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TOPICS IN THE PHONOLOGY OF IRISH

A Dissertation Presented

by

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This thesis is dedicated to my parents for their support and confidence in me over the years.

ABSTRACT

TOPICS IN THE PHONOLOGY OF IRISH

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Directed by: Professor John J. McCarthy

This work examines a range of phenomena in the phonology of Modern Irish, in particular the initial consonant mutations, distinctive palatalization and epenthesis and compensatory lengthening. A convergence of evidence from these different domains argues for the theoretical frameworks adopted, in particular those of Feature Geometry Theory and Moraic Theory. The articulated structures of Feature Geometry Theory allow for a more principled account of the initial consonant mutations than is possible within other theories. The epenthesis and lengthening processes may be accounted for only within a prosodic theory based on syllable weight. Issues bearing on Underspecification Theory are also addressed.

In Chapter 2, the initial consonant mutations that express morphological distinctions in Irish are discussed. The following claims are argued for: First, these mutations are the result of rules, rather than morphological

affixation. Second, these rules are blocked by linked heteromorphemic structure, however, this Inalterability effect cannot be captured by current proposals in the literature. Rather, a more general condition on structural conditions on rule application is proposed. Third, vowel stems in Irish are argued to have underspecified onsets. The range of prothetic consonants that occur preceding vowel-initial stems in certain morphological environments is shown to be the surface realizations of these onsets.

Chapter 3 focusses on the Place features and palatalization. It is argued, on the basis of evidence involving the initial consonant mutations and assimilation, that the primary and secondary place features must be represented independently. Of further interest are data involving consonant-vowel interaction which argue for context-sensitive Radical Underspecification, whereby lexical and default feature values are relativized to the categories for which they are defined.

In Chapter 4 a unified prosodic account is given of a number of epenthesis and vowel-lengthening processes in Irish. The epenthesis process discussed is not conditioned in an obvious syllabic way, nor is the vowel-lengthening a typical case of compensatory lengthening following deletion of segmental material. Rather, both processes are the result of the transfer, and thereby the preservation, of prosodic weight within the syllable.

TABLE OF CONTENTS

GLOSSARY

The following abbreviations are used in examples in the text:

adj	adjective
C	consonant
COND	conditional
dat	dative
def	definite
f	feminine
gen	genitive
imper	imperative
indef	indefinite
m	masculine
N	noun
NEG	negative
nom	nominative
nonfin	nonfinite
pl	plural
Q	question
sg	singular
V	vowel
voc	vocative

CHAPTER 1

THEORETICAL FRAMEWORK

1.1 Introduction

In this dissertation I examine a broad range of phenomena in the phonology of Modern Irish, in particular (i) the initial consonant mutations and the range of prothetic consonants that occur preceding vowel-initial stems in certain environments, (ii) palatalization and consonant-vowel interaction and (iii) epenthesis and compensatory lengthening. These topics are actually seen to bear on each other within the uniform theoretical framework adopted, that is, a number of theoretical issues recur. This 'convergence of evidence' and the extent to which the accounts of the different domains are mutually constraining speaks in favor of the approach adopted. In fact, we would risk proposing an incorrect account if we were to limit the scope of inquiry to any single phenomenon. The proposals made in Chapter 3, for example, for the structural representation of the primary and secondary place features are, to a large extent, dependent on the theoretical description of Lenition in Chapter 2. Data involving epenthesis in Chapter 4 support this representation.

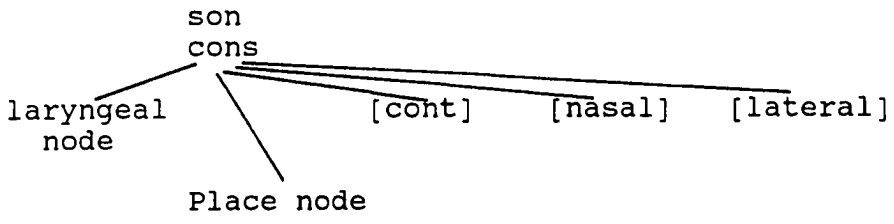
1.2 Theoretical Framework

An account of the facts presented necessarily bears on current theories of representation and conditions on rule-application. I focus in particular on Feature Geometry Theory, Underspecification Theory, and Moraic Theory. I briefly outline the theoretical assumptions of this dissertation in the following sections.

1.2.1 Feature Geometry Theory

I assume Feature Geometry Theory (Clements (1985), Sagey (1986), McCarthy (1988) and references therein) in which phonological features are hierarchically organized according to how they pattern in phonological processes (assimilation, delinking, etc). As a point of departure, I adopt the model of feature geometry proposed in McCarthy (1988), given in (1).

(1)



The articulated structures of Feature Geometry Theory allow for a principled account of the phenomena evidenced in Irish.

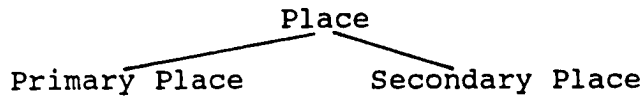
(i) Feature Geometry Theory provides a theoretical basis for the linked structure that gives rise to Geminate Inalterability which is essential in the account of the initial consonant mutations - both lenition and eclipsis are blocked whenever a target coronal consonant shares a (primary) place specification with the preceding consonant in certain domains (§2.2.5, §2.3.4); linked place structure also blocks the prosodically defined processes of Weight-by-Position and epenthesis (§4.4).

(ii) We may account in a principled way for the realizations of lenited coronal segments - debuccalization of coronal segments in lenition is represented as delinking of [Coronal] (§2.2.5). Both (i) and (ii) above are problematic for alterative theoretical approaches (§2,2,9, §2.3.3).

(iii) Feature Geometry Theory makes predictions about the kinds of assimilations we would expect in a language. Conversely, assimilation processes may provide evidence for particular structural representations. In Chapter 3 I provide evidence involving nasal assimilation for a more articulated structure for the place features. The data discussed argue for a representation in which primary and secondary place features are independent yet dominated by

the same node. The representation I argue for is given in (2).

(2)



This proposal is further supported by evidence from Coronal Delinking (§2.2.5 & §3.2.2), Coronal Fusion (§3.2.1) and evidence from epenthesis (§4.6).

1.2.2 Underspecification Theory

The data presented in Chapter 3 concerning the secondary place features representing palatalization pose problems both for Restricted Underspecification Theory (Steriade (1987), Clements (1988), Mester & Itô (1989)) in which only redundant values of features are underlyingly unspecified, and for Radical Underspecification Theory (Kiparsky (1982), Archangeli (1984), Archangeli & Pulleyblank (1986), Itô & Mester (1986), Pulleyblank (1988)) in which both redundant values and unmarked values of contrastive features are underlyingly unspecified. In Irish, the feature [back] is contrastive in the consonants (marking palatalization) and in the long vowels. However, [back] must be underspecified in the phonology as follows:

[+back] is unspecified for the consonants while [-back] is unspecified for the long vowels. Neither of the theories above predicts this situation.

I argue instead for context-sensitive Radical Underspecification whereby the lexical and default specifications of a feature are relativized to the category (for example, consonants or vowels) for which it is defined. I argue for the following system in Irish: (i) consonants are lexically specified for [-back] and [+back] is assigned by default, (ii) long vowels are lexically specified for [+back] and are assigned [-back] by default and (iii) non-low short vowels are lexically unspecified for [back] and are assigned a value for this feature by spreading from an adjacent consonant.

Besides palatalization, this approach to underspecification is supported by the account of the vowel-initial stems given in Chapter 2. I argue that, in order to account for the different prothetic consonants that occur preceding these stems, we must posit a radically underspecified (consonantal) onset. The realization of this consonant is determined by both spreading and default fill-in rules. The account proposed of the prothetic consonants is desirable because it captures the relationship between these consonants and the initial consonant mutations. I argue that this approach allows for a unified account of the different prothetic consonants in Irish that obviates a

proliferation of 'floating' consonants/segments, a characteristic of previous accounts (e.g. Gussmann (1986), Kelly (1989)).

1.2.3 Moraic Theory

I assume a moraic approach to syllabification (McCarthy & Prince (1986, 1988), Hayes (1988), Ito (1989), Hyman (1984)) in which underlying quantity distinctions are represented using moras. The generalizations presented in Chapter 4 concerning the prosodically conditioned processes of epenthesis and compensatory lengthening in Irish may be accounted for only within a theory that is based on syllable weight. Both processes are shown to be the result of the preservation of elements of prosodic structure - moras. The lengthening process is not the prototypical compensatory lengthening following deletion of a segment (see, for example, Hayes (1988), Sezer & Wetzels (1986) and references therein, for examples of this more typical form of compensatory lengthening), but rather is the result of the transfer of weight from one segment to an adjacent, tautosyllabic segment. Such lengthening is in fact a 'resort' process in Irish since epenthesis, the default transfer process, cannot apply in the examples in question.

The existence of this unusual 'Compensatory Epenthesis' is compelling support for the moraic theory adopted.

1.3 The Sound Inventory of Modern Irish

The consonant and vowel inventories of Irish are given in (3)-(7) below. For the purposes of setting out the contrasts, I am assuming (i) that palatalization is distinctive and (ii) the short vowels are not specified for [back]. These assumptions about the synchronic phonology are different from the history; thus I will argue for both of these assumptions in Chapter 3.

1.3.1 The Consonant Inventory

The consonant inventory of Irish is given in (3). I indicate the non-palatalized/palatalized distinction using **C** and **C'**, respectively.

(3)

Labial		**Coronal**		**Dorsal**		**Laryngeal**	
p	p'	t	t'	k	k'		
b	b'	d	d'	g	g'		
f	f'	s	s'	x	x'	h	h'
v	v'			ɣ	ɣ'		
m	m'	n	n'	ŋ	ŋ'		
		l	l'				
		r	r'				
w				j			

In (4)-(6), I present a three-way division of the consonant inventory that reflects the distribution of these sounds. The consonants in (4) have an unrestricted distribution: they may occur in all positions, that is, word-initially in both non-derived (non-mutation) and derived (mutation) environments, word-internally and word-finally.

(4) Consonants with unrestricted distribution[1]

Labial	**Coronal**	**Dorsal**	**Laryngeal**
p p'	t t'	k k'	
b b'	d d'	g g'	
f f'	s s'		h
m m'	n n'		
	l l'		
	r r'		

The consonants in (5) have a partially restricted distribution: they may occur in all positions - however, they occur word-initially only in derived (mutation) environments.

