaking interpretations have commented on the irregular occurrence of breaking in OE, none have been able to provide a coherent account for this phenomenon. I will now demonstrate how the varied nature of breaking can be systematically explained with reference to the parameters of vowel integrity and derivative strength.

To begin, I create a graph by placing the parameter of vowel integrity along the vertical axis, and the parameter of derivative strength along the horizontal axis. Then, I plot each instance of breaking in OE at the intersecting point of its specific vowel+consonant combination, which is indicated by upper case letters. A OE sample word that corresponds with each coordinate of breaking is provided in the upper right corner of the graph. In the following diagram, I present the manifestation of breaking in OE:

(24)

A- *niowul*
B- *hweowol*
C- *līoht*
D- *nēalǣċan*
E- *Piohtas*
F- *feohtan*
G- *eahta*
H- *betīoh*
I- *nēah*
J- *mioh*
K- *feoh*
L- *seah*
M- *sēon*
N- *hiord*
O- *eorl*
P- *bearn*
Q- *liornian*
R- *eorþe*
S- *spearwa*
T- *seolf*
U- *ceald*
V- *meolcan*
W- *healdan*



At this point, the reader may be questioning why there are so few breaking examples within the realm of the *w* conditioner in the above graph. According to previous arguments, breaking would be most likely to occur before *w*, especially in coda- and word-final positions, because it is in these positions in which a segment reflects the weakest articulatory strength and hence, and would be the most conducive environment for the development of a transitional glide. Breaking would also be expected to prominently occur in *æ* when followed by *w*, since low vowels appear to be the least resistant to mutational influence. However, the digraphs used by the scribes to indicate breaking in OE are not recorded before *w* in coda positions, nor in lieu of the low front vowel *æ* when *w* occurs in the onset of the following syllable.

If the reader will recall from section 3.5.3., the general lack of OE breaking representation before *w* is most likely an indication of the early vocalization of *w* in Gmc., as suggested by Lutz (1994). To elaborate, post-vocalic *w* took part in an early development of diphthongs and long vowels that began in Primitive West Gmc., and continued on through OE. For example, PGmc. $^+$d a u̯ u̯ a, $^+$b e u̯ u̯ a, and $^+$t r i u̯ u̯ i developed into OE *dēaw* 'dew', *bēow*, 'barley', *trīewe* 'true', respectively.[38] Also, PGmc. $^+$x a u̯ i̯ a > WGmc. $^+$x a u̯ u̯ i̯ a[39] > OE *hēġ*, *hīġ* 'hay'; PGmc. $^+$n i u̯ i̯ a > WGmc. $^+$n i u̯ u̯ i̯ a > OE *nīowe*, *nīewe* 'new', and similarly *glīow*, *glīw* 'mirth', *hlēowan*, *hlȳwan* 'warm' (from Campbell, 1959§120).

So, although diphthongs did arise from V+*w* combinations in Primitive West Gmc., their original forms were so obscured by further sound changes that, by the time of OE scribal documentation, they did not appear to be manifestations of breaking in OE. I argue that the development of a transitional glide between vowels and coda *w*, (i.e., breaking) did

---

[38]The first element of the Primitive Gmc. double glide $^+$u̯ u̯ in coda position merged (i.e., underwent nucleation) with the preceding vowel to create diphthongs, namely *au*, *eu*, *iu*, which then developed into *ēa*, *ēo*, and *īe* in OE. From Campbell (1959§120).
[39]Before i̯ , u̯ was doubled in the development of West Gmc. Gemination. See Campbell (1959§407) for full description.

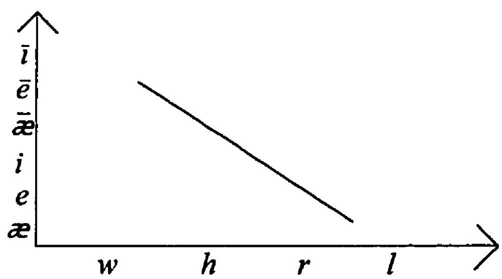
indeed occur in Primitive Gmc., but due to the lack of written documentation in that era, the resulting diphthongs were not recorded. I also suggest that the lack of OE breaking examples before coda- and word-final *w* indicates the early vocalization of this glide in these positions, which is based on the determinations presented by Howell (1991) and Lutz (1994) whereby a post-vocalic segment is more likely to undergo vocalization in a coda position rather than when in the following onset.

The absence of OE breaking documentation in the low vowel *æ* when occurring before *w* in the onset of the following syllable also serves to demonstrate that the development of *w* vocalization was well underway by the OE period. More specifically, I propose that the onset *w* conditioner was already totally vocalized (i.e., was situated in the nucleus) when following *æ* in OE, and at the time of scribal documentation, did not reflect the broken sound that resulted from the development of a transitional offglide between a front vowel its following back consonant. On the other hand, the appearance of breaking digraphs in lieu of *e* and *i* when followed by an onset *w* conditioner signifies the presence of a transitional offglide in these environments, which would therefore indicate that complete nucleation of this glide had not yet transpired in OE. In other words, the *w* conditioner in onset position was not fully vocalized in OE when the preceding vowel space was occupied by *e* or *i*, which, as I argue, was more than likely due to the higher levels of mutational resistance reflected by these vowels.

My hypothesis regarding the rare occurrence of breaking before *w* in OE is based on the determinations in Lutz (1994), specifically that consonantal vocalization occurs earliest in open vowels, and also that breaking is caused by weak consonants in weak phonotactic positions. Accordingly, I suggest that the appearance of digraphs in OE breaking, which is an indication of transitional glide formation, is a scribal portend to the final stage of vocalization, in which a weakened consonant moves into the nucleus of a vowel.

To demonstrate the relationship between breaking and vocalization, I refer the reader back to diagram (24), in which the emergent pattern of breaking occurrence in OE resembles a downward slope, as shown in the following illustration:

(25)



I argue that the falling line in the above diagram reflects the extent of vocalization which has occurred in the four breaking conditioners at the time of OE textual documentation. For example, since the highest position of the line within the graph is situated above *w*, vocalization is well underway in this conditioner. Conversely, the low position of the line over the *l* conditioner indicates that the development of vocalization, which includes both lenition and subsequent nucleation, is in its earliest stages in OE.

3.6. Breaking Conditioner Backness.

Although the breaking interpretations presented in Howell (1991) and Lutz (1994) reveal several insights regarding the weakening development of consonants according to syllable structure constraints, the fact remains that breaking is a process in which front vowels acquire a back offglide when followed by the consonant set (*w*, *h*, *r*, *l*). Consequently, it is generally assumed that each breaking conditioner reflects some quality of backness which determines the development of a back offglide in breaking.

To demonstrate that this assumption is correct, I refer to a diphthong formation process in the tenth century OE dialect of Northumbrian, which can be viewed as a similar diphthongal manifestation as that of breaking in the West Saxon dialect in OE. Presented below are some examples of front vowels which have become diphthongal in Northumbrian, as documented by Jones (1989:55):

(26)

heg	>	*heig*	'meadow'
frægn	>	*fraign*	'he asked'
dryge	>	*druige*	'arid'

If the reader will note, the development of thc palatal offglide, indicated by orthographic *i*, occurs in the same preconsonantal environment as the development of a back offglide in breaking. Due to this positional similarity, it is reasonable to assume that post-vocalic *g* in the above examples would be subject to the same weakening conditions as breaking conditioners, and consequently, a similar transitional offglide development between vowels and articulatorily reduced consonants.

The only difference between the diphthongal development demonstrated in Northumbrian above, and OE breaking is the quality of the offglide; *i* is palatal in the above examples whereas in breaking, a back offglide (*o* or *a*) develops. Jones identifies the *g* segment in the above forms in (26) to be a voiced palatal fricative. Therefore, it would appear that the quality of this developmental offglide is determined by the quality of its following consonant. Correspondingly, it may be concluded that breaking conditioners in OE reflect a back quality, which influences the development of back offglide.

A further implication of these diphthongal developments in Northumbrian and OE breaking is that weakening in consonants, characteristic of the articulatory reduction demonstrated in the vocalization process, does not appear to affect a consonant's inherent place features. Accordingly, Howell (1991:109) states, 'the traditional assumption that the breaking environment in general must be characterized by the feature [+back] . . . can be retained without contradiction'. In the following chapter, I will argue that breaking conditioners are characterized by a [dorsal] place feature.

3.7. Summary.

According to the interpretations of Jones (1989), Howell (1991) and Lutz (1994), breaking is viewed not only as a vocalic mutation, in which front vowels become diphthongal, but also as a manifestation of a consonantal development, in which a consonant becomes reduced in primary articulations due to the weakening properties of a syllable's coda. As such, breaking can be described as a process which involves the interaction of a vowel and its following consonant. Accordingly, I have constructed two parameters of breaking, namely vowel integrity and derivative strength. The first indicates the vocalic properties of the vowels involved in breaking. The second characterizes the consonantal attributes of breaking conditioners. Through the interaction of these parameters within a graph, breaking instances form a pattern, specifically a falling line, which I interpret as a representation of the extent of vocalization in each breaking conditioner in OE.

CHAPTER FOUR

A Featural View of Breaking.

4.1. Introduction.

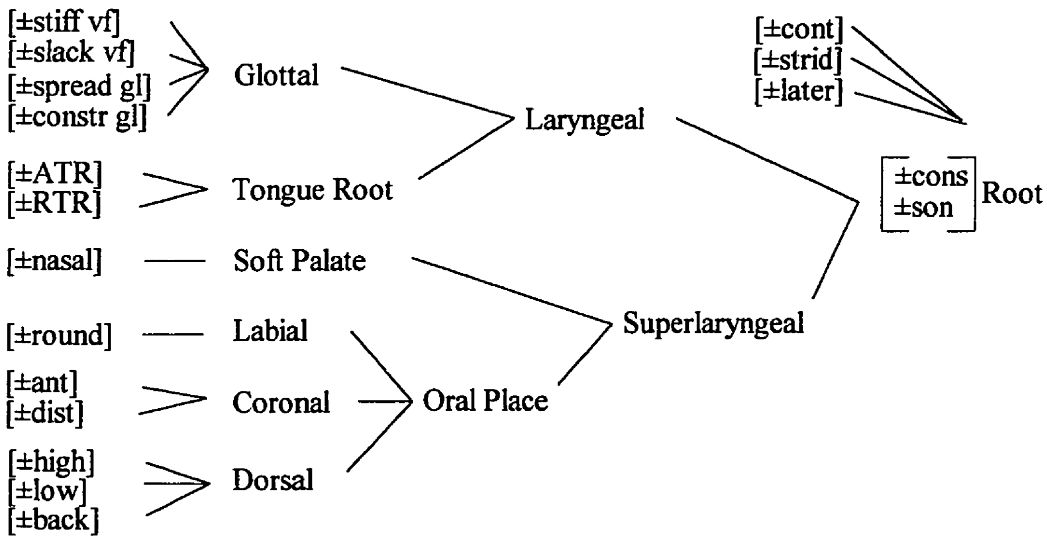
Breaking is a diphthong formation process, in which front vowels (*i*, *e*, *æ*) become diphthongs with a back offglide (*io*, *eo*, *ea*) when followed by *w*, *h*, *r*, or *l*. However, one of the problems that remains unresolved in breaking explanations is the identification of a common relationship between the breaking conditioners that excludes the membership of all other consonants. As such, traditional interpretations have been unable to represent breaking as an exclusive process of assimilation.