(5) Consonants with partially restricted distribution

Labial	**Dorsal**	**Laryngeal**
	x x'	h'
v v'		
	ŋ ŋ'	
w	j	

[1] **p, p', t, t', k, k'** occur word-initially only in non-derived environments.

Of these consonants **x x' h' v v' w j** are derived word-initially in Lenition environments and **v v' ŋ ŋ'** are derived in Eclipsis environments.

Finally the consonants in (6) have a restricted distribution: they may occur only word-initially in derived (Lenition) environments.

(6) Consonants with restricted distribution

Dorsal

ɣ ɣ'

ɣ ɣ' are derived by lenition.

I refer back to this distribution of the consonants when I discuss possible restrictions on the application of Lenition and Eclipsis, e.g. Structure Preservation.

1.3.2 The Vowel Inventory

Irish has an underlying system of five long vowels and three short vowels. In the short vowels, only height is distinguished. The underlying and surface vowel inventories are illustrated in (7).

(7) The vowel inventory of Irish

Long vowels					
underlying	i:	u:	**surface**	i:	u:
	e:	o:		e:	o:
		ɑ:		a:	ɑ:

Short vowels					
underlying	I[2]		**surface**	i	u
	E			e	o
	a			a	

In addition, Irish has a number of diphthongs which are not relevant to the issues discussed in this dissertation.

1.3.3 Dialect and Notation

The dialect with which I am concerned, for the most part, is the western dialect, in particular that spoken in Connemara, Co. Galway. I draw on data from other dialects in a number of sections - the dialects/sources are explicitly referred to when this is the case.

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[2] I and E are archisegments - not central vowels - representing high and mid short vowels, respectively.

The examples presented throughout this work are of the following format:

example (traditional orthography) transcription 'gloss'

The transcriptions generally reflect the phonemic structure of the language, that is, they are only very 'broadly' phonetic.

CHAPTER 2

THE INITIAL CONSONANT MUTATIONS

2.1 Introduction

There are two phonologically distinct types of initial consonant mutations in Modern Irish, traditionally referred to as **Lenition** and **Eclipsis**. The environments in which these mutations occur are for the most part distinct, although there is a certain amount of free variation in some cases which is dialect dependent.[1] The concern of the present study is the phonological processes involved in the initial consonant mutations rather than an attempted characterization of the environments - morphological or syntactic - in which the mutations occur.

The initial consonant mutations in Irish and, more generally, in the Celtic languages have been the focus of a number of phonological investigations within different theoretical frameworks (for example, Ó Siadhail & Wigger (1975), Roscoe McBrearty (1979), Ó Dochartaigh (1979), Ewen

[1] Free variation is found in the case of the object of certain prepositions, the initial consonant of which may be either lenited or eclipsed.

(1982), Willis (1986), Lieber (1987), Kelly (1989)).[2] While these works have attempted to provide a uniform account of the various mutation types, significant facts conditioning the application of the two initial consonant mutation types in Modern Irish have been overlooked. These facts, which give important insights into the formalism required for an adequate account, concern the exceptions to the initial consonant mutations in Modern Irish.

2.2 Lenition

2.2.1 The Lenition Series

The consonant alternations under Lenition are given in (1). The alternations discussed in this section are common to all dialects of Modern Irish. In addition, there is, in some dialects, a series of alternations that affect the coronal sonorant consonants in Lenition environments.

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[2] The initial consonant mutations have also been the subject of a number of accounts focussing on the morphological and syntactic conditioning of the application of these alternations, e.g. Rotenberg (1987), Massam (1983).

(1) (a) non-lenited **p p' b b' k k' g g'**

lenited **f f' v/w v' x x' ɣ ɣ'-j**[3]

(b) non-lenited **m m'**

lenited **w-v v'**

(c) non-lenited **t t' d d' s s'**

lenited **h h' ɣ ɣ'-j h h'**

(d) non-lenited **f f'**

lenited **ø ø'**

(e) non-alternating consonants (i) **n n' l l' r r'**

(ii) **h h'**

The alternations listed above are summarized as follows:

(a) Labial and dorsal stops lenite to the corresponding fricatives. There is an additional variation between the resulting labial and dorsal fricatives and glides: a non-palatalized voiced labial stop **b** lenites to a non-palatalized voiced labial fricative **v** or a labial glide **w**, while a

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[3] Where there is possible variation this is indicated by using a dash. In this case the variation is between a palatalized dorsal fricative and a dorsal glide. I return to the fricative/glide alternation in §2.2.3 and §3.4.1.7.

palatalized voiced labial stop **b'** lenites to a palatalized voiced labial fricative **v'**; a palatalized voiced dorsal stop **g'** lenites to a palatalized voiced dorsal fricative **ɣ'** or a palatal glide **j**, while a non-palatalized voiced dorsal stop **g** lenites to a non-palatalized voiced dorsal fricative **ɣ**.

(b) Lenition of labial nasals involves concomitant loss of [nasal]. The resulting segments merge with the lenited voiced labial stops.

(c) Coronal stops do not alternate with coronal fricatives as might be expected;[4] rather, lenited voiceless coronal consonants debuccalize, that is, they become 'placeless', being realised as voiceless laryngeal fricatives; the lenited voiced coronal stops merge with the lenited voiced dorsal stops.

(d) Labiodental fricatives are deleted in Lenition environments. In the case of a palatalized labiodental fricative, the palatalization feature is retained following deletion and is realized on

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[4] This was the case historically, however.

the preceding consonant in certain phonological domains.

(e) (i) Coronal sonorants do not alternate in Lenition environments in the dialects under consideration. In certain dialects there is a tense/lax distinction in the coronal nasals and laterals. This distinction tends to be neutralized in Lenition environments: lenited word-initial tense sonorant consonants become lax.
(ii) Laryngeal fricatives occur word-initially in a limited set of words and remain unaffected in Lenition environments.

Examples of the consonant alternations in Lenition environments are given in (2).[5]

(2)

a.	<u>cearc</u>	<u>mo chearc</u>	<u>cúig chearc</u>
	k'ark	mə x'ark	ku:g' x'ark
	'a hen'	'my hen'	'five hens'
b.	<u>mála</u>	<u>mo mhála</u>	<u>trí mhála</u>
	mɑ:lə	mə wɑ:lə	t'r'i: wɑ:lə
	'a bag'	'my bag'	'three bags'

[5] Lenition is marked orthographically by the addition of **h** adjacent to the initial consonant of the word, e.g. **<u>cóta</u>/<u>chóta</u>**.

c.	<u>teach</u>	<u>mo theach</u>	<u>trí theach</u>
	t'ax	mə h'ax	t'r'i: h'ax[6]
	'a house'	'my house'	'three houses'
d.	<u>fiacail</u>	<u>mo fhiacail</u>	<u>trí fhiacail</u>
	f'i:əkəl'	mə i:əkəl'	t'r'i: i:əkəl'
	'a tooth'	'my tooth'	'three teeth'
e.	<u>nead</u>	<u>mo nead</u>	<u>dhá nead</u>
	n'ad	mə n'ad	ɣa: n'ad
	'a nest'	'my nest'	'two nests'
	<u>hata</u>	<u>mo hata</u>	<u>trí hata</u>
	hatə	mə hatə	tri: hatə
	'a hat'	'my hat'	'three hats'

The initial consonant of a noun preceded by certain possessive pronouns or by certain cardinal numbers lenites.[7] In (2)a., for example, the initial palatalized voiceless dorsal stop **k'** becomes a corresponding dorsal fricative **x'** when the noun is preceded by **<u>mo</u>** 'my' or **<u>cúig</u>** 'five'. In (2)c., the initial palatalized voiceless coronal stop **t'** becomes placeless, resulting in a (palatalized) laryngeal fricative **h'**.

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[6] I represent a lenited palatalized **t'** as **h'**. The palatalized quality of **h'** is effectively realised only preceding back vowels, where it is realised as a palatal off-glide.

[7] Cardinal numbers **2-6** induce lenition of the following noun while cardinal numbers **7-10** induce eclipsis of the following noun.

In the account presented in the following sections I argue that Lenition involves two rules: Spirantization and Coronal Delinking. Spirantization accounts straightforwardly for the examples in (1)(a) above. The variation between fricatives and glides, I argue, is the result of a later rule of Glide Formation.[8] The loss of [nasal] in the lenited labial nasals, (1)(b) above, can be regarded as a consequence of a markedness convention whereby nasalized fricatives are more marked than non-nasalized fricatives.

The remaining alternations, those involving the coronal and labiodental consonants, (1)(c) and (1)(d) above, present interesting problems for an account of Lenition. I focus first on the coronal consonants, which appear to be exceptional in the Lenition series. Coronal Delinking results in the debuccalization of coronal consonants in Lenition environments: lenited coronal consonants are realized as laryngeals (which, by enhancement, can be realized as dorsals). The blocking of Lenition by heteromorphemic coronal clusters raises problems for

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[8] There is considerable variation in the different dialects between the fricatives and glides discussed. However, I am not concerned with this at present and do not restrict myself to one dialect as the variation can be accounted for quite straightforwardly. In the account I propose, fricatives are derived first by lenition and glides are derived later by an independent rule of Glide Formation, §3.4.1.7. The dialectal variation can be accounted for by restricting the application of this later rule in particular dialects.

theories of Inalterability. The account I propose of Coronal Blocking entails strict interpretation of the morphological condition incorporated in the formulation of both Spirantization and Coronal Delinking. Furthermore, this account has important consequences with respect to underspecification: I argue that [Coronal], or more generally, Primary Place, cannot be underspecified in Irish.

The lenition of labiodental fricatives is accounted for by proposing a default rule that deletes segments that undergo Lenition vacuously (if they are already specified as [+continuant]). Lenition is therefore a complex rule comprising two unordered sub-rules - Spirantization and Coronal Delinking - along with a default rule, Total Deletion. Finally, I examine the behaviour of initial clusters in Lenition environments.

2.2.2 Spirantization

The alternations listed in (1)(a) - those involving lenition of labial and dorsal stops - may be accounted for by a spirantization rule. This rule is formulated in (3).

(3) Spirantization

$$[_{Wd} \quad \overset{\alpha}{|} \quad [\ \ ] \quad \rightarrow \quad [+\text{continuant}]$$

Spirantization assigns a [+cont] specification to a word-initial segment unspecified for [cont] in a Lenition environment. We cannot restrict the target class of segments further, for example [-sonorant], a class that would exclude the coronal sonorants, as spirantization applies also to the labial nasals **m, m'**. Lenition as formulated in (3) may be considered a feature fill-in rule. I argue in §2.2.6 that this conception of the rule is necessary to account for the alternations shown by the labiodental fricatives in the lenition series.