The purpose of this chapter is to represent breaking as a unified process. To accomplish this, I will propose that breaking conditioners form a natural class of consonants which are unified by common place features. My analysis will be presented within the framework of feature theory, as developed by Clements (1991). I will then present breaking as a process of assimilation, which adds an association line via spreading to the preceding vowel, thus forming a diphthong, characteristic of breaking. I begin my analysis with a brief outline of feature organization and some of its implications.

4.2. Feature Organization.

In the study of feature theory, the relationship between features and articulators has recently been formalized into a geometrical hierarchy, which portrays features (i.e.,[voice], [sonorant]), articulators (i.e., Labial), and vocal cavities (i.e., Laryngeal); all of which are headed under separate constituents.[40] Shown below is one of the earliest feature organization, referred to as the Halle-Sagey Articulator model (based on Halle 1992):

(27)



A hierarchical organization of features and articulators is advantageous because it is able to convey contrasts between phonological categories, and consequently, identify a natural class.

A natural class is an exclusive group of speech sounds that has one or more features in common. In feature representation, natural classes may be indicated by constituent nodes. That is to say, the speech sounds which are included under the dominion of a constituent node form a natural class. The number of sounds in a natural class will be increasingly

[40]The development of features according to articulators is based on work from Halle & Stevens (1971, 1991), Clements (1985), Sagey (1986), et. al. For discussion and summary, see Kenstowicz (1994, chap. 4) and Goldsmith (1990, chap.6).

reduced as the number of shared features increases. So, a class that is defined by both [±nasal] and [±consonantal] features is more limited than a class which is only unified by the feature [±consonantal]. In general, it can be stated that the position of a constituent node within the feature tree determines the possible membership of speech sounds in a natural class; the closer the constituent node is to the Root, the larger the class.

The organization of features into constituents, or natural classes, also allows for an economical implementation of phonological processes. Feature organization is constructed according to the conventions of autosegmental theory, such that constituent nodes are situated on separate levels, or tiers. Within an autosegmental chart, the Root node is attached to a C- or V-slot on the skeletal tier. Therefore, processes involving certain feature specifications, such as place in assimilation, can be clearly demonstrated within an autosegmental representation. In this regard, a natural class may be defined as a group of features that acts as a functional unit in the application of phonological processes.

4.3. The Development of Feature Hierarchies.

The underlying goal of any feature geometry is to provide a universal and economical organization of features that can accurately convey phonological phenomena in every human language. To that end, the original Halle-Sagey feature model has been subject to revision due to representational limitations, specifically with regard to the expression of linguistic constraints and processes observed in various languages.

One such revision involves the features related to the Root node. According to the articulator feature model in (27), the major class features [±consonantal] and [±sonorant] constitute the root of the tree, and characterize obstruents, sonorants and vocoids (i.e., vowels and glides). Stricture features, notably [±continuent], [±strident] and [±lateral], fall under the immediate domain of the Root node, thus distinguishing various consonantal properties.

However, based on the proposals of Schein & Steriade (1986), McCarthy (1988) and Clements (1990), features that characterize the Root node have recently been determined to be [sonorant], [approximant] and [vocoid], which are assigned positive feature values to distinguish among major sonority classes, as demonstrated in the following (from Clements 1990):

(28)

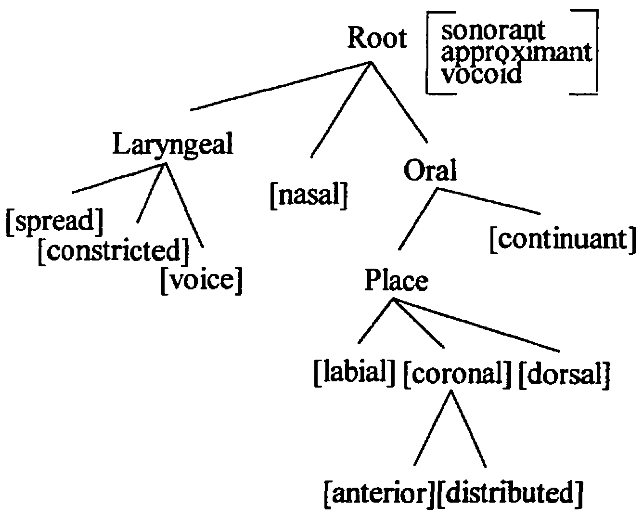
	[sonorant]	[approximant]	[vocoid]
obstruent	-	-	-
nasal	+	-	-
liquid	+	+	-
vocoid	+	+	+

This assignment of root features not only expands the defining realm of major classes to include obstruents, nasals, liquids and vocoids, but also allows for a unified and economical representation of natural process involving these classes at the root-level.[41]

[41]Note in (28) that there is no distinction between vowels and glides; they are collectively classed as vocoids. This lack of differentiation is arguably counterintuitive, since vowels are generally assumed to occupy the nucleus of a syllable, while glides reside either in syllable onsets or codas, where they function as consonantal segments (see Colman 1983, Clements & Keyser 1983, and Vennemann 1988 for elaboration). Furthermore, the assignment of positive values to the major classes in (28) fails to capture the distinction between vowels and approximants; the latter of which includes glides and liquids (i.e., *j*, *w*, *r*, *l*). As such, I

Consequently, the stricture features are either eliminated, as in the case of [±strident], or relocated within the feature tree. For example, the feature [±continuant] is placed under the Oral node, and [±lateral] is reassigned as the feature [distributed], which is dominated by the [coronal] place feature. These revisions are demonstrated in the following geometry (based on Clements & Hume 1995):

(29)



suggest that the sonority class of vocoid should be further divided to reflect distinct vowel and glide classes. To distinguish between vowels and glides according to the root features proposed by Schein & Steriade (1986), McCarthy (1988) and Clements (1990), I propose a revision to the assignment of positive values. Specifically I suggest that vowels should be specified as [+sonorant, -approximant, +vocoid], while glides should be specified as [+sonorant, +approximant, +vocoid]. This value reassignment distinguishes vowels from glides with a contrastive [approximant] specification; the distinction between glides and liquids is indicated by opposing [vocoid] values.

In the following section, I will further examine the development of feature organization, specifically with regard to the theories presented by McCarthy (1991) and Clements (1991).

4.4. McCarthy (1991).

Based on phonological evidence in Semitic languages, McCarthy (1991) observes that pharyngeal consonants pattern as a natural class of sounds. Accordingly, he proposes that an additional place-node constituent characterizing pharyngeal consonants is a necessary component in feature organization. In this section, I will discuss the properties of pharyngeals, namely gutturals and emphatics, and the significance of these segments in feature representation. The parallels between uvulars and emphatics will also be examined. Finally, McCarthy's (1991) revision of the Place node to include a pharyngeal constituent will be provided.

Semitic languages demonstrate an elaborate system of pharyngeal consonants, which can be divided into two subclasses, namely gutturals and emphatics. Gutturals are produced at the hindmost region of the vocal apparatus between the larynx and oropharynx, and include laryngeals [ʔ, h], articulated at the glottis; pharyngeals [ʕ, ħ], which involve the tongue root forming a constriction in the lower pharynx; and uvulars [χ, ʁ], which are formed by a constriction produced between the tongue-dorsum and the back wall of the oropharynx. Acoustically, gutturals demonstrate relatively high formant frequencies,[42] and

[42]For numerical Hz values, refer to McCarthy (1991), section 12.2.1.

are also characterized by approximant strictures. In other words, gutturals are defined at the root node by the feature [+approximant].[43]

In the Semitic languages described by McCarthy, gutturals pattern as a natural class with regard to vowel lowering, avoidance of syllable-final position, geminate cluster prohibition and lastly, cooccurrence restrictions which disallow the presence of two or more of the same type of consonants within a root. Due to these shared characteristics of laryngeals, pharyngeals and uvulars, McCarthy (1991) determines that these guttural segments form a natural class of consonants, characterized by primary pharyngeal constrictions. Ergo, he argues that pharyngeals must be represented by a unique place-node constituent within feature geometry.

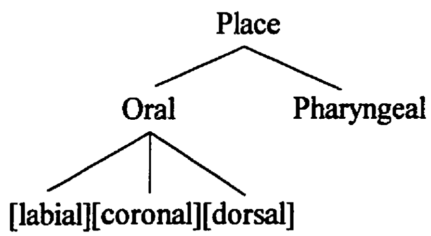
It would appear that McCarthy's proposed pharyngeal constituent node is necessary, though this particular class of sounds is not indicated within the Halle-Sagey model. Recall that in this early feature geometry, as shown in (27), the sounds characterized by Glottal or Tongue Root features fall under the domain of the Laryngeal node. Although the [spreadgl] feature, executed by the Glottal articulator, may account for laryngeals, and the [RTR] feature could possibly characterize pharyngeals, uvulars cannot be represented under the Laryngeal constituent because they are produced by the tongue-dorsum (i.e., the Dorsal articulator), which, according to the Halle-Sagey model, is an Oral Place constituent, dominated by the Suprlaryngeal node. Hence, gutturals are not represented as a natural class of features headed by a common constituent node in the Halle-Sagey model, even

[43]Except for possibly the glottal stop [ʔ].

though they pattern as a natural class with respect to their phonetic and phonological attributes.

Within feature theory, McCarthy determines that the Pharyngeal constituent should not be placed under the Laryngeal node, but rather within the constituency of Place, because gutturals are functionally similar to oral consonants with regard to root cooccurrence restriction and vowel lowering. In the following diagram, McCarthy's (1991) revision of feature organization is provided, which includes the place feature Pharyngeal:

(30)



Note in the above diagram that the Pharyngeal constituent is dominated by the Place node. McCarthy argues that a separation of Oral and Pharyngeal constituents is necessary to indicate the divergent behaviour of gutturals from oral consonants in Arabic. For example, vowel-to-vowel assimilation is blocked by oral consonants, but not by gutturals.[44] The structural representation of gutturals, and their transparency in spreading, will be more fully discussed in the following section.

---

[44]Based on Steriade (1987).

Semitic languages also demonstrate a set of emphatic consonants, which involve both Oral and Pharyngeal constrictions. Emphatics include coronal fricatives (*S, Z*) and stops (*T, D*), along with the uvular stop (*q*). Structurally, they are represented with oral articulations, specifically the [coronal] feature for coronal emphatics, and [dorsal] for the uvular stop, along with pharyngeal constrictions.

Traditionally, emphatics are described as pharyngealized consonants, although McCarthy cautions that 'the so called pharyngealized consonants of Arabic should really be called uvularized' (1991:219). This caveat is derived from the fact that both emphatics (*T, D, S, Z, q*) and uvulars (χ, ʁ) demonstrate similar constrictions at the oropharynx. Furthermore, during the course of diachronic change, if emphatics lose their primary point of articulation, a uvular consonant remains (i.e., in Arabic, *nZr* > *nʁr* 'guard'). Finally, emphatics and uvulars pattern as a natural class of consonants, which conditions vowel backing in some Arabic languages.[45] Specifically, back vowels [a, u] occur when immediately adjacent to the following consonants (*S, Z, T, D, r, χ, ʁ, q*); front vowels occur elsewhere. McCarthy (1991) determines that this backing occurs due to the spread of [dorsal], which is present in both uvulars and emphatics. Accordingly, McCarthy concludes that emphatics and uvulars form a natural class of sounds, distinguished by both [dorsal] and [pharyngeal] articulations.

This conclusion is also reached by Herzallah (1990) in an investigation of vowel dorsalization in Palestinian Arabic. She observes that stem vowels are substituted with [u]

---

[45]Specifically Sibawayh and Palestinian; see McCarthy (1991:220) for particulars.

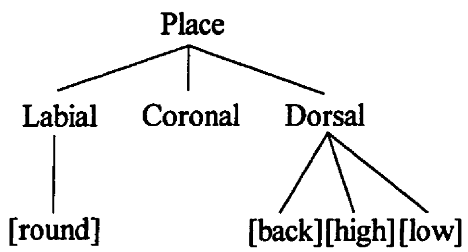
in the perfective form when followed by emphatics and uvulars, and formalizes this process as a spread of [dorsal] from the pharyngeal consonant to the place node of the original vowel. Ultimately, Herzallah concludes that emphatics and uvulars form a natural class of consonants, which are uniquely specified with both [dorsal] and [pharyngeal] place features, thus discerning them from other consonants, including velars. She further contends that uvulars are specified with a primary dorso-pharyngeal constriction; in emphatics, this constriction is secondary.

4.5. Clements (1991).

Within this section, I will examine Clement's (1991) unification of consonantal and vocalic place features. In response to the inability of the Sagey (1986) feature hierarchy to indicate place preservation in strengthening and weakening processes, Clements (1991) proposes a separation of vocalic and consonantal constituents within feature organization.

Shown in the following is a representation of place features according to Sagey (1986), which characterizes both consonants and vowels:

(31)



Note in the above diagram that the dependency of the features [back], [high] and [low], subsumed under the Dorsal node, appear to represent a connection between the vowels and consonants produced by the tongue dorsum. Further note that there is no relation indicated between vowels and coronal consonants, since, within this model, vowels may only be produced the Labial and Dorsal articulators. As a result, the representation of place preservation in processes of strengthening and weakening becomes problematic.

Based on cross-linguistic data, there is a general tendency for palatal consonants to weaken to palatal vocoids, and for palatal vocoids to strengthen to palatal consonants.[46] However, this relationship between consonants and vowels, with regard to place of articulation, is not clearly demonstrated in the Sagey model, as seen in (31) above. For example, it would be expected that features which characterize palatal vowels are assigned to the Coronal node, since strengthening and weakening processes tend to preserve their place of articulation.

---

[46]Refer to section 3.3 of Clements (1991) for specific examples and references.

Furthermore, it is generally the case that both velar and labial consonants weaken to labio-velar vocoids (*u, w*), and these vocoids strengthen to either a labial or velar consonant. Note, however, that the separation between the Labial and Dorsal constituents, shown in (31), cannot capture the development of a labial glide to a dorsal consonant in strengthening. Overall, the Sagey model cannot fully account for place feature relationships between consonants and vowels in certain phonological processes.

Clements (1991) argues that the preservation of place features in strengthening and weakening, along with other natural processes such as assimilation, indicates that consonants and vowels with shared articulatory constrictions operate as a single functional unit in phonological processes, and therefore constitute a natural class. He defines these natural classes, which are unified by place of articulation, as follows:

a) [labial] - which involves lip constriction for the production of lability in consonants, and rounding in vowels.

b) [coronal] - which characterizes apical consonants and front vowels produced by the front blade or tip of the tongue.

c) [dorsal] - involving constriction at the centre or back of the tongue, for the production of velar and uvular consonants, and back vowels.

d) [pharyngeal][47] - where a constriction exists at the lower pharynx, for pharyngeal and laryngeal consonants; vowels are low and pharyngealized.

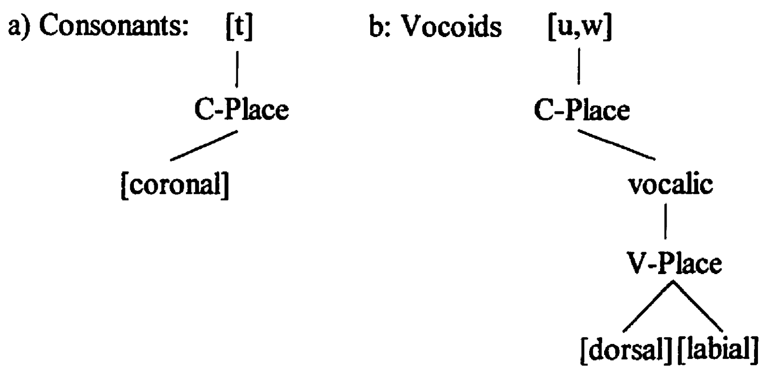
---

[47]Clements follows the arguments in McCarthy (1991) regarding [pharyngeal] as a place feature.

Note that since the above place features represent both vowels and consonants, the [back], [high], [low] and [round] features, which characterize vowels in the above geometry proposed by Sagey (1986), become redundant.

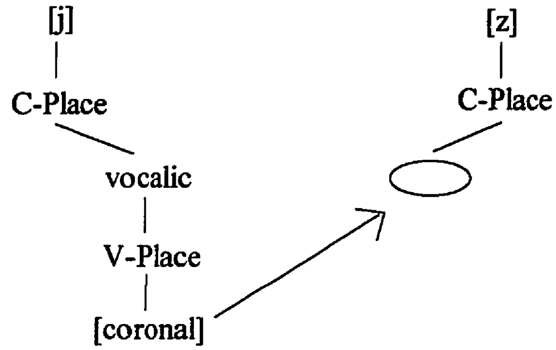
In order to represent the place feature relationship among consonants and vowels without compromising the [±consonantal] class distinction between the two, Clements (1991:78) segregates the place features of consonants from those of vowels, in effect, linking them to separate tiers within the feature tree, as demonstrated in the following diagram:

(32)



So, according to the organization of place features, as shown above, strengthening and weakening processes can be viewed as place feature reassignments. For example, strengthening in a vocoid is demonstrated as a relocation of a feature(s), specified under V-Place, to C-Place, as shown in the following, where [j] > [z]:

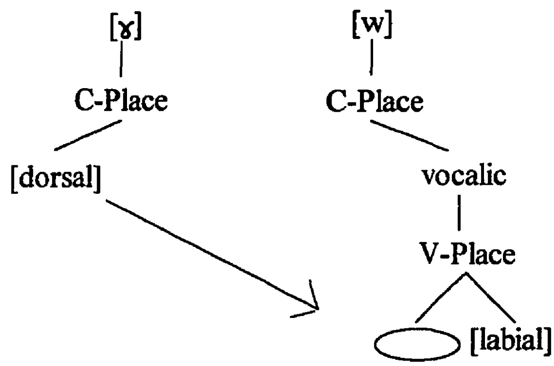
(33)



Note that the [coronal] feature is only reassigned to C-Place, in other words, it is not newly created as a primary place feature, which corresponds with the demonstration of place preservation, cross-linguistically.

Weakening, on the other hand, involves the transference of a feature(s), specified under C-Place, to V-Place. In the following, I demonstrate the development of weakening as observed in OE [ɣ] *boga* > ME [w] *bowa* 'bow':

(34)



Note that the [labial] feature is assigned by a default rule, since the velar glide [w] is also specified as labial underlyingly.[48] This dual specification is able to capture the development of labial consonants to labial vocoids (i.e., [b] > [w]), and also that the labio-dorsal glide [w] may either develop into a labial [b], or velar [ɣ]consonant. From these developments, it can be generalized that place features are typically preserved, not created, in strengthening and weakening. Put another way, a place feature which is not present in the original segment will more than likely not surface in its weakened or strengthened reflex.

Ultimately, the place feature organization presented by Clements (1991) is advantageous because it can clearly indicate the place affinity between consonants and vocoids in natural phonological processes. In the following sections, I will present an application of certain phonological considerations expressed in McCarthy (1991), Herzallah (1990), Iverson, Davis & Salmons (1994) and Howell (1991), within the framework of

[48]See Herzallah (1990).

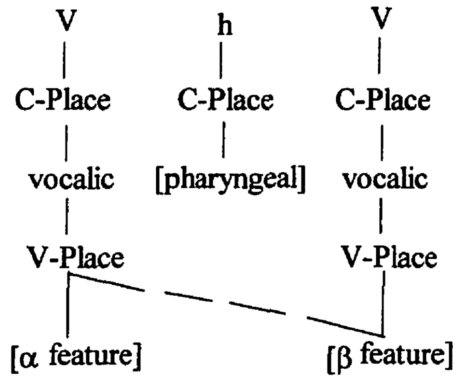
Clements (1991); all of which will be a necessary prelude to my analysis of breaking conditioners and their corresponding feature structures.

4.5.1. Assimilation, and Secondary V-Place Barriers.

The separation of consonantal and vocalic place features proposed by Clements (1991) is insightful with regard to the behaviour of consonants and vocoids in assimilation processes. As outlined in chapter 2, assimilation is represented by the addition of an association line from one segment to another, which is generally referred to as spreading. According to autosegmental theory, association lines may not cross. Therefore, an intervening vocoid would block place feature spreading between two consonants because its V-Place specifications are situated at the lower most level of the autosegmental chart. Conversely, a consonant that is only specified with a C-Place feature would not present any barriers to assimilation from one vocoid to another, since the C-Place node is situated on a higher level in the feature organization. This may be demonstrated with vowel-to-vowel assimilation in Arabic.