Formulating Lenition as a fill-in rule entails a certain amount of underspecification. If we adopt a version of Radical Underspecification Theory (Kiparsky (1982), Archangeli (1984), Archangeli & Pulleyblank (1986), Itô & Mester (1986). Pulleyblank (1988)) in which all predictable features are unspecified in lexical representations, the feature [cont] is lexically unspecified as follows: the sonorant consonants are unspecified for [cont] -- [-cont] is assigned to the nasal consonants and [+cont] to the liquids by redundancy rules; among the obstruents, only the fricatives are specified for [cont], being specified [+cont], the remaining obstruents are assigned [-cont] by a default rule.[9] Lenition, as formulated in (3), precedes both the default and the redundancy rules that assign

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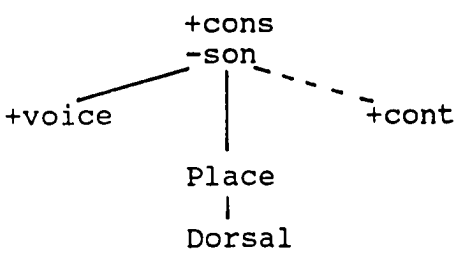
[9] I discuss Underspecification Theory in relation to the vowel system of Irish in §3.4.1.4 and argue for context-sensitive Radical Underspecification.

[-cont]. Lenition of a voiced dorsal stop is represented within this approach as in (4).[10] The dashed line indicates feature fill-in.

(4) g → ɣ



Alternatively, we could regard Lenition as a feature-changing rule that applies to fully specified representations. Lenition would then be formulated so as to change the [-cont] specification of word-initial consonants in Lenition environments to [+cont], i.e. [-cont] → [+cont], in the appropriate environment.

I adopt the first approach outlined above and discuss the motivation for this in §2.2.6.1.

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[10] The feature geometry in (6) is not fully articulated. I argue for more elaborated Place features in the following chapter.

2.2.3 Glide Formation

Spirantization as formulated in (3) derives fricatives from stops. The remaining features that define the segments in question, i.e. the major class features [consonantal] and [sonorant] along with the Place and Laryngeal features, are not affected by the rule. However the reflexes of the lenited voiced stops in (1)(a) vary between fricatives and glides. A lenited non-palatalized voiced labial stop **b** is realized either as a labial fricative **v** or as a labial glide **w**. A lenited palatalized voiced dorsal stop **g'** is realised either as a palatalized voiced dorsal fricative **ɣ'** or as a palatal glide **j**.

(5)

non-lenited	lenited
b	v - w
b'	v'
g	ɣ
g'	ɣ' - j

The above alternations are the result of a Glide Formation rule that is not part of Lenition per se. I discuss the rule of Glide Formation in the following chapter when I discuss secondary articulations.

2.2.4 Labial Nasals

Lenition of the labial nasals **m, m'** results in a merger with the lenited voiced labial stops: **m, m' → v-w, v'**. I argue in §2.2.5.4 that this merger is the result of underspecifying labial nasals for [son]. The derivation in these cases is essentially the same as for the labial stops with the additional deletion of the [nasal] specification of the leniting segment. Following Lenition, [-son] is assigned by default. [nasal] is deleted as a marked, although not entirely incompatible, specification for fricatives or glides. In fact, labial glides and fricatives that are derived from underlying labial nasals are commonly weakly nasalized by older speakers of the western dialect of Irish (see de Bhaldraithe (1945, 46), O Siadhail (1989)). However, nasalized glides and fricatives are marked segments.[11]

So far I have argued that, in order to account for the alternations in (1)(a) and (1)(b), we need (i) a rule of Spirantization, given in (3) above, and (ii) a later rule of Glide Formation. In the following section I discuss the coronal segments and argue for a more complex rule of Lenition.

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[11] Historical treatments generally distinguish glides and fricatives that are derived from nasal and non-nasal sources (see, for example, Jackson (1967)).

2.2.5 Coronals

2.2.5.1 Coronal Delinking

The coronal obstruents appear to be exceptional in the Lenition series, see (1)(c) above. They undergo an additional rule that deletes the primary place specification in Lenition environments. In the account pursued in the following section, I assume that [Coronal] is specified in lexical representations, that is, I assume that there is no underspecification of [Primary Place] in Irish. I argue for this assumption in §2.2.5.3.[12] Further, if we adopt the partial feature geometry representation in (6), it follows that debuccalization, that is, delinking of the primary place node - [Coronal] in this case - yields 'placeless' or laryngeal segments. This is the case for the voiceless coronal segments **t, t', s, s'**. The representation in (6) illustrates the lenition of the non-palatalized voiceless coronal stop **t**:

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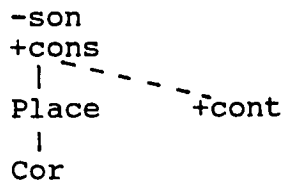
[12] I argue for distinct Primary and Secondary Place nodes in the following chapter. Primary Place, I argue, cannot be lexically unspecified whereas Secondary Place is unspecified for non-palatalized consonants.

(6) **t → h**



Coronal Delinking results in a laryngeal segment; [+cont] is assigned by Spirantization, the second sub-rule of Lenition. The debuccalization rule deletes only the primary place specification of the segment undergoing Lenition. A secondary place specification, e.g. palatalization, is retained and is expressed on the resulting laryngeal fricative. This is illustrated in (7), where a voiceless coronal fricative preceding a back vowel is lenited. In this instance, palatalization is expressed as an off-glide following the laryngeal fricative. I return to the retention of the secondary place feature in the following chapter and discuss its implications for the representation of the place features.

(7)

(i)	<u>seol</u>	s'o:l		'sail'(V)
	<u>sheol</u>	h'o:l	[h^{Y}o:l]	'sailed'
(ii)	<u>siúl</u>	s'u:l		'walk'(V)
	<u>shiúl</u>	h'u:l	[h^{Y}u:l]	'walked'

(iii)	teoranta	t'o:rəntə	'limited'
	ró-theoranta	ro: h'o:rəntə	'too limited'
		[h^{y}o:rəntə]	
(iv)	tiubh	t'uv	'thick'
	ró-thiubh	ro: h'uv	'too thick'
		[h^{y}uv]	

The past tense of the verbs in (7)(i) and (ii) is expressed by leniting the initial consonant of the verb. Similarly, the initial consonant of the adjectives in (7)(iii) and (iv) is lenited following the prefix ró ro: 'too'. Coronal Delinking is formulated in (8).

(8) Coronal Delinking

$[_{Wd}$ -son
≠
Coronal

I present additional evidence for this formulation of Coronal Delinking, in particular for the incorporation of morphological conditioning, in the following section where I discuss the blocking of Lenition.

Lenition of the voiced coronal stops d, d' must also be accounted for: lenition of these consonants results in voiced dorsal fricatives ɣ, ɣ'. The palatalized dorsal fricative ɣ' alternates with the palatal fricative j. While

these alternations would appear to be problematic, assuming a rule of Coronal Delinking, this is not necessarily the case. Deriving dorsal fricatives in place of voiced laryngeal fricatives can be accounted for by taking the following into consideration:

- It is not clear what laryngeal consonant, distinct from **h**, might be derived from a voiced stop by debuccalization. Suppose we were to derive a voiced laryngeal fricative ɦ. According to Maddieson (1984) 'voiced **h**' is extremely rare in the languages surveyed and, more importantly, a voicing contrast within the class of laryngeal fricatives is even rarer. Of the 13 out of 317 languages in the UCLA Phonological Segment Inventory Database (UPSID) that have a 'voiced **h**', only two contrast voiceless and voiced **h**'s.

- In certain western dialects **h'** alternates with **x'** as the result of leniting **t'** or **s'**, (Finck (1899), Ó Siadhail (1989), Ó Cathán (1990)). The forms in (9), for example, illustrate the lenition of verb stems with an initial palatalized voiceless coronal stop, **t'**. The lenited segment is realized alternatively as **h** or **x'**.

(9)

t' → h	ni: huka	<u>ní thiocfá</u> NEG come-COND-2sg 'you would not come'
t' → x'	x'u: m'e:	<u>thiubhaigh mé</u> thickened I 'I thickened' Ó Catháin (1990)

- There is evidence elsewhere in the phonology of an alternation between voiceless laryngeal and dorsal fricatives. In a number of dialects, principally the northern dialects, **x, x'** and **h, h'** are interchangeable. According to Ó Dochartaigh (1980), voiceless velar fricatives alternate with voiceless velar approximants and voiceless glottal fricatives, (see also Wagner (1969)). However, the 'weakening' of **x, x'**, as it is termed in the literature, that is, the alternation of dorsal and laryngeal fricatives, is most likely to occur intervocalically rather than word-initially, see Ó Dochartaigh (1980) and references therein.

The relationship between laryngeal and dorsal fricatives can thus be regarded as a relatively natural one in Irish. Structure Preservation cannot be invoked to account for the absence of voiced laryngeal fricatives from the derived inventory as the alternation actually manifested also violates Structure Preservation: lenited voiced coronal

stops **d, d'** are realized as dorsal fricatives **ɣ, ɣ'**. (The palatalized dorsal fricative further varies with a palatal glide). Voiced dorsal fricatives are not part of the lexical inventory of Irish, word/syllable initially or otherwise, rather they are derived as a result of leniting voiced dorsal and coronal stops, see (6) in §1.3.1. Coronal Delinking, I argue, applies to <u>all</u> coronal segments and [dorsal] is assigned to the lenited voiced coronal segments as an enhancing feature at the level of phonetic interpretation.

Lenition is therefore a complex rule involving two distinct operations: Coronal Delinking and Spirantization. In the following section I discuss the blocking of Lenition, which I have termed Coronal Blocking.

2.2.5.2 Coronal Blocking

In addition to being exceptional with respect to the alternations manifested in the Lenition series, coronal segments are exceptional in that Lenition is blocked by heteromorphemic coronal clusters. The lexical word-formation processes of compounding and prefixation, for example, are both marked by leniting the initial consonant of the second member - the second word within a compound and

the stem in the case of a prefixed form. Compound-formation and Prefixation are illustrated in (10) and (11), respectively.

(10) Compounding

a.	leath # súil	→	leathshúil
	l'a su:l'		l'ahu:l'
	'half' 'an eye'		'one eye'
b.	cúl # caint	→	cúlchaint
	ku:l kan't'		ku:lxan't'
	'back' 'talk'		'gossip'
c.	sean # máthair	→	seanmháthair
	s'an ma:hir'		s'anwa:hir'
	'old' 'a mother'		'a grandmother'
d.	mór # bealach	→	mórbhealach
	mo:r b'aləx		mo:rv'aləx
	'big' 'a way'		'a highway'

(11) Prefixation

a.	do- + déanta	→	dodhéanta
	do d'e:ntə		doje:ntə
	NEG 'done'		'impossible'
b.	il- + gnéitheach	→	ilghnéitheach
	il' g'n'e:həx		il'ɣ'n'e:həx
	multi 'faceted'		'multifaceted'

c.	in- +	pósta	→	inphósta	
	in'	po:stə		in'fo:stə	
	(=-able)	'married'		'marriageable'	
d.	ró +	te	→	ró-the	
	ro:	t'e		ro:h'e	
	'too'	'hot'		'too hot'	

In (10)a, for example, the initial voiceless coronal fricative of the second word is debuccalized to become a laryngeal fricative. In (10)b, the initial dorsal stop becomes a dorsal fricative.

However, whenever two heteromorphemic coronal consonants, with the exception of **r, r'**, are adjacent in the domain of application, lenition of the second member is blocked. The forms in (12) and (13) below, where Lenition is blocked, may be compared with those in (10) and (11).

(12) Coronal blocking: compounds

a.	sean # duine		→	seanduine	*seandhuine
	s'an din'i			s'andin'i	s'anɣin'i
	'old' 'a person'			'an old person'	
b.	fad # téarma		→	fadtéarma	*fadthéarma
	fad t'e:rmə			fadt'e:rmə	fadh'e:rmə
	'long' 'a term'			'longterm'	

c.	lán # sásta	→	lánsásta[13]	*lánshásta
	lɑ:n sɑ:stə		lɑ:nsɑ:stə	lɑ:nhɑ:stə
	'full''happy'		'fully happy'	

(13) Coronal Blocking: prefixed forms

a.	an- + deas	→	an-deas	*an-dheas
	a:n d'as		a:nd'as	a:njas
	'very''nice'		'very nice'	
b.	il- + teangach	→	ilteangach	*iltheangach
	il' t'aŋgəx		il't'aŋgəx	il'haŋgəx
	multi'lingual'		'multilingual'	
c.	leas- + deartháir	→	leasdeartháir	*leasdheartháir
	l'as d'r'əhɑ:r'		l'asd'r'əhɑ:r'	*l'asjr'əhɑ:r'
	'step-' 'a brother'		'a stepbrother'	

I propose that rule application is blocked in these cases by the shared [Coronal] specification, a kind of Inalterability.[14]

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[13] An alternative form is also possible which is lántsásta l :nt :st .

[14] Lenition is not blocked when either **r** or **r'** is the first member of a cluster the second member of which is a coronal segment, e.g.

(i) fíor # duine → fíordhuine (compare with (12))
f'i:r din'i f'i:rɣin'i
'real' 'person' 'a real person'

The clusters in these cases do not form a linked structure. Since **r, r'** do not pattern with the coronal consonants in this respect we must conclude that these sounds are non-coronal in Irish or that they are coronal and either (i) are characterized by an additional feature dependent on the primary coronal specification that blocks Coronal Fusion or (ii) that Coroanl Fusion applies to all coronal clusters in the relevant domin except **rC**-clusters. I favour the latter

Geminate Inalterability is typically accounted for in the literature by adopting either the Linking Constraint (Hayes (1986)) or the Uniform Applicability Condition (UAC) (Schein & Steriade (1986)). Consider first an account in which the Linking Constraint, given in (14) is adopted.

(14) Linking Constraint (Hayes (1986))
Association lines in structural descriptions are interpreted as exhaustive.

Coronal Delinking is repeated in (15).

(15) Coronal Delinking

$[_{Wd}$ -son
↓
Coronal

In order to block Coronal Delinking in examples such as those given in (12) and (13), we must propose a rule of Coronal Fusion that applies to derived coronal clusters in a given domain. Coronal Fusion applies to derived coronal clusters which occur at formative junctures following prefixation or compounding and when certain proclitics precede nominal forms. Thus the derived nasal-stop cluster

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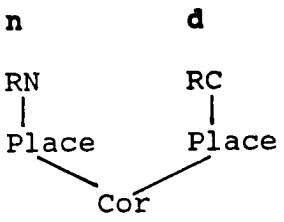
possibility as **r, r'** are flaps/taps articulated in the coronal region in most dialects of Irish. Furthermore, word-internal **rC**-clusters are linked (§4.4.3) and the coronal specification of **r** and **r'** spreads in certain domains (§2.4.4).

in **an-deas** **a:n d'as** 'very nice', for example, has a shared a [Coronal] specification.

(16) an-deas a:n d'as



Since Coronal Delinking refers to a singly linked coronal node it fails to apply to the linked structure in (16).

Coronal Blocking can be circumvented in certain cases by inserting a vowel into the coronal cluster. The relevant examples involve forms containing the intensifying prefix **an-** **a:n** 'very', or the prenominal adjective **sean** **s'an** 'old', both of which have a final nasal consonant. Lenition applies when an unstressed vowel is inserted following this nasal consonant within the formative domain resulting in non-adjacency of the coronal consonants. Coronal Fusion is blocked following vowel-insertion and Lenition applies, as illustrated in (17). I illustrate both possibilities in these examples, that is, both the form in which Coronal Blocking is evident from the failure of Lenition, (i), and the form in which it is circumvented by vowel-insertion and in which Lenition has applied, (ii).

(17)

A.	an- + te an- t'e	→	(i)	an-te an t'e
		→	(ii)	an-te anə h'e
	'very''hot'			'very hot'
B.	sean # duine s'an din'i	→	(i)	seanduine s'andin'i
	'old''person'	→	(ii)	seanduine s'anə ɣin'i
				'an old person'

Morever, Lenition is not blocked with heteromorphemic non-coronal homorganic clusters.

(18)

a.	óg # gluaiseacht o:g gluəs'əxt	→	ógghluaiseacht o:gɣluəs'əxt
	'young''a movement'		'a young movement'
b.	ubh # bailitheoir uv bal'iho:r'	→	ubhbhailitheoir uvwal'iho:r'
	'egg' 'a collector'		'an egg-collector'

Neither the adjacent identical dorsal consonants in (18)a, nor the homorganic labial cluster in (18)b, block the application of Lenition, which in these cases would involve

only Spirantization.[15] Spirantization applies in spite of the homorganic place specification in labial or dorsal sequences. We can account for this difference by stipulating that coronal clusters are the only heteromorphemic homorganic clusters that are fused. I have in fact referred to Coronal Fusion and not [Primary Place] Fusion in the discussion. This stipulation is essential if we are to account for the failure of Lenition in coronal clusters as a case of Inalterability.

However, Lenition comprises two operations -- Coronal Delinking and Spirantization. Where Coronal Delinking fails to apply, we do not find that Spirantization nevertheless does. Consequently, we must ensure that Spirantization is also blocked by linked Coronal structure. Spirantization, as formulated, is a feature fill-in rule which makes no reference to (Primary) Place. If Spirantization is to be blocked in examples containing linked coronal nodes, we must refer to [Place] in the structural description of the rule, as in (19).

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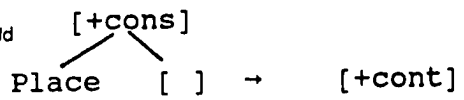
[15] Blocking also occurs optionally in some southern dialects with nasal-stop labial clusters, see Ó Cuív (1986), e.g.

(i)	bolg	bolǝg		'stomach'
	im bholg	ǝmbolǝg	*ǝmwolǝg	'in my stomach'

(19) Spirantization



Spirantization would then be blocked by a linked coronal specification. However, including [Place] in the formulation of the rule is otherwise unmotivated.[16]

An alternative to incorporating gratuitous reference to [Place] in the formulation of Spirantization would be to assume disjunctive ordering of Coronal Delinking and Spirantization. Disjunctive ordering is a property of morphological rules expressing the same meaning (see, for example, Anderson (1986)). Coronal Delinking, the more specific rule, would precede Spirantization. Spirantization would then not apply. Lenition of coronal obstruents would involve only Coronal Delinking and Spirantization could be formulated without referring to [Place]. However, while this alternative could be adopted to account for Coronal Blocking in Lenition environments, it is not an option for the second type of initial consonant mutation - Eclipsis. Eclipsis involves a single rule which applies to all places of articulation. Though the rule does not refer to Place - as Spirantization does not - it is also blocked by linked

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[16] See also Hayes (1986:345) where rules are discussed that show Inalterability effects but whose structural descriptions need refer to certain association lines only to derive these effects, e.g. Spanish spirantization, Harris (1982), plural formation in Hausa, Tuller (1984).

Coronal structure. I address this instance of blocking in §2.3.4. Therefore, we can conclude that disjunctive rule ordering is not a satisfactory option.

We may turn then to the second proposal mentioned earlier in this section. Schein & Steriade's Uniform Applicability Condition (UAC) predicts blocking of structure-dependent rules when the input to a rule contains linked structure.

(20) Uniform Applicability Condition (Schein & Steriade (1986:727))
Given a node n, a set S consisting of all nodes linked to n on some tier T, and a rule R that alters the contents of n: a condition in the structural description of R on any member of S is a condition on every member of S.

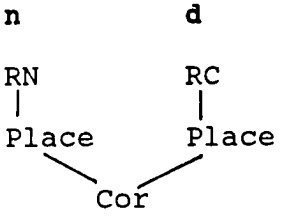
The UAC as stated predicts blockage if the target node of the rule is linked to two nodes which are on the same tier but only one of which satisfies a condition imposed on a node on that particular tier in the rule formulation. Coronal Delinking, repeated in (21), requires that the Coronal node be word-initial.

(21) Coronal Delinking

$[_{Wd}$ -son
≠
Coronal

The coronal node in (16), repeated in (22), is simultaneously linked to the place node of the word-initial segment that is the target of Lenition and to the place node of the preceding prefix-final segment. The structural condition incorporated in Coronal Delinking, that is, that the target [Coronal] be word-initial, cannot be exclusively met in this case and Coronal Delinking is blocked.

(22) an-deas a:**n** **d'**as (=(16))



However, the UAC in this instance faces the same problem as the Linking Constraint: unless we stipulate disjunctive ordering of Coronal Delinking and Spirantization, we cannot prevent Spirantization from applying in the examples that contain linked coronal structure. The UAC predicts geminate blockage only if the target node is doubly linked. The coronal node in the

examples illustrating Coronal Blocking is indeed doubly linked; however, the coronal node is not the target of Spirantization and we would therefore not expect rule-application to be blocked by a linked coronal node.