Recall from section 4.4 that McCarthy (1991) separates pharyngeal place features from oral place features to account for the observation that vowel assimilation occurs freely over gutturals. Within the framework of Clements (1991), the features of gutturals would be specified under C-Place, because they do not block spreading between adjacent vowels, as presented in the following:

(35)

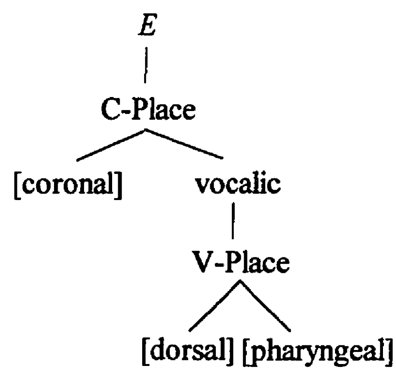


The above representation specifically demonstrates assimilation across an intervening laryngeal [h]. McCarthy (1991) determines that all gutturals are transparent in vowel-to-vowel assimilation in Arabic. Therefore, in addition to laryngeals, pharyngeals and uvulars would be also specified with the feature [pharyngeal] under C-Place.

In effect, assimilation may be used as a test to determine the underlying structure of consonants. To be sure, an intervening consonant which does not hinder assimilation from one vowel to another would only be specified with C-Place features. On the other hand, if vowel-to-vowel feature spreading is blocked, then the intervening consonant would have underlying V-Place specifications, or secondary articulations.

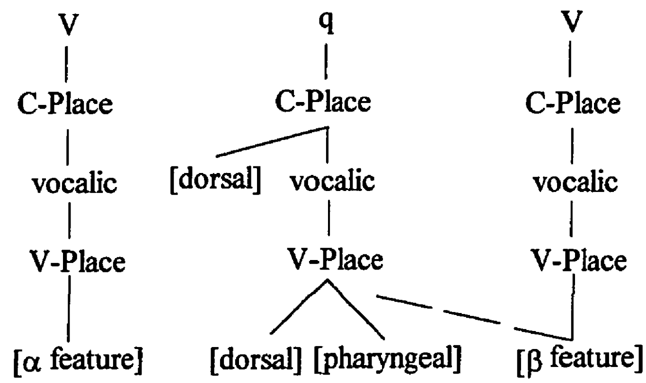
Clements (1991) represents secondarily articulated consonants (e.g., PIE $^{+}k^{w}$) as a merger of primary and secondary features, with primary constrictions subsumed under C-Place, and secondary constrictions specified as V-Place features. Based on the determinations of both McCarthy (1991) and Herzallah (1990), emphatics are complex segments, with both oral and dorsal-pharyngeal constrictions, and can be represented as secondarily articulated consonants. Below is a general representation of coronal emphatics (*T, D, S, Z*), which I will collectively designate as *E*:

(36)



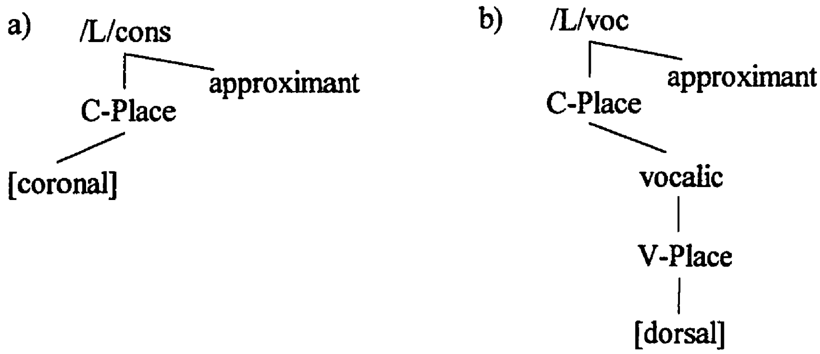
It seems reasonable to assign the place features of secondarily articulated consonants under V-Place, since these consonants act as barriers in assimilation processes. For example, McCarthy (1991) notes that the uvular stop *q*, which is also an emphatic, blocks vowel-to-vowel feature spreading in Arabic, which is demonstrated as follows:

(37)



In a similar exercise, Iverson, Davis & Salmons (1994) suggest that assimilatory processes in Old High German (OHG) are blocked by consonants with secondary V-Place articulations. In OHG, vowel umlaut is hindered when *rC* and *lC* clusters occur between short *a*, and (*i*, *j*) in the following syllable. Based on the proposal in Howell (1991), specifically that liquids condition OE breaking only when they have been reduced in primary articulations, Iverson, Davis & Salmons (1994) suggest that the primary articulations of liquids in OHG have also been reduced, rendering vocalic liquids in preconsonantal position. The difference between vocalized liquids and their consonantal counterparts in OHG is represented in Iverson, Davis & Salmons (1994:140) as follows:

(38)



Ultimately, Iverson, Davis & Salmons (1994) conclude that the V-Place feature specifications of preconsonantal *r* and *l* in OHG block the spread of place features between vocoids, which accounts for the failure of umlaut in these environments.

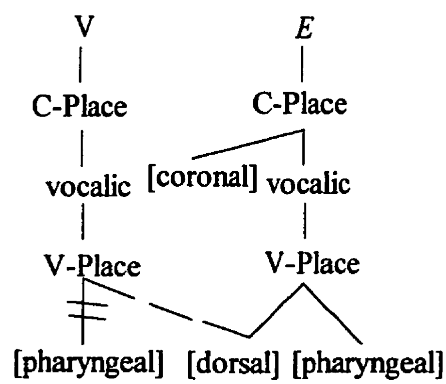
It would appear, from the above representations in (38), that the development of a consonantal liquid to one that is vocalized via reduction in OHG is that of a weakening, in which a [coronal] consonant becomes a [dorsal] vocoid. However, according to the tendency of place preservation in weakening processes, it would generally be expected that the V-Place of the vocalized liquid, in (38b), would be specified with the feature [coronal] instead of [dorsal], after it had been reassigned from C-Place.

In section 4.6.2., I will suggest that preconsonantal liquids in OE are secondarily articulated consonants underlyingly. As such, there is no need for feature reassignment from C-Place, because V-Place feature specifications are already present. My proposal removes any inconsistencies with place preservation that may arise after the reduction of primary articulations.

4.5.2. Vowel Dorsalization.

In this section, I present the process of vowel dorsalization in Arabic, which is triggered by both emphatic consonants and uvulars. Before emphatics, this vowel mutation appears in the imperfective form, yi-ɣdu̱ṛ 'betray' (Herzallah 1990), which is derived from its perfective form ɣada̱ṛ (a → u /_ṛ). To represent vowel dorsalization before emphatics, an association line is added between the terminal feature of the emphatic, and the V-Place of the preceding vowel, with concomitant delinking, indicated by the transverse lines, as shown in the following:

(39)



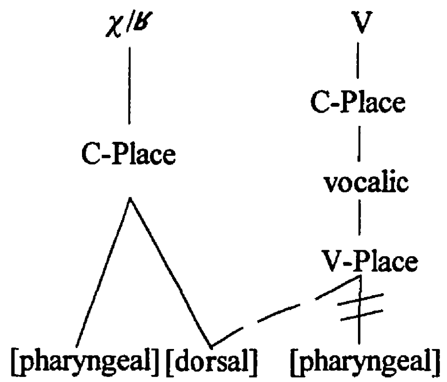
Note that the [coronal] feature, specified under C-Place of the emphatic *E*, does not present a barrier to spreading because it is situated on a higher tier in the feature organization.

Also note the sequential order of features under V-Place of the emphatic consonant, which is firstly [dorsal] and secondly, [pharyngeal]. This ordering appears necessary for the emphatic to condition dorsalization in the preceding vowel. To elaborate, if the ordering of the emphatic's place features were reversed, for example, [pharyngeal]-[dorsal], the leftward spread of the [dorsal] feature to the V-Place of the preceding vowel would have to cross over the association line connecting [pharyngeal] with V-Place of the emphatic. This, however, is not allowable according to the No Crossing Condition (NCC) stated within the tenets of autosegmental representation.[49] I now describe the dorsal influence that uvulars have on Arabic vowels.

Vowel dorsalization conditioned by uvulars in Arabic can be viewed in the imperfective form yi-sχ<u>un</u> 'get hot', which is derived from the perfective form saχ<u>an</u> (a → u /χ_).[50] According to McCarthy (1991) and Herzallah (1990), uvulars are specified with [dorsal] and [pharyngeal] features, which are both primary constrictions. Vowel dorsalization occurring after uvulars is represented as follows (from Clements 1991:88):

[49]See Goldsmith (1990) and Clements (1991).
[50]From Herzallah (1990).

(40)



Note above that in the uvular segment, the features under C-Place are ordered as firstly [pharyngeal], and secondly [dorsal], which is opposite to the placement of the same features under V-place of the emphatic, presented in the previous diagram (39). However, in order for the uvular to condition vowel dorsalization in a following vowel, its place feature order, specifically [pharyngeal]-[dorsal], is required to demonstrate the rightward spread of [dorsal] to the V-Place node of the following vowel without line crossing. This random feature arrangement elucidates one of the basic premises in Clements (1991), specifically that the ordering of features within a plane/tier (i.e., V-Place) is arbitrary. This condition will be further discussed in section 4.5.4.

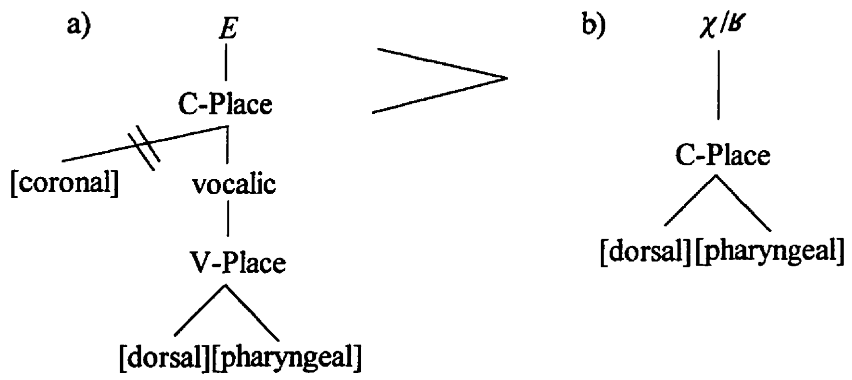
Due to the influence of vowel dorsalization exerted by emphatics and uvulars, McCarthy (1991) determines that, in addition to their guttural-class membership, emphatics and uvulars form a subclass of consonants, which is characterized by both [dorsal] and [pharyngeal] features. This determination is also based on historical changes in Arabic which demonstrate uvular reflexes of emphatic consonants.

4.5.3. Loss of Primary Articulations.

In this section, I provide representations for a diachronic change in Arabic, in which emphatics from early dialects lose their primary articulations to become uvulars in later dialects. At this point, it must be stated that if primary articulations of a secondarily articulated consonant are lost, then the secondary V-Place features are automatically reassigned to C-Place in order to maintain its consonantal status, since true consonants must have their stricture features executed by a primary articulator (Halle 1989). This reassignment of secondary features to C-Place is referred to by Clements (1991) as the process of promotion.

In the following diagram, the loss of primary articulations of coronal emphatics is represented by the delinking of C-Place, indicated by the transverse lines in (41a). Promotion is demonstrated in (41b) as a reassignment of the secondary feature of the original emphatic to C-Place, which renders a uvular consonant (χ, ʁ):

(41)



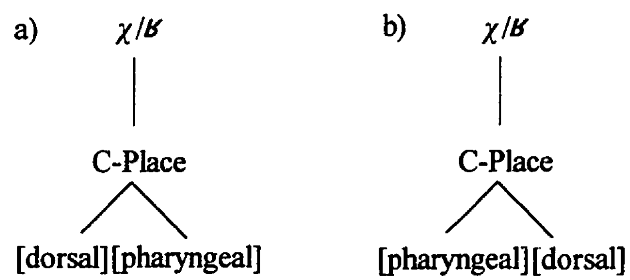
Note above that without promotion, the loss of primary articulations would render an ill-formed structure, specifically a vocoid that is characterized by [dorsal] and [pharyngeal] features, which does not appear in vowel inventories cross-linguistically. Therefore, promotion can be viewed as a default rule, which acts in accordance with well-formedness conditions to ensure the creation of a phonologically plausible structure.

If the reader will also note in (41a), the loss of primary articulations through delinking is surely reminiscent of the characterization of liquid reduction, stated by Howell (1991:41), in which 'the constriction at the primary point of articulation . . . tends to be weakened or stripped away altogether'. Recall that Howell determines articulatory reduction to be the precursor to the diphthongal development in OE breaking. However, based on vowel dorsalization in Arabic, demonstrated in diagram (39), the loss of primary articulations in emphatics (i.e., secondarily articulated consonants) is not necessary for a vowel to undergo dorsal mutation, because C-Place features do not block spreading between V-Place feature specifications.

4.5.4. A Problem with Coarticulated Segments.

Recall from section 4.5.2., that according to the hierarchical feature organization proposed by Clements (1991), the order of features specified under a class node appears to be arbitrary. For example, the branching arrangement of [dorsal] and [pharyngeal] features, specified under C-Place in the representation of a uvular segment, can be switched, as demonstrated in the following diagram:

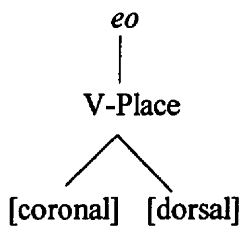
(42)



In the above examples, the different orderings of [dorsal] and [pharyngeal] are inconsequential, because these features are simultaneously realized in a uvular consonant. In other words, a uvular is a coarticulated segment, which is specified with both [dorsal] and [pharyngeal] place features.

However, this begs the question of how the feature organization presented in Clements (1991) differentiates between coarticulated segments and those which are sequentially realized.[51] For example, diphthongs (e.g., *eo*, *au*, etc.) involve a linear timing of multiply associated vocalic elements with differing qualities, or place features, as shown in the following:

(43)

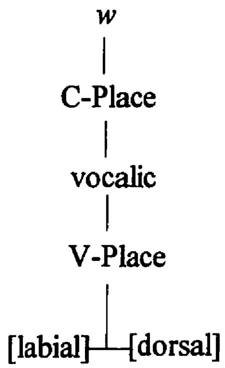


Note that the order of [coronal] and [dorsal] place features in the above representation is essential to indicate the sequential production of the vocalic *e-* element, followed by the *-o* element, in the realization of the diphthong *eo*.

In order to distinguish between coarticulated segments (i.e., χ, *w*), and sequentially realized segments, (i.e., diphthongs), I suggest a modification to the feature structure presented by Clements (1991). Specifically I propose a revamping of association lines between a place node and its terminal features in coarticulated segments. In the following diagram, I present my revision of place feature structure, with the representation of *w*; a dorso-labial, coarticulated glide:

[51] I am grateful to both Dr. Robert Murray and Dr. Michael Dobrovolsky for pointing out this problem.

(44)



Note that the [labial] and [dorsal] features are attached to the opposite ends of a horizontal line. This line serves as a bridge between terminal features. The feature bridge is then connected to one vertical association line, which links it with the V-Place node. Assuming that the feature bridge is pivotal, terminal features would then be able to circulate, and thusly, change positions within an autosegmental tier.

I base this modification of association lines on what is referred to as the *spiral-notebook* model of features, in which terminal features are associated to the root node in a similar manner to which individual pages of a notebook are attached to its spiral spine.[52] Accordingly, there is no precedence of terminal features, since, as compared with the nature of a circle; a starting place for feature specification does not exist.

[52]Goldsmith (1990) comments that this model of feature organization, proposed by Halle in the 1970s, is an alternative to the class-node model, as presented by Mohanan (1983), Clements (1985) and Sagey (1986). The *spiral-notebook* model is also referred to *rollodex* or *bottle brush* models. See Goldsmith (1990:279-298) for full discussion.

It must be stated that the purpose of this modification is to distinguish between simultaneously and sequentially realized segments within the place feature organization presented by Clements (1991). Of course, I acknowledge that my modification of association lines within a feature hierarchy may present complications in the representation of other phonological phenomena, and surely, this is an area in need of future research. However, in order to clearly represent the process of breaking in OE, I argue that my structure revision of coarticulated segments is necessary.

4.6. Featural Representations of Breaking Occurrence in OE.

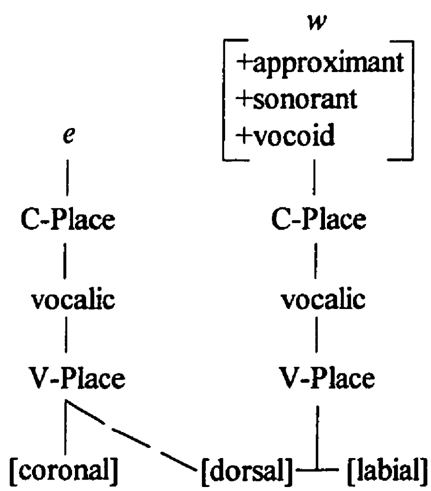
In this section, featural representations of the breaking process in OE will be provided, according to the place feature organization presented within Clements (1991). Specifically, I will determine the underlying feature structures of breaking conditioners, as I interpret them, according to various descriptions of conditioner realizations in OE breaking explanations. The development of breaking diphthongs in OE will be represented as a process of assimilatory spreading, which involves the addition of an association line between consonantal conditioners and their preceding vowels. I begin my analysis with a representation of breaking before *w*, since the feature structure of this glide is well established, and the least controversial of all the breaking conditioners.

4.6.1. OE Diphthong Formation before *w*.

The breaking conditioner *w* effects diphthong formation in the front vowels *e* and *i* when it is situated in the onset of the following syllable. In OE, *w* is traditionally described as a velar glide, or a dorso-labial approximant. According to place feature organization presented in Clements (1991), *w* is represented as a vocoid, with both [labial] and [dorsal] features specified under V-Place.

I represent breaking before *w* as a leftward spread of the terminal [dorsal] feature from the V-place node of the *w* conditioner, to the V-Place of its preceding vowel, which forms a diphthong characterized with [coronal] and [dorsal] articulations. This process of diphthong formation before *w* in OE is shown in the following:

(45)



Note in the above diagram that the association line between the vowel's [coronal] feature and its V-Place node is not delinked, as this would indicate complete assimilation. In this manner, breaking is represented as an instance of partial assimilation, because the front vowel does not lose its [coronal] specification; it only acquires the terminal [dorsal] feature from the following consonant.

4.6.2. OE Diphthong Formation before Preconsonantal Liquids.

In order to condition the development of diphthongs with back offglides, preconsonantal liquids in OE are traditionally assumed to be velarized, dark, or gutteral variants.[53] In remaining positions, non-syllabic liquids in OE are generally determined to be apical in articulation.[54] Lutz (1994:179) describes breaking liquids as 'weakened, partially vocalised, velar allophones'. In Howell (1991), it is argued that the [+back] offglide in breaking diphthongs, which occurs before preconsonantal liquids in OE, is influenced by secondary velar, or pharyngeal, constrictions, which persist after the alveolar point of articulation in a liquid has been lost through reduction.

According to these descriptions, I propose that OE breaking liquids are consonants which are underlyingly specified with secondary articulations. I also suggest that the development of back offglides in OE diphthongs before breaking liquids can be compared with the assimilatory process of vowel dorsalization in Arabic (in 4.5.2.), which is influenced by secondarily articulated consonants known as emphatics (Herzallah 1990).

---

[53]Campbell (1959), et. al.
[54]Moulton (1954), Kuhn (1970), et. al.