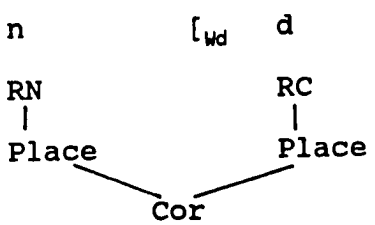
The evidence of Irish requires that Geminate Inalterability be captured by a more general condition on structurally defined rules as proposed in (23).

(23) Structural conditions are strictly interpreted.

By "strictly", I mean the following: when a structural condition is imposed on a segment, no part of that segment may obey a contradictory structural condition. For example, the structural condition on both Spirantization and Coronal Delinking requires that the segment which is the target of the rule be word-initial. A word-initial segment that is place-linked to a preceding segment is no longer strictly word-initial - a part of that segment (Place) is word-final. In **an-deas** **a:n d'as**, for example, the voiced coronal stop **d** is the target of Lenition. However, this consonant is place-linked to the preceding coronal nasal and is therefore not strictly word-initial. Lenition cannot apply. Compare the forms in (24)a. and (24)b. (24)a. contains linked structure that blocks Lenition whereas (24)b. does not.

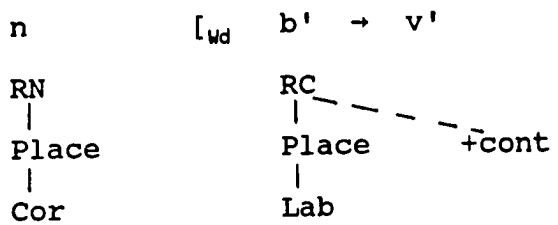
(24) a. deas d'as 'nice'

an deas a:n d'as 'very nice'



b. beag b'og 'small'

an-bheag a:n v'og 'very small'



Nevertheless, Lenition does apply to the first consonant of word-initial coronal clusters. The past tense forms of the verbs in (25)a. and b., which have initial coronal clusters, is expressed by Lenition.

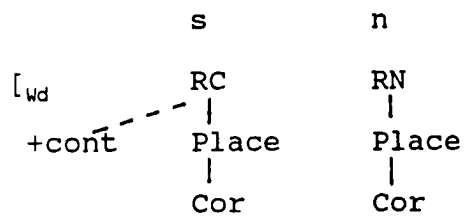
(25) a. sleamhnaigh s'l'awnə 'slip'(imper)

shleamhnaigh h'l'awnə 'slipped'

b.	<u>snámh</u>	**sn ɑ:v**	'swim'(imper)
	<u>shnámh</u>	**hn ɑ:v**	'swam'

While there is reason to believe that coda consonants in clusters are place-linked with a following homorganic consonant (§4.4.3), apparently onset clusters are not place-linked. Lenition of the initial consonant of the verb **<u>snámh</u>** **sn :v** 'swim' in (25)b. is illustrated in (26).

(26) <u>shnámh</u> **hn ɑ:v**



I discuss word-initial clusters in §2.2.8.

2.2.5.3 [Coronal] - Lexically Specified or not?

In the present study I have so far assumed that [Coronal] is lexically specified. More generally, primary place is lexically specified for all places of articulation in Irish. [Coronal] must crucially be specified in at least two domains where rules that precede default rules apply,

namely, (i) at the level of syllabification and (ii) at the level at which prefixation and compound formation take place. (i) All primary place features must be specified at the level at which syllabification takes place as Weight-by-Position, a rule that applies during syllabification, is blocked when a consonant to which it would apply forms a linked structure with a following homorganic consonant (see §4.4.3). (ii) [Coronal] must be specified in order to account for the blocking of Lenition at morpheme and word junctures within prefixed and compound forms. Lenition is blocked in these cases by the linked place structure, as discussed in the previous section.

However, an alternative approach to that taken here would be to argue that [Coronal] is the default specification for (Primary) Place in Irish and that coronal segments are lexically unspecified for primary place.[17] Taking [Coronal] as the default specification for place would not be remarkable: coronal segments clearly have a particular status at least in the initial consonant alternations. The special status of coronals in a number of languages has indeed been the focus of much recent research, e.g. Avery & Rice (1988, 1989), Paradis & Prunet (1988), Yip (1989), Lahiri & Evers (1989). The motivation for considering [Coronal] to be lexically unspecified in Irish would clearly be that it might enable us to account for the

[17] This is in fact the proposal made by Kelly (1989).

'placelessness' of lenited coronal consonants.[18] Default fill-in of [Coronal] would somehow be blocked as a result of Lenition and coronal consonants would remain placeless in Lenition environments.[19] However, this approach would not permit an account of Coronal Blocking. As discussed in the previous section, a coronal consonant preceded by another coronal consonant in certain domains fails to undergo lenition. The account proposed derived Coronal Blocking as a result of linked structure (Inalterability), which in turn is the result of Coronal Fusion. If [Coronal] is unspecified at the level at which Lenition applies, there is no linked structure and we have no way of accounting for the failure of Lenition. We may derive the linked structure only by applying the default rule that assigns [Coronal]

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[18] A similar proposal is made by Avery & Rice (1989) for coronal/glottal stop variation in English.

[19] Kelly (1989) proposes that coronal segments receive a dorsal specification (spread from a preceding vowel-final trigger) in Lenition environments. Apart from the fact that laryngeal segments are not typically represented as dorsal segments, this account is problematic as not all Lenition environments involve a vowel-final trigger, e.g. (i) Lenition may apply sentence-initially (past-tense marking on (S-initial) verbs) (See also §2.2.9 where I argue that Lenition cannot be represented as affixation), (ii) phrasal agreement (post-nominal adjectival agreement) marked by Lenition can occur following a non-dorsal segment, e.g. **tais tas'** 'damp', **áit thais ɑ:t' has'** 'a damp place'. [Note that Coronal Fusion does not apply in this case so that the coronal sequence does not form a linked structure that would block Lenition].

before the application of Lenition.[20] However, the original motivation for underspecifying [Coronal] was to account for the 'placelessness' of lenited coronal consonants. This necessitated ordering the default rule after Lenition. We are thus faced with contradictory requirements and must therefore conclude that taking [Coronal] as the default (primary) place specification for Irish is untenable.

2.2.5.4 Coronal Sonorants

The coronal sonorants do not alternate in Lenition environments in the dialect under consideration.[21] The forms in (27) show no alternations. Recall that the initial consonant of a noun preceded by the possessive pronoun **mo** m 'my' lenites, see also (2).

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[20] In order to derive the desired linked structure, we would have to stipulate that default rules are subject to the Obligatory Contour Principle (McCarthy (1986), Leben (1973) Goldsmith (1976)).

[21] In dialects where there is a tense/lax distinction (also referred to as a length distinction) in the coronal sonorants a word-initial tense sonorant becomes lax in Lenition environments. Selkirk (1990) presents an account of geminates in a lenition process in Finnish in which an ill-formed representation that is the output of the application of the rule is 'repaired' by degemination. Such an account could be extended to account for the tense sonorant consonants in these dialects of Irish.

(27)

A.	(i)	námhaid	nɑ:wid'	'an enemy'
		mo námhaid	mə nɑ:wid'	'my enemy'
	(ii)	néal	n'e:l	'a cloud'
		mo néal	mə n'e:l	'my cloud'
B.	(i)	lámh	lɑ:v	'a hand'
		mo lámh	mə lɑ:v	'my hand'
	(ii)	léine	l'e:n'i	'a shirt'
		mo léine	mə l'e:n'i	'my shirt'
C.	(i)	rás	rɑ:s	'a race'
		mo rás	mə rɑ:s	'my race'
	(ii)	réalt	re:lt	'a star'
		mo réalt	mə re:lt	'my star'

Coronal Delinking was thus formulated so as to apply only to the coronal obstruents. Spirantization may or may not apply to the liquids: both Spirantization and the default rule for these segments assign [+cont]; the resulting segments either way are non-distinct.[22] If we disregard the liquids,

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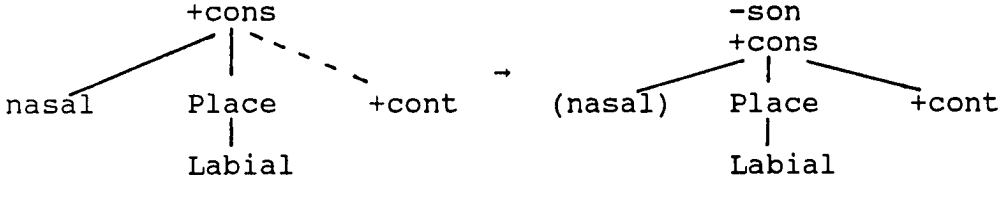
[22] In this respect the liquids pattern with the laryngeal fricatives.

Lenition, in effect, applies to the obstruents and the labial nasals pattern with the obstruents in this respect.[23] We can account for the different behaviour of labial and coronal nasals in Lenition environments by underspecifying the labial nasals for [son]. Labial nasals initially become labial nasalized fricatives; [nasal] is then deleted as the result of a markedness convention, §2.2.4. Coronal nasals, on the other hand, do not undergo Spirantization. If labial nasals are lexically unspecified for [son], the remaining relevant specifications, [+cons] and [+nasal], are compatible with [+cont] and Spirantization applies as illustrated in (28); [-son] is then assigned by default and the lenited labial nasals thus merge with the lenited voiced nasal stops.

(28)



Spirantization [-son] assigned by default

Underspecifying the labial nasals for [son] has further consequences in the phonology, in particular with respect to

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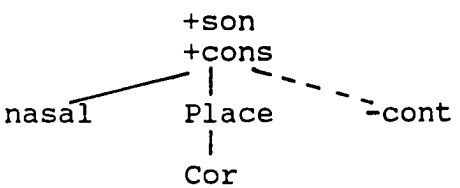
[23] The contrasting behavior of coronal and labial nasals is a more general problem encountered in a number of languages.

clusters where they pattern with the obstruents (§2.2.8) and also with respect to defining a hierarchy of relative sonority (§2.3.2). I return to this issue in those sections.

The coronal nasals, in contrast, are specified for [+son] and [nasal], which together are incompatible with [+cont]. Spirantization is therefore blocked. The coronal nasals are then assigned [-cont] by default, as illustrated in (29).