4.6.2.1. Breaking Influence of *r*, and its Diachronic Development.

In order to represent breaking before *r*, I contend that preconsonantal *r* in OE is a secondarily articulated variant, with primary [coronal] articulations, and secondary uvular constrictions. I assume that the breaking conditioner *r* is specified with the primary C-Place articulation [coronal] based on the evidence presented in Howell (1991), in which preconsonantal *r* is assumed to be apical before reduction. My determination that the *r* conditioner in breaking reflects secondarily articulated uvular constrictions is based on Lass & Anderson (1975:86), in which preconsonantal *r* in OE is realized as a 'uvular continuant'. In Howell (1991), it is suggested that the *r* conditioner in breaking, which is assumed to be reduced of primary articulations, is also characterized with secondary pharyngeal articulations. As Howell (1991:41) states, this 'reduced form is much more vowel-like than the syllable-initial liquid although secondary constrictions . . . such as the pharyngealization common in rhotics, may remain'. My proposal that uvular constrictions are underlyingly present in preconsonantal rhotics in OE is further substantiated by the existence of post-vocalic uvular [*R*] forms in Gmc. dialects, including Standard German.[55]

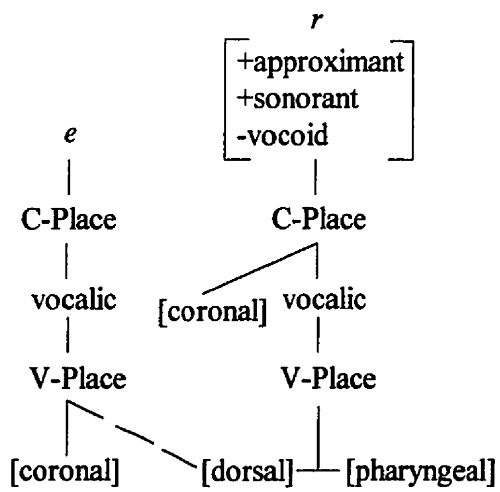
According to McCarthy (1991) and Herzallah (1990), segments with uvular constrictions are specified with both [dorsal] and [pharyngeal] features. Ultimately, I

---

[55]For the distribution of uvular /*R*/ in German, see Tracy Alan Hall (1993). For other modern dialects of German that contain uvular /*R*/, see Howell (1991). Howell argues against uvular liquid conditioners in OE because he assumes that only consonants which have been stripped of their primary articulations can influence the diphthong formation characteristic of breaking. However, I do not assume that preconsonantal *r* in OE was realized with primary uvular constrictions; instead I argue that the *r* conditioner in breaking is articulated with secondary uvular constrictions.

propose that the *r* conditioner in breaking is structurally similar to an emphatic consonant, seen in (39), which influences vowel dorsalization in Arabic through the spread of the feature [dorsal]. Within the framework of Clements (1991), I represent breaking before *r* in the following:

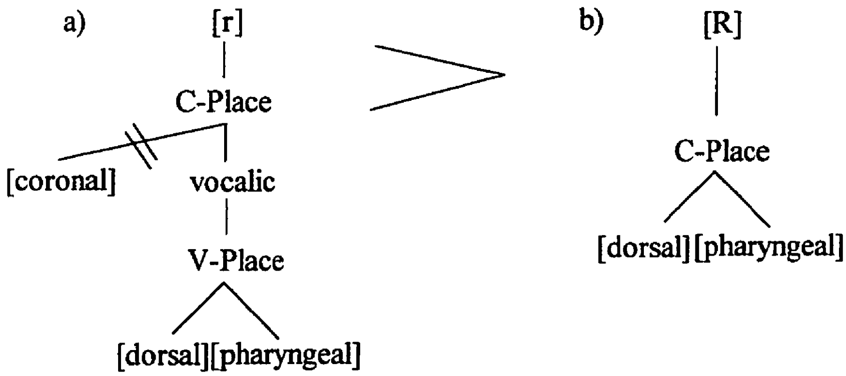
(46)



Note in the above diagram that the [coronal] specification under C-Place does not present a barrier to spreading because it is situated on a higher level in the feature tree.

I now provide a diachronic representation of the development of the traditionally assumed apical *r in PIE to its uvular reflex /R/ in later Gmc. dialects. My presentation parallels the analysis of historical changes in Arabic, as presented by both McCarthy (1991) and Herzallah (1990), in which an emphatic consonant loses its primary place of articulation, resulting in a uvular consonant, as demonstrated in (41). Accordingly, I represent the development of uvular [R] forms in Gmc. (< [r]) by delinking the primary [coronal] specification from C-Place in the secondarily articulated consonant, shown in (47a). The concomitant promotion of secondary [dorsal] and [pharyngeal] features from V-Place to C-Place is shown in (47b), and occurs due to well-formedness conditions. The diachronic development of PIE ⁺r > Gmc. /R/ is demonstrated in the following:

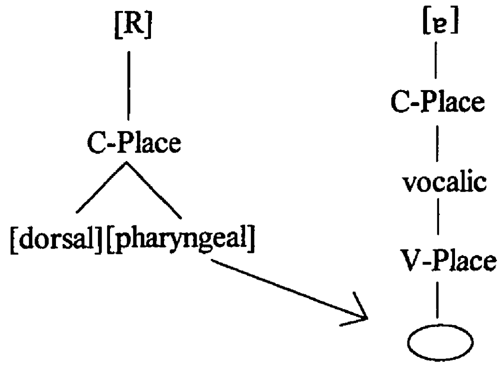
(47)



I also assume that the further development of [R] > [ɐ], which is demonstrated in Gmc. dialects,[56] is a weakening process, in which the primary [pharyngeal] feature of uvular [R] is reassociated from C-Place to V-Place, thus forming the vowel [ɐ], shown in the following:

[56]In Standard German, 'vocalised /R/ is traditionally transcribed as [ɐ]' (Hall 1993). Note that this phonetic value [ɐ] is similar to the value Howell (1991) assumes for reduced *r* in Gmc., which resembles an [a]-like vowel, after its primary articulations have been stripped away.

(48)



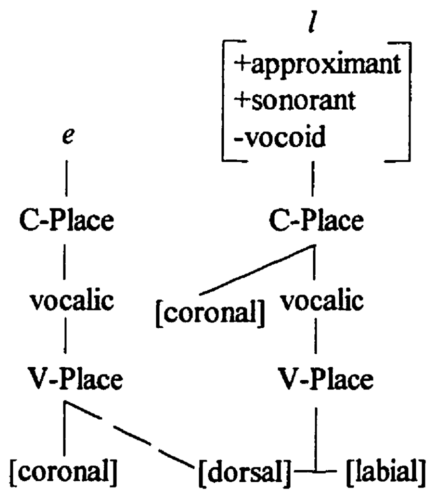
I now turn to the representation of diphthong formation before preconsonantal *l* in OE breaking.

4.6.2.2. Breaking Influence of *l*, and its Diachronic Development.

To represent breaking before *l*, I assume that preconsonantal *l* in OE is a secondarily articulated variant with primary coronal articulations and secondary velar constrictions. According to traditional interpretations (Campbell 1959, Kuhn 1970, Lass & Anderson 1975), preconsonantal *l* is a velarized variant [ɫ]. Howell (1991:71) also assumes that 'the *l* variant responsible for Old English breaking must have been some sort of dark velar [ɫ]', and cites Jones (1956:176), who describes [ɫ] as a liquid variant produced with [u]-like constrictions while retaining its tongue-tip articulation. Within Clements (1991), [u]-like sounds are specified with both [dorsal] and [labial] articulations under V-Place.

Based on these descriptions, I propose that the *l* conditioner in breaking is a secondarily articulated consonant, which is specified with a [coronal] feature under C-Place, and [dorsal] and [labial] specifications under V-Place. I also view the diphthong formation characteristic of breaking before *l* as a similar process of assimilation to that of vowel dorsalization in Arabic, effected through the leftward spread of the feature [dorsal] (as seen in diagram 39). Within the framework of Clements (1991), I represent the development of a diphthong before *l*, characteristic of OE breaking, in the following:

(49)

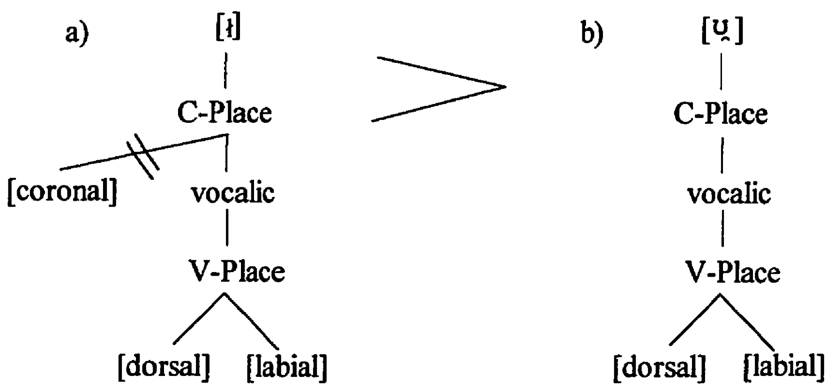


To represent the further development of [ɫ] > [u̯] in Gmc. dialects, demonstrated in Cockney forms, such as [f o u̯] 'fall', [m ɪ u̯ k] 'milk' and [ʃ e u̯ f] 'shelf',[57] I delink the

[57]From Lutz (1994:174). Thanks to Dr. Dobrovolsky for pointing out the glide status of [u̯] in these forms.

[coronal] feature from C-Place, shown in (50a) below, which renders a vocoid, demonstrated in (50b), which retains its secondary [dorsal] and [labial] V-Place features:

(50)



Note in the above diagram that promotion does not occur, because vocoids with [dorsal] and [labial] V-Place specifications are well-formed, cross-linguistically.

If the reader will recall from section 4.5.3., I compared the loss of C-Place articulations through delinking with that of liquid reduction, in which primary articulations of liquids are diminished, or eliminated altogether (Howell 1991). Correspondingly, I interpret the development of [ɫ] > [ʊ̯], and also [r] > [R], as processes of reduction.[58] However, contrary to Howell's (1991) breaking analysis, I do not assume that reduction is the precursor to breaking because, as shown in (39) with Arabic vowel dorsalization before emphatics, the spread of V-Place features may proceed even when a consonant is specified with primary C-Place articulations. In other words, C-Place specifications are not barriers to assimilation between V-Place features.

[58]I interpret the development of [ʊ̯] > [u], and [R] > [ɐ] as processes of vocalization.

Overall, I assume that only preconsonantal liquids in OE are specified with secondary constrictions. Syllable-initial and word-final liquids are characterized with C-Place, but no V-Place articulations, as shown in the following:

(51)

```
      L
      |
   C-Place
      |
  [coronal]
```

The lack of diphthong formation characteristic of breaking before syllable-initial and word-final liquids can therefore be explained by the exclusive C-Place feature specification in these variants of liquids. That is to say, breaking in OE only occurs before liquids which are positionally specified with secondary V-Place constrictions.

4.6.3. OE Diphthong Formation before Post-Vocalic *h*.

In this section, I will attempt to determine the realization of the *h* conditioner in breaking, specifically with regard to its featural characteristics. To capitulate at this point, post-vocalic *h* in OE is traditionally reconstructed as the voiceless velar fricative [x] (Campbell 1959, et. al.). The velar quality in this fricative has consequently been viewed as the conditioning feature that influences the development of a back offglide in OE breaking.

The basic problem with this assumption is that other velar consonants in OE, namely the voiced velar fricative [ɣ] and the voiceless velar stop [k], do not condition breaking.