(29)



Spirantization blocked;
[-cont] assigned by default

Spirantization must be blocked for the coronal nasals; we would otherwise expect nasal segments to pattern uniformly. Lenited coronal nasals would then merge with lenited (voiced) coronal stops. Moreover, since this is not the case, we do not have recourse to active persistent rules in the spirit of Myers (1990). Myers accounts for a series of consonant mutations in Shona by spreading the features of a mutation morpheme to the initial segment of the word to which it is attached. Illicit outcomes of the spreading process are dealt with by active persistent rules which

modify the resulting segment. This clearly is not the case with the lenited coronal nasals in Irish.

2.2.6 Labiodental Fricatives

2.2.6.1 Deletion as a Default Rule

Labiodental fricatives undergo spirantization vacuously as they are lexically specified as [+cont]. Spirantization, repeated in (30), is a fill-in rule.

(30) $[_{Wd}\ \overset{\alpha}{[\ ]}] \rightarrow [+cont]$

However, recall that labiodental fricatives are deleted in Lenition environments, as illustrated in (31).

(31)

A.	(i)	<u>fata</u>	fatə	'a potato'
		<u>an fhata</u>	ən atə	'the potato' m sg gen
	(ii)	<u>fuil</u>	fil'	'blood'
		<u>an fhuil</u>	ən il'	'the blood' f sg nom
B.	(i)	<u>fíon</u>	f'i:n	'wine'
		<u>an fhíon</u>	ən' i:n	'the wine' f sg nom

(ii)	feoil	f'o:l'	'meat'
	an fheoil	ən' o:l'	'the meat' f sg nom

An additional rule, which I call Total Deletion, must therefore be proposed that applies to these segments. Total Deletion can be regarded as a default rule that applies whenever Lenition applies vacuously. In order to consider Lenition to have applied vacuously, Lenition **must** be regarded as a feature fill-in rather than a feature-changing rule. Recall that both possibilties were introduced in §2.2.2. If Spirantization were a feature changing rule (changing [-cont] to [+cont]), it would not apply to labial fricatives (vacuously or otherwise). This conception of the rule is necessary also to account for the behaviour of vowel-initial stems in Lenition environments which I discuss in §2.4.5.

Having a default rule that applies whenever a rule applies vacuously is not an expected property of a phonological rule. However, Lenition is morphologically conditioned and could therefore be expected to share properties of morphological rules.[24]

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[24] A similar type of 'default' process may be seen, for example, with Yiddish borrowings in English. Echo-word Reduplication of Yiddish words is usually of the form: CX → CX shmX, where the initial consonant of the word (represented here by C) is replaced in the reduplicated form by shm, e.g. quotas, shmotas; fancy, shmancy. However, if a word already contains an initial shm, this cluster is instead replaced by shp in the reduplicated form, i.e. shmX

2.2.6.2 Palatalized Labiodental Fricatives

Lenited palatalized labiodental fricatives undergo Total Deletion. However, the palatalization feature is retained and is realized on the preceding consonant in certain domains as illustrated in (32).[25]

(32)

(i)	fíon	f'i:n	'wine'
	an fhíon	ən' i:n	'the wine' f sg nom
(ii)	feoil	f'o:l'	'meat'
	an fheoil	ən' o:l'	'the meat' f sg nom
(iii)	féar	f'e:r	'grass'
	an féar	ən f'e:r	'the grass' m sg nom def
	an fhéir	ən' e:r'	'the grass' m sg gen def
(iv)	file	f'il'i	'a poet'
	an file	ən f'il'i	'the poet' m sg nom def
	an fhile	ən' il'i	'the poet' m sg gen def

→ shmX shpX, *shmX shmX, for example, shmalz → shmalz, shpalz, *shmalz, shmalz. This second rule may be regarded as a default rule that applies to maintain morphological distinctness.

[25] I present further evidence for a rule of Total Deletion when I discuss the vowel-initial stems in lenition environments, §2.4.5.

Feminine singular nominative definite nouns, (32)(i) and (ii) and masculine singular genitive definite nouns, (32)(iii) and (iv), are marked by Lenition. Lenition of the initial palatalized labiodental fricatives in these examples results in (i) deletion of the segment and (ii) palatalization of the preceding nasal consonant. It is clear from (32)(iii) and (iv) that palatalization of the final nasal consonant of the preceding proclitic occurs only with deletion of the initial palatalized labiodental fricative. Segment deletion with subsequent retention of a feature specification may be likened to the 'Phantom Limb' phenomenon described by Hale (1973), who makes use of the term proposed by S.J. Keyser to refer to the realization in a preceding segment of a feature inherent in the following segment following deletion of the second segment.

2.2.7 Summary of Lenition

We now have the following division of segments in Lenition environments:

A. Segments that undergo Lenition (non-vacuously):

(1) Coronal obstruents

[Coronal Delinking, Spirantization, (Enhancement of laryngeal to dorsal)], [Glide Formation]

(2) Labial and dorsal stops

[Spirantization], [Glide Formation]

(3) Labial nasals

[Spirantization, [Nasal]-Deletion], [Glide Formation]

(4) Laryngeal fricatives,[26] (Liquids)

[Spirantization]

B. Segments that undergo Lenition vacuously:

(1) Labial fricatives

[Spirantization (vacuously), Total Deletion]

C. Segments that do not undergo Lenition:

(1) Coronal nasals

The rule of Lenition is a complex rule that comprises three rules, repeated in (33).

(33) Lenition

Coronal Deletion = (3)

Spirantization = (8)

Default: Total Deletion

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[26] Like the liquids (§2.2.5.4), **h** is assigned [+cont] by a redundancy rule. Lenition pre-empts this rule although the outputs of both rules are non-distinct.

Total Deletion as discussed is a special default rule that applies only in the case of vacuous application of Lenition.

2.2.8 Clusters

The clusters that are permissible word-initially in non-mutation environments in Irish are listed in (34). Clusters carry uniform specifications for secondary place features with two exceptions, noted below.[27]

(34) (i) Non-coronal obstruent + liquid
{p,p',b,b',f,f',k,k',g,g'} + {l,r}

(ii) Coronal stops + r
{t,t',d,d'} + r

(iii) Dorsal stops + n
{k,k',g,g'} + n

(iv) s,s' + coronal sonorant
{s,s'} + {n,l,r}

(v) s,s' + voiceless stops[28]
{s,s'} + {p,p',t,t',k,k'}

---

[27] The sonorants in these lists are represented as non-palatalized. However, in a cluster they share the palatalization feature of a preceding palatalized segment.

[28] The cluster **s'p'** is not a permissible cluster word-initially. It only occurs medially. **sp'-** and **sp-** are both possible word-initially.

(vi) s + labial nasal[29]

s + m

Lenition applies to the clusters in (34)(i), (ii), (iii) and (iv) above. The initial consonant of each cluster undergoes Lenition. This is illustrated as follows.

(35)	(i)	glas	glas	'a lock'(N)
		ghlas	ɣlas	
	(ii)	trá	trɑ:	'a beach'
		thrá	hrɑ:	
	(iii)	gné	g'n'e:	'an aspect'
		ghné	ɣ'n'e:	
	(iv)	snáth	snɑ:	'a thread'
		shnáth	hnɑ:	

[29] The same constraint holds here as holds of an **s + labial stop** cluster, namely, the coronal fricative can not share a palatalization feature with the following labial nasal. Thus **sm'-** and **sm-** are permissible word-initially but **s'm'-** is not. As with the **s + labial stop** cluster, **s'm'** can occur medially.

Lenition cannot apply to the clusters in (34)(iv) and (vi) above.[30] Examples of occurrences of these clusters word-initially are given (36) and (37), respectively.

(36) **s,s' + voiceless stop**

(i)	spéaclaí	sp'e:kli:	'spectacles'
(ii)	stól	sto:l	'a stool'
(iii)	scian	s'k'i:ən	'a knife'

(37) **s + labial nasal**

smaoineamh	smi:n'əv	'a thought'
sméara	sm'e:r	'berries'

Neither the forms in (36) or in (37) show alternations in Lenition environments. The result of leniting the clusters in (36) would be **hp'**, **ht**, and **hk'**, respectively. These clusters violate sonority requirements on syllable initial clusters that require a sequence of increasing sonority from the syllable boundary to the nucleus. Voiceless stops are less sonorous than (or possibly equally sonorous with)

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[30] The generalization here is that when a cluster consists of two leniting consonants, Lenition is blocked. However, when a cluster consists of a leniting consonant and a non-leniting consonant (that is, if the liquids are considered non-leniting, see §2.2.5.4), Lenition applies. This may point towards an alternative treatment of this type of blocking than the account I am about to propose.

voiceless laryngeal fricatives. The unlenited versions do not violate sonority requirements because voiceless coronal fricatives **s, s'** are exceptional with respect to sonority - there are instances in many languages of these segments behaving as though they were outside the sonority hierarchy.

We may extend a sonority-based account to the second group of exceptions in (37) and argue that **m** is less sonorous than other nasal consonants.[31] **mn** is a word-initial cluster in a small number of words in Irish based on the form **mná** mna: 'woman (gen sg), women (nom pl)'. I proposed in §2.2.5.4 that labial nasals in Irish are unspecified for [son]. They therefore fall between the voiced obstruents and the remaining nasals on a hierarchy of relative sonority. I discuss such a hierarchy for Irish in §2.3.2. Assuming the labial nasals to be less sonorous than the coronal nasals and thus closer in sonority to the voiceless fricatives, the result of leniting **sm** or **sm'** would violate a minimal sonority distance requirement on clusters, whereas lenited **sn** or **s'n'** would not.

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[31] This has been claimed to be the case also in Chukchee, (Levin (1985).

2.2.9 Lenition as Affixation

The account pursued in the present study is one in which Lenition is considered a rule that applies directly to the mutating segment. In the case of a coronal obstruent, a coronal specification is deleted (Coronal Delinking); in the case of all segments undergoing Lenition, a [+cont] specification is assigned non-vacuously where the segment in question is unspecified for this feature and vacuously where the segment in question is already specified as [+cont].

An alternative approach that has been proposed in the literature is one in which Lenition, or indeed any initial consonant mutation, is considered to be affixation. This alternative approach involves those accounts in which the contents of the affix are subsegmental features (for example, Massam (1983), Lieber (1987), Gussmann (1986), Kelly (1989)). Initial mutations are accounted for in these works by positing a floating autosegment consisting of the mutating feature(s) which associate(s) to the segment that is the target of the mutation. These accounts assume a certain amount of underspecification in the lexical representations. In the account proposed by Lieber, for example, the alternating consonants are unspecified for some or all of the features of any mutation autosegment in the language. A feature in the floating autosegment is incorporated into the segmental tier of the segment to which

it associates, unless the segment is previously specified for that feature. In the event of this occurring, the segment is said to be **prespecified** for the feature in question. Prespecification is thus used to override the association of a feature specification in the floating autosegment.