In response to this problem, Howell (1991) has suggested an alternate realization for post-vocalic in OE, which he assumes is glottal [h]. He argues that [h] influences the development of breaking diphthongs with a back offglide due to its inherent weakness and its [+back] feature specification. However, according to the place feature organization of Clements (1991), [h] is classed as a laryngeal consonant, specified with the primary feature [pharyngeal], which, in vowel assimilation processes, would exert a lowering, not a backing, influence on vowels. The conditioning feature in vowel backing processes within this framework is assumed to be [dorsal], which is echoed in McCarthy (1991) and Herzallah (1990), in which vowel dorsalization processes in Arabic are represented by [dorsal] feature spreading.

Since breaking in OE is also viewed as a process of vowel backing, in which a front vowel acquires a back offglide due to the influence of a following consonant (*cneht* > *cneoht* 'boy'), it is reasonable to assume that the breaking conditioner *h* is specified with the feature [dorsal], which determines the back quality of the offglide. Unfortunately, this brings us back to the original problem of why the velars *c* and *g* in OE, which are also specified with the feature [dorsal], do not condition breaking.

For the moment, let us assume that *c*, *g* and *h* in OE are each specified with the feature [dorsal]. How would *h* then be distinguished from *c* and *g*? Recall that one of the most pervasive observations with regard to breaking made by contemporary scholars (i.e., Jones (1989, Howell 1991, Lutz 1994) is the relationship between consonantal weakness and the development of a diphthong. To be sure, breaking conditioners are determined to be weak, vowel-like variants, and this quality of weakness is assumed to be the primary influence of offglide development.

If the reader will also recall, from section 3.5.2., breaking conditioners in OE are ordered in relation to consonantal strength as follows:

(52) weakest *w* → *h* → *r* → *l* strongest

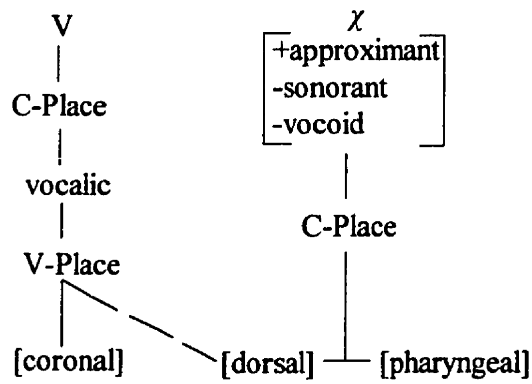
This ordering raises an important consideration with regard to the phonetic properties of the *h* conditioner in OE breaking. Note that *h* in the above schematic occurs between a glide (*w*) and a liquid (*r*), which are collectively classed as approximants. Thus, it would be reasonable to suggest that post-vocalic *h* in OE was realized as an approximant consonant rather than a voiceless fricative [x], which is generally assumed in traditional interpretations of breaking.

If the reader will further recall, from section 4.4., it is determined by McCarthy (1991) that guttural consonants are approximants, with primary pharyngeal constrictions. Gutturals include uvulars [χ, ʁ], which are specified with [dorsal] and [pharyngeal] constrictions; pharyngeals [ʕ, ħ], specified with [radical] and [pharyngeal] constrictions; and laryngeals [ʔ, h], which include a [pharyngeal] feature. In Semitic languages, gutturals influence vowel lowering, which is viewed as an assimilatory process, conditioned by the [pharyngeal] specification in each guttural consonant. Vowel dorsalization in Arabic is conditioned by uvulars, arguably by the [dorsal] specification in these gutturals.

So, in consideration of the nature of the breaking process in OE, specifically the development of a back offglide in diphthongs, which occurs due to the influence of weak consonants, specified with constrictions produced at the posterior end of the vocal tract, I propose that the *h* conditioner in OE breaking is realized as a uvular approximant consonant, specified with [dorsal] and [pharyngeal] place features, which is intrinsically capable of exerting a backing influence on vowels, as demonstrated in Arabic. The distinction, then, between post-vocalic *h* and the velars (*c* and *g)* in OE, would not lie in place feature specification (i.e., [dorsal]), but rather in a root node specification; the *h* conditioner in breaking would be specified [+approximant] while the velars (*c* and *g*) would be specified as [-approximant] in OE.

Based on vowel dorsalization in Arabic, I represent the OE diphthong formation in breaking before *h* in the following diagram:

(53)



4.7. A Natural Class of Breaking Conditioners.

One of the main goals of this investigation is to present breaking as a unified process of assimilation. In previous explanations, this has been problematic because the consonants that condition breaking do not appear to form a natural class. For example, based on traditional reconstructions, breaking conditioners consist of a velar fricative [x], a dark rhotic [r], a velarized lateral [ɫ], and a labio-velar glide [w]. At first glance, it may be assumed that since each of these consonants reflects a velar articulation, then velarity could be the conditioning factor in breaking. However, the voiced velar fricative [ɣ] and the voiceless stop [k] do not influence diphthong formation characteristic of breaking.

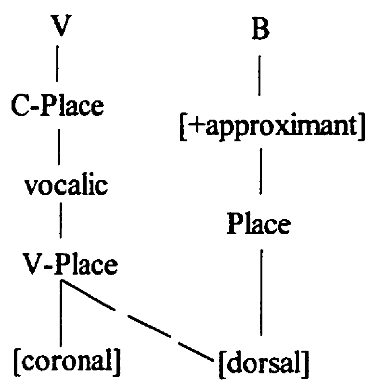
Instead of positing an [x] realization for post-vocalic *h* OE, I have argued that the development of a back offglide in this breaking environment is most likely conditioned by a uvular consonant [χ], due to its weak, approximant nature, and its [dorsal] place feature specification. Furthermore, uvular consonants have also been shown to exert a backing influence on vowels in other languages, such as Arabic.

For the realization of preconsonantal *r* in OE, I have proposed an apical liquid with secondary [dorsal] and [pharyngeal] constrictions. For preconsonantal *l*, I have suggested a velarized liquid, with secondary [dorsal] and [labial] articulations. I contend it is the [dorsal] feature in both of these liquid variants which influences the development of a back offglide in breaking. Liquids are also specified with the features [+approximant, +sonorant, -vocoid] at the root node.

To account for the realization of *w* conditioner in breaking, I follow Clements (1991), who specifies *w* with vocalic [dorsal] and [labial] articulations. Root node specifications include [+approximant, +sonorant, +vocoid]. I have argued that the [dorsal] place feature in *w* conditions the development of breaking diphthongs.

The feature specifications which are common among breaking conditioners, according to my reconstructions, are [+approximant] and [dorsal]. Therefore, I propose that breaking conditioners form a natural class of dorsal approximants in OE. To represent breaking as a unified process of assimilation, I apply leftward spreading of the terminal [dorsal] place feature of the breaking conditioner (B), to the V-Place of the preceding front vowel, as shown in the following:

(54)



4.8. Summary.

In this chapter, I have presented the underlying feature specifications of breaking conditioners within the place feature organization of Clements (1991). My reconstructions are based on previous interpretations of conditioner realizations in OE, and also the influence of vowel dorsalization, exerted by emphatic consonants and uvulars in Semitic languages, as documented by McCarthy (1991) and Herzallah (1990). According to these reconstructions, I have argued that breaking conditioners form a natural class of dorsal approximants in OE. The development of a diphthong with a back offglide before breaking conditioners is accordingly represented as a leftward spread of the [dorsal] feature in the breaking conditioner to the V-Place node of the preceding vowel.

CHAPTER FIVE

Conclusions.

In this study, I set out to present a coherent account of breaking in OE. My specific goals were twofold. Firstly, I wanted to make sense of why the diphthong formation in OE breaking occurs to varying degrees, depending on which vowels and consonants are involved. Secondly, I wanted to represent breaking as a uniform process of assimilation.

With regard to the first task, it was speculated that because breaking is an assimilatory process, then the occurrence of breaking, or its failure, would most likely be due to certain conditions that either foster or inhibit the interactive relationship between a vowel and its following consonant. Accordingly, I determined that two variables would be necessary to account for the development of diphthongs in breaking; one vocalic, and the other, consonantal.

To characterize the parameter which indicates vowels in breaking, I incorporated the properties of height and length, which are reflected to varying degrees in breaking diphthongs. In consideration of the differing strength values of low, mid and high vowels, according to Vennemann (1988), and also, that long vowels typically demonstrate more resistance to vowel mutation than short vowels, as outlined by Goldsmith (1990), I suggested that the vowels involved in breaking could be graded within a scale according to their intrinsic strength, or the degree of resistance to diphthong formation they demonstrate in breaking. This vocalic parameter was labelled as vowel integrity.

For the representation of consonants that condition breaking, the factors of consonantal strength and phonotactic position were coalesced within one variable. In this consonantal parameter, I proposed that breaking conditioners could be ordered according to derivative strength, which indicates not only the intrinsic phonological strength of a consonant, but also its varying strength values within differing phonotactic positions.

Once a relative ordering of conditioner strength and vowel integrity had been established, I hypothesized that the varied nature of breaking outcomes could be sensibly explained through the convergence of these parameters. To demonstrate the relationship between vowel integrity and derivative strength, I placed them respectively along the vertical and horizontal axes of a graph. I then plotted each occurrence of diphthong formation in OE breaking at the appropriate intersecting points of vowel integrity and derivative strength. What emerged was a pattern of breaking that resembled a falling line, indicating a negative, or inverse, correlation between my proposed breaking parameters. In other words, as the integrity of a vowel increases, the likelihood of diphthong formation in breaking decreases. Similarly, as the derivative strength of a consonant increases, the incidence of breaking diphthongs decreases.

I interpreted the decreasing height of the line as an indication of the extent of vocalization that has occurred in each breaking conditioner at the time of OE. Accordingly I determined that vocalization was well underway in the *w* breaking conditioner in OE; to a lesser extent in the *h* conditioner; and even lesser in the *r* conditioner. In the *l* conditioner in OE, the development of vocalization had barely begun. So, in relation to the development of vocalization in English and its participation in diphthong formation in OE breaking, as determined by Lutz (1994), I concluded that breaking is a scribal portend to the final stage of vocalization, in which a post-vocalic consonant moves into the nucleus of a syllable to function as a vowel.