Lieber's account of Lenition in Welsh, which has some similarities with Lenition in Irish, can be outlined as follows. The consonant alternations are given in (38).

(38) non-lenited p t k b d g m l r
lenited b d g v ð Ø v l r

Lieber accounts for these alternations by proposing that the non-lenited environment is characterized by an autosegment [-voice, -cont] (essentially the default values for these segments), while the lenited environment is characterized by [+voice, +cont]. The initial consonants in Welsh are then prespecified as follows: voiceless stops are prespecifed for [-cont] and voiced stops are prespecifed for [+voice]. Non-lenited and lenited **p** and **b** are represented in (39) and (40) below.

(39) a. non-lenited **p** = [p]

[+ant, -cor, +lab, -cont]

non-mutation autosegment

[-voice, -cont]

b. lenited **p** = [b]

[+ant, -cor, +lab, -cont] ——overrides——

lenition autosegment

[+voice, +cont] ←

(40) a. non-lenited **b** = [b]

[+ant, -cor, +lab, +voice] ——overrides——

non-mutation autosegment

[-voice, -cont] ←

b. lenited **b** = [v]

[+ant, -cor, +lab, +voice]

lenition autosegment

[+voice, +cont]

In (39)a., non-lenited **p** is assigned the (default) value [-voice] as a result of the association of the non-mutating autosegment. In (39)b., prespecification of **p** for [-cont] prevents the opposing value for this feature in the lenition autosegment from associating in a Lenition environment;

[+voice] associates resulting in a voiced labial stop. In (40)a., prespecification of [+voice] in the stem melody overrides [-voice] in the autosegment that marks non-lenition environments; [-cont] associates resulting in a voiced labial stop. In (40)b., the [+cont] of the autosegment associates to cause spirantization of the labial segment.

If we were to adapt Lieber's approach to account for Lenition in Irish, we would have the following problem in particular to face:[32] If we assume the Lenition autosegment to be [+cont], this would enable us to account for the lenition of the labial and velar stops. However, there is no clear way in which to derive the 'placelessness' of the lenited coronal segments. Plainly, there is no way to affix the absence of a feature. This problem is not particular to Lieber's analysis, rather it holds of all affixation analyses. Even if [Coronal] were unspecified in the lexical representation, we would have to stipulate that this remains the case only in lenition environments. A default fill-in rule assigning [Coronal] to segments unspecified for Place would have to be sensitive to whether

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[32] Apart from the problem outlined in the text, Lieber's account requires an ad hoc division of the stops with respect to the specification for [cont]: voiceless stops are prespecified for [-cont] while voiced stops are unspecified for [cont].

or not the segment in question had undergone lenition.[33] However, within an affixation approach we would clearly account for Coronal Blocking as the result of Inalterability: affixation would be blocked by linked structure. [Coronal] would have to be specified for such an account.

2.3 Eclipsis

2.3.1 The Eclipsis Series

The consonant alternations in Eclipsis are given in (41).

(41) (a) non-eclipsed **p p' t t' k k' f f'**
eclipsed **b b' d d' g g' v v'**

(b) non-eclipsed **b b' d d' g g'**
eclipsed **m m' n n' ŋ ŋ'**

The alternations in (41) are summarized as follows:

(a) Voiceless obstruents become voiced. This alternation is subject to Structure Preservation -

[33] See also the argument against underspecification of [Place] in §2.2.5.3.

there are no voiced coronal fricatives in either the lexical or the derived inventory in Irish, see (4)-(6) in §1.3.1. Voiceless coronal fricatives **s, s'** therefore do not undergo Eclipsis.

(b) Voiced obstruents become nasals.

Examples of the alternations are given in (42).

(42)

A.	(i)	teach t'ax	a dteach ə d'ax
		'a house'	'their house'
	(ii)	cóta ko:tə	a gcóta ə go:tə
		'a coat'	'their coat'
	(iii)	fear f'ar	leis an bhfear l'es' ə v'ar
		'a man'	'with the man'
B.	(i)	bosca boskə	ar an mbosca ər ə moskə[34]
		'a box'	'on the box'
	(ii)	doras dorəs	a ndoras ə norəs
		'a door'	'their door'

[34] The final nasal consonant of the definite article is elided in these phrases.

(iii)	geata	bhur ngeata
	g'atə	wur ŋ'atə
	'a gate'	'your (pl) gate'

The second person plural possessive pronoun in (42)A.(i), (ii) and (42)B.(ii) and the third person plural possessive pronoun in (42)B.(iii), respectively, trigger eclipsis of the following noun, which results in an alternation between the initial voiceless coronal and dorsal stops and their voiced counterparts. The prepositional objects in (42)A.(iii) and (42)B.(i) are also marked by Eclipsis. Consequently, the initial voiceless labial fricative and voiced labial stop alternate with a voiced labial stop and a labial nasal, respectively.

2.3.2 Eclipsis as a Sonority-based Alternation

Within a rule-based approach, Eclipsis can be formulated as two distinct segmental rules: (i) a voicing rule: [-voice] → [+voice], which accounts for the alternations in (41)(a) above, and (ii) a nasalizing rule: [-son, +voice] → [+nasal], which accounts for the alternations in (41)(b). Alternatively, the rule may be formulated to reflect a uniform (minimal) increase in sonority of the target segments along a sonority scale that may be defined roughly as follows: voiceless obstruents <

voiced obstruents < nasals. I pursue the second account here.

There have been a number of proposals in the literature for specifying a sonority hierarchy in terms of distinctive features,[35] e.g. Zwicky (1972), Rivas (1977), Farmer-Lekach (1979), Levin (1985), Clements (1987), Zec (1989). Clements (1987), for example, calculates the sonority index of classes of segments by counting the number of positive specifications a particular class has for a delimited set of features. I adopt this approach.

Clement's (1987) specifies a broad sonority scale using the features [vocoid] - essentially the opposite of [consonantal] - [approximant] and [sonorant]. Clements, however, assumes that [voice] is not relevant for the purposes of calculating the relative sonority rank of the oral stops. If we are to view Eclipsis as a sonority-based alternation, we must specify a sonority scale that assigns voiced and voiceless obstruents different sonority values. Therefore, I include [voice] in the class of features used to specify the sonority scale for this purpose. I also omit a specification for [son] for the labial nasals, as proposed in §2.2.5.4. The labial nasals thus form a class independent of the other nasal consonants. The table in

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[35] The approach taken in the works cited may be contrasted to an opposing approach in which a scale of relative sonority is stipulated rather than derived, e.g. Hankamer & Aissen (1974), Selkirk (1984).

(40) below is a modified version of that proposed by Clements and captures the relevant sonority distinctions in Irish.

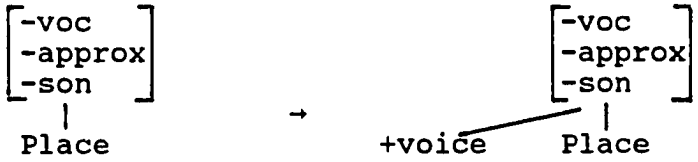
(43)

	O-v	O+v	m	N	L	V
vocoid	-	-	-	-	-	+
approximant	-	-	-	-	+	+
sonorant	-	-		+	+	+
voice	-	+	+	+	+	+

O = obstruents, m = labial nasals, N = nasals, L = liquids, V = vocoids (vowels and glides)

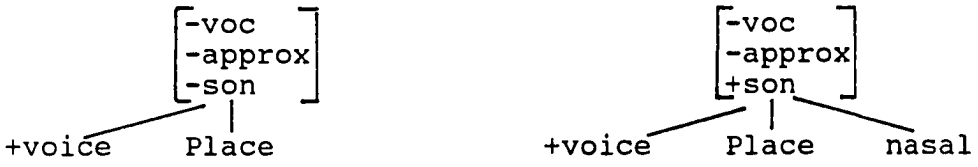
Eclipsis targets [-sonorant] segments and involves a minimal change along the sonority scale defined above. 'Minimal change' is defined so as to involve the addition of <u>one</u> specification in a specified direction (more/less sonorous) to the feature representation of the segment undergoing a process that is defined in sonority terms. Eclipsis involves a minimal increase in the relative sonority value of the class of segments that undergo the rule. Voiceless obstruents thus acquire a positive specification for [voice], as illustrated in (44).

(44)



A voiced obstruent acquires a positive specification for [son]. In this case the resulting segment is specified for [nasal] by the following redundancy rule: [-vocoid, -approximant, +sonorant] → [nasal].

(45)



Defining Eclipsis in this way captures the generalization that eclipsis involves a chain shift.[36] I discuss additional data involving prothetic consonants in Eclipsis environments in §2.4.4 that support this approach.

Notice that within this account the labial nasals pattern with coronal and dorsal nasals in so much as the result of eclipsing a voiced stop is the corresponding nasal. This is not inconsistent with the approach adopted. The labial nasals clearly have an ambiguous status in the phonology: they pattern with the obstruents with respect to

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[36] Recall that the voiceless coronal fricatives do not alternate in Eclipsis environments, §2.3.1. I suggested that this was due to Structure Preservation. As pointed out in §2.2.8, voiceless coronal fricatives behave as though they were outside the sonority hierarchy. This could point to an alternative account of their failure to eclipse.

lenition of single segments and clusters, whereas they pattern with the remaining nasals with respect to Eclipsis. Underspecifying the major class feature that distinguishes the obstruents from the sonorants captures this ambiguous status and as a result the labial nasals form a distinct class in a hierarchy defined in terms of positive feature specifications as in (43).

2.3.3 Dependency Phonology and Mutations

The account of Eclipsis proposed in the previous section shares a distinctive characteristic with accounts of the different initial consonant mutations in both Irish and Welsh that have been proposed within the theory of Dependency Phonology. Both approaches attempt to characterize the mutations in terms of a change along a hierarchy that is, in turn, defined in terms of the components that make up the segmental representation. In the present account, the sonority hierarchy is specified in terms of certain subsegmental features. Eclipsis is then characterized as involving an increase in the sonority value of the alternating consonant.