In order for breaking instances in OE to be represented as a uniform process of assimilation, a commonality must first exist between the consonants that condition breaking. To that end, I have re-evaluated the possible phonetic realizations of breaking conditioners according to traditional interpretations (Campbell 1959, et. al.), and also, to more recent breaking accounts, such as Howell (1991) and Lutz (1994). Based on these descriptions, I then reconstructed the most plausible realizations of breaking conditioners within the place feature organization of Clements (1991). From these reconstructions, I determined that breaking conditioners include the labio-dorsal glide *w*; the uvular approximant [χ], distinguished by primary dorso-pharyngeal constrictions; the rhotic *r*, which reflects primary coronal and secondary dorso-pharyngeal constrictions; and the lateral [ɫ], characterized by primary coronal and secondary dorso-labial articulations. The common features among breaking conditioners, based on my reconstructions, are [+approximant], specified at the root level, along with the place feature [dorsal]. I therefore concluded that breaking conditioners form a natural class of dorsal approximants in OE.

Not only do breaking conditioners have to possess a common feature(s) in order for breaking to be represented as a uniform process of assimilation, but it must also be shown that this particular feature(s) is able to influence the assimilatory effect that breaking renders in preceding vowels. Based on the documentation of dorsalization in Arabic vowels, as presented by McCarthy (1991) and Herzallah (1990), it was determined that vowel backing occurs due to the influence of adjacent consonants, which possess the place feature [dorsal]. Specifically, vowel dorsalization in Arabic is represented as the spread of [dorsal] in a consonant to an adjacent vowel, with concomitant delinking of the original vowel feature, indicating complete assimilation.

Accordingly, I represented the development of a back offglide in breaking diphthongs, which I argue is comparable to vowel backing, with the addition of an association line between the [dorsal] feature of the conditioning consonant and the V-Place node of the preceding front vowel, according to the conventions of autosegmental phonology developed by Goldsmith (1990). In breaking, leftward [dorsal] spreading to a short vowel creates a multiply associated, short diphthong. Diphthong formation in long vowels involves the leftward spreading of the consonantal [dorsal] feature to the preceding vowel, with concomitant delinking of the geminate vowel's second association line. In my representations of breaking, no delinking of the original [coronal] feature of the vowel occurs, thus portraying breaking as a process of partial assimilation.

My investigation of breaking in OE has brought to light some areas that I contend are in need of further research. Firstly, the legitimacy of my proposed parameters of vowel integrity and derivative consonantal strength requires verification. Secondly, my suggestion regarding the separation of the vocoid sonority class, as determined by Mohanan (1983), Sagey (1986) and Clements (1986), into a vowel and a glide class, distinguished by respective [-approximant] and [+approximant] feature specifications, necessitates cross-linguistic phonological confirmation. Thirdly, real-language evidence for a dark *r* variant in OE, along with the development of an apical-to-uvular *r*, must be afforded. Lastly, further inquiry needs to be initiated with regard to my revision of the place feature organization presented by Clements (1991). Specifically, I modified the placement of association lines to allow for a distinction between sequentially articulated segments, such as diphthongs, and coarticulated segments, which include affricates, the labio-dorsal glide *w*, and gutturals.

Perhaps the most significant implication of my study concerns the addition of a uvular consonant [χ] to the phonological inventory of OE, thereby eliminating the voiceless velar fricative [x]. Accordingly, OE would be characterized with a velar set of consonants, which includes [k], [g] and [ɣ], along with a set of gutturals, consisting of glottal [h] in word-initial position, and uvular [χ] in breaking environments.

BIBLIOGRAPHY

Anderson, John M. and Charles Jones. 1977. *Phonological Structure and the History of English.* Amsterdam: North Holland Publishing Co.

Baldi, Philip. 1983. *An Introduction to the Indo-European Languages.* Southern Illinois University Press.

Bauer, Gerd. 1956. The Problem of Short Diphthongs in Old English. Anglia 74. 427-37.

Brunner, Karl. 1953. The Old English Vowel Phonemes. *English Studies* 34. 247-51.

Campbell, A. 1959. *Old English Grammar.* Oxford: Clarendon Press.

Chomsky, Noam and Morris Halle. 1968. *The Sound Pattern of English.* New York: Harper and Row.

Clements, George N. 1986. Syllabification and Epenthesis in the Barra Dialect of Gaelic. In *The Phonological Representation of Suprasegmentals*, ed. by Koen Bogers, Harry van der Hulst, and Maarten Mous. Dordrecht: Foris Publications.

--------1990. The Role of the Sonority Cycle in Core Syllabification. *Papers in Laboratory Phonology: Between the Grammar and Physics of Speech.* John Kingston and Mary E. Beckman (eds.) Cambridge: Cambridge University Press. 283-333.

--------1991. Place of Articulation in Consonants and Vowels: A Unified Theory. *Working papers of the Cornell Phonetics Laboratory* 5, 77-123. Ithica, N.Y.: Cornell University.

--------and Samuel Jay Keyser. 1983. *CV Phonology: A Generative Theory of the Syllable.* Cambridge: The MIT Press.

--------and E. Hume. 1995. The Internal Organization of Speech Sounds. *The Handbook of Phonological Theory*, 245-306. ed. by John A. Goldsmith. Blackwell Publishers.

Colman, Fran. 1983. 'Vocalisation' as Nucleation. *Studia Linguistica* 37, 30-48.

Cull, Naomi. 1994. Syllable Based Sound Change and Palatalization in Early Romance. Unpublished Master's Thesis, The University of Calgary, Alberta.

Daunt, M. 1940. Old English Sound-Changes Reconsidered in Relation to Scribal Tradition and Practice. *Transactions of the Philological Society* 1939. 108-137.

Flom, George T. 1937. Breaking in Old Norse and Old English with Special Reference to the Relations between Them. *Language* 13. 123-36.

Goldsmith, John A. 1990. *Autosegmental & Metrical Phonology.* Oxford: Blackwell.

Hall, Tracy Allen. 1993. The Phonology of German /R/. *Phonology* 10 (1), 83-105.

Halle, M. 1989. The Intrinsic Structure of Speech Sounds. unpublished ms., MIT, Cambridge, Mass.

--------1992. Phonological Features. *International Encyclopedia of Linguistics*, vol. 3, 207-212. ed. by W. Bright. Oxford: Oxford University Press.

--------and Stevens. 1971. A Note on Laryngeal Features. *Quarterly Progress Report*, vol. 101, 198-212. Cambridge, Mass.: Research Laboratory of Electronics, MIT.

--------and Stevens. 1991. Knowledge of Language and the Sounds of Speech. *Music, Language, Speech and Brain*, ed. by J. Sundberg et. al., 1-19. London: Macmillan.

Herzallah, R. 1990. Aspects of Palestinian Arabic Phonology: a Non-Linear Approach, Unpublished Ph.D. dissertation, Cornell University, Ithaca, N.Y.

Hogg, Richard M. 1979. Old English Palatalization. *Transactions of the Philological Society* 1979. 89-113.

-------- 1992. *A Grammar of Old English*. Oxford: Blackwell.

Hooper, J. B. 1976. *An Introduction to Natural Generative Phonology*. New York: Academic Press.

Howell, Robert B. 1991. *Old English Breaking and its Germanic Analogues*. Tübingen: Max Niemeyer Verlag.

Iverson, G. K., G. W. Davis and J. C. Salmons. 1994. Umlaut Blocking Environments in Old High German. *Folia Linguistica Historica* 15. 131-48.

Jones, Charles. 1989. *A History of English Phonology*. London: Longman Group UK Limited.

Jones, Daniel. 1956. *The Pronunciation of English*. 4th ed. Cambridge: Cambridge University Press.

Kenstowicz, Michael. 1994. *Phonology in Generative Grammar*. Oxford: Blackwell.

Kuhn, Sherman M. 1961. On the Syllabic Phonemes of Old English. Language 37. 522-538.

--------1970. On the Consonantal Phonemes of Old English. *Philological Essays: Studies in Old and Middle English Language and Literature in Honor of Herbert Dean Meritt*. Ed. by James L. Rosier, 16-49. Janua Linguarium, Series Maior, 37.) The Hague: Mouton.

-------- and Randolph Quirk. 1953. Some Recent Interpretations of Old English Digraph Spellings. *Language* 29. 143-56.

--------1955. The Old English Digraphs: A Reply. *Language* 31. 390-401.

Lass, Roger. 1987. *The Shape of English*. London: J.M. Dent and Sons LTD.

--------1994. *Old English: A Historical Linguistic Companion*. Cambridge: Cambridge University Press.

--------and John Anderson. 1975. *Old English Phonology*. Cambridge: Cambridge University Press.

Lutz, Angelika. 1994. Vocalisation of 'post-vocalic r' - an Early Modern English sound change? *Studies in Early Modern English*. Ed. by Dieter Kastovsky. Berlin: Mouton de Gruyter.

McCarthy, J. 1988. Feature Geometry and Dependency: a Review. *Phonetica* 45. 84-108.

--------1991. The Phonetics and Phonology of Semitic Pharyngeals. *Papers in Laboratory Phonology III: Phonological Structure, Realization and Phonetic Form*. 191-233.

Mohanan, K. P. 1983. The Structure of the Melody. Unpublished paper, MIT.
Mossé, Fernand. 1945. *Manuel de l'anglais du moyen âge des origines au XIVe sie`cle. I. Viel-anglais*. Paris: Aubier.
Moulton, W. G. 1954. The Stops and Spirants of Early Germanic. *Language* 30. 1-42.
Murray, Robert W. 1989. On Epenthesis. *Folia Linguistica* 23. 293-316.
--------and Theo Vennemann. 1983. Sound Change and Syllable Structure in Germanic Phonology. *Language* 59. 514-528.
Nielsen, Hans F. 1984. A Note on the Origin of Old English Breaking and Back Mutation. *Amsterdamer Beitraege zur Äelteren Germanistik* 22. 73-81.
Ohala, John J. 1974. Phonetic Explanation in Phonology. *Proceedings of the Parasession on Natural Phonology*, 251-274. Chicago: Chicago Linguistic Society.
Sagey, E. 1986. *The Representations of Features and Relations in Non-Linear Phonology*. Ph.D dissertation, MIT.
Shein, B. & D. Steriade. 1986. On Geminates. *Linguistic Inquiry* 17. 691-744.
Steriade, D. 1987. Locality Conditions and Feature Geometry. *North East Linguistic Society* 17. 595-617.
Stockwell, R. P. and C. W. Barritt. 1951. Some Old English Graphemic-Phonemic Correspondences: *æ*, *ea*, *e*. *Studies in Linguistics*, Occasional Papers, 4.
--------1955. The Old English Short Digraphs: Some Considerations. *Language* 31.372-89.
--------1961. Scribal Practice: Some Assumptions. *Language* 37. 75-82.
Vennemann, Theo. 1972. Phonetic detail in assimilation: Problems in Germanic Phonology. *Language* 48. 863-892.
--------1988. *Preference Laws for Syllable Structure and the Explanation of Sound Change*. Berlin: Mouton de Gruyter.