Dependency Phonology accounts (Ó Dochartaigh (1979), Ewen (1982)), on the other hand, define a hierarchy in terms of the prominence of certain gestures that are defined as

primitives of the theory. The relevant gestures are the categorial gestures (as distinct from the articulatory gestures), that is, those defining manner and voicing. The gestures **V** and **C** define the 'relative periodicity' and the 'energy reduction', respectively, of a segment according to the degree of prominence these gestures have in the structural representation.[37] The degree of prominence of the various gestures, (including also the nasal gesture **N** and the initiatory gesture **O** (defining the degree of glottal stricture)) is determined by the nature of the dependency relations that hold between the various gestures, viz. governing, mutual dependence or dependence.

Consonant alternations are defined as uniform changes in the relations that hold between these gestures. For example, Ó Dochartaigh proposes that Lenition in Irish involves the addition of a mutually dependent **V**-element, as illustrated in (46). Voiceless and voiced stops are represented in terms of the phonatory gestures as **C** and $\underset{|}{\mathbf{C}}$, $\underset{\mathbf{V}}{}$

respectively; voiceless and voiced fricatives are represented as **V,C** and $\underset{|}{\mathbf{V}}$**,C**, respectively. $\underset{\mathbf{V}}{}$

---

[37] These gestures may be compared with the Jacobsonian features [vocalic] and [consonantal].

(46)

C	→	V,C		C	→	V,C
				|		|
				V		V
Voiceless stops → fricatives				Voiced stops → fricatives		

While I do not concern myself with the mechanics of the changes effected within this approach, it is clear that the idea is to attempt to represent the consonant alternations along a continuum of segment types. Ó Dochartaigh addresses the issue of the exceptional reflexes of the lenited coronal segments by referring to the coronal consonants by means of an independent process that deletes the supra-glottal submatrix, as in (47).

(47)

[+Dental]	→	[Ø]
[V,C]		[V,C]

i.e. The place specification of the dental fricatives is deleted.

While an independent process is clearly required to account for the behaviour of the coronal consonants - and this account is not different from the account proposed in this study in that regard - the account given does not enable us to predict Coronal Blocking. Given the primitives of the theory, it is not possible to predict blocking of Lenition, §2.2.5.2, or blocking of Eclipsis, to be discussed in the following section. The structures represented within this approach cannot be used to refer to independent

continuous tiers, and thus to linked structures, in the way that a Feature Geometry approach can.

2.3.4 Coronal Blocking

Eclipsis is blocked in a subset of the environments in which Lenition is blocked. A prepositional object may either be lenited or eclipsed, depending on the dialect. However, both of these initial mutation processes are blocked whenever two heteromorphemic coronal consonants are adjacent at the word boundary between the article and the noun. The following examples illustrate this blocking.

(48) Blocking of eclipsis

a.	(i)	an doras ən dorəs	ar an doras / *ndoras er' ən dorəs[38] / * norəs
		'the door'	'on the door'
	(ii)	an dearmad ən d'arəməd	faoin dearmad[39]/ *ndearmad fi:n' d'arəməd / *n'arəməd
		'the mistake'	'about the mistake'

[38] The final nasal consonant of the definite article may be elided. However, whether or not it is articulated does not affect the application of Eclipsis in these examples.

[39] The complex prepositional form in this example, **faoin fi:n**, contains the preposition **faoi fi:** and the definite article **an ən**.

b.	(i)	an teallach ən t'aləx	leis an teallach / *dteallach l'es' ən t'aləx / * d'aləx
		'the hearth'	'with the hearth'
	(ii)	an talamh ə(n) talə	faoin talamh / *dtalamh fi:n talə *dalə
		'the ground'	'under the ground'

The examples in (48) above may be compared with those in (42), repeated in (49).

(49)	(i)	bosca boskə	ar an mbosca ər' ən moskə	(=(42)b.(i))
		'box'	'on the box'	
	(ii)	fear f'ar	leis an bhfear l'es' ən v'ar	(=(42)a.(iii))
		'man'	'with the man'	

Eclipsis usually applies to the initial consonant of the definite objects of the prepositions **ar** 'on' and **leis** 'with', but is blocked in the examples in (48) by the presence of the linked coronal structure.

Eclipsis is not blocked, on the other hand, by linked coronal sequences in other relevant domains (i.e. following (coronal) consonant-final proclitics). The following examples contain verbs preceded by a proclitic - the question particle - whose final consonant is a coronal nasal.

(50) a.	an dtagann	ən dagən[40]	(Q-comes) lit 'does X come?
b.	an ndearna	ən nɑ:rnə	(Q-made) lit 'did X make?'

Eclipsis is also not blocked when the heteromorphemic coronal cluster involves a noun preceded by a cardinal number (an Eclipsis environment).

(51) a.	doras dorəs	seacht ndoras s'axt norəs
	'a door'	'seven doors'
b.	teach t'ax	seacht dteach s'axt d'ax
	'a house'	'seven houses'

Coronal Blocking in Eclipsis environments is accounted for in the same way as Coronal Blocking in Lenition environments: the formulation of the rule includes a structural condition that requires the target segment to be word-initial.

(52) Eclipsis

$[_{Wd}$ -son

Eclipsis: minimal increase in sonority

---

[40] As in previous examples, the final nasal of the proclitic can be elided in this form.

As with Lenition, a coronal segment place-linked with a preceding heteromorphemic segment is no longer strictly word-initial and rule-application is blocked. However, clearly not all sequences of coronal consonants that occur in Eclipsis environments are linked - Eclipsis is blocked only for a restricted set of cases. We must, therefore, restrict the domain of application of the rule of Coronal Fusion, so as to derive linked structure only in the relevant cases.

The account proposed in this section may be summarized as follows: Eclipsis applies to obstruents and involves a (minimal) chain shift along a sonority scale in the direction of increased sonority interpreted as a change in relevant feature values. The failure of Eclipsis in certain instances (Coronal Blocking) is accounted for by strict interpretation of the structural condition on rule-application, namely, that target segments be word-initial.

2.4 Vowel-stems and Prothetic Consonants

2.4.1 Prothetic Consonants in Mutation and Non-mutation Environments

Along with the initial consonant alternations discussed in the previous sections, there is a series of prothetic

consonants that appear before vowel-initial stems (henceforth, vowel-stems) in Irish when preceded by certain proclitics. The appearance of these consonants correlates in a clear way with the environment in which the word occurs, viz. whether the word occurs in mutation or a non-mutation environment. The following paradigm illustrates the different prothetic consonants that occur in Irish.

(53)	asal	asəl	'a donkey' m sg nom indef
	an t-asal	ən tasəl	'the donkey' m sg nom def
	an asail	ən asil'	'the donkey' m sg gen def
	asail	asil'	'donkeys' pl nom indef
	na h-asail	nə hasil'	'the donkeys' pl nom def
	na n-asal	nə nasəl	'the donkeys' pl gen def

The prothetic consonants in the examples above are **t-**, **h-** and **n-**. The distribution of these consonants is determined by two factors, namely, (i) the morphological or syntactic environment and (ii) the phonological environment in which the stem occurs. The former determines the mutation environment, that is, whether the stem occurs in a mutation (Lenition or Eclipsis) or non-mutation environment. The latter concerns the phonological material that precedes

the stem, that is, whether the stem occurs in a post-pausal position or, if preceded by a proclitic, whether that proclitic ends on a consonant or a vowel. The distribution of the prothetic consonants as determined by the interaction of these two conditioning factors is represented in the table in (54).[41]

(54)

	Phonological environment		
	post-pausal	following C-final or V-final proclitic	
Morphological environment			
No mutation	-- (**h-**)[42]	**t-**	**h-**
Lenition	--	--	--
Eclipsis	NA	**n-**	**n-**

In the following section I argue that vowel stems in Irish in fact have (consonantal) onsets. I focus first on vowel-stems preceded by consonant-final proclitics. Palatalization of the final consonant of the proclitic

[41] The prothetic consonants are not realized exclusively as non-palatalized - I use the non-palatalized member to represent both the non-palatalized and the palatalized consonant in the table in (54).

[42] Optional in the case of the autonomous past forms.

Palatalization of the final consonant of the proclitic occurs unpredictably before front and back vowels. I argue that it is not the initial vowel of the stem that determines whether or not palatalization occurs, rather, that the vowel-stems have underspecified onsets which may be lexically specified for [-back], the secondary place feature representing palatalization.[43] Where palatalization occurs, it is the the result of spreading [-back] from the onset to the preceding consonant. This account is generalized to all vowel-stems, that is, all apparent vowel stems in Irish have underspecified onsets. These onsets are, in turn, subject to the initial consonant mutations and the different realizations of the prothetic consonants are shown to follow from this account.

2.4.2 Vowel-stems and Underspecified Onsets

A number of vowel-stems show unpredictable behaviour when they occur with certain consonant-final proclitics. This unpredictable behaviour concerns assimilation of secondary place features. Palatalization of the final consonant of the proclitic sometimes occurs where we would not expect it to occur, that is, preceding a back vowel.

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[43] I argue in the following chapter that consonants are lexically specified for [-back]; [+back] is assigned by default.

Likewise, palatalization fails to occur in some instances where palatalization typically occurs, that is, preceding a front vowel.[44] In order to account for these discrepancies I argue that in the exceptional cases the stems are actually consonant-initial stems, that is, they have underspecified onsets. These onsets may be specified for secondary place (vowel) features which may differ from the features of the following vowel. A consonant preceding such a 'vowel stem' will assimilate to the secondary place feature of the onset and not to the features of the vowel. In the discussion that follows I restrict the examples to cases of the definite article followed by a vowel-initial nominal stem, i.e. $[[_{DefArt}\ ən][_{N}V...]]$. However, the generalizations stated apply to all consonant-final proclitics preceding vowel-stems in the appropriate domain.

Palatalization of the final consonant of a proclitic usually occurs before a vowel stem with an initial high front vowel.

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[44] The generalization as stated is a naive statement of the surface facts. I will argue in the following chapter that palatalization is in fact never triggered by a vowel. Rather, it is always either the result of spreading from an adjacent palatalized consonant or the result of a rule of Final Palatalization.

(55)

(i)	<u>iontas</u>	i:ntəs	'a wonder'
	<u>an iontais</u>	ən' i:ntis'	'the wonder'[45] m sg gen def
(ii)	<u>iasc</u>	i:əsk	'a fish'
	<u>an iasc</u>	ən' i:əsk	'a fish' m sg dat def
(iii)	<u>inneall</u>	inəl	'a machine'
	<u>an innill</u>	ən' in'il'	'the machine' m sg gen def
(iv)	<u>ithir</u>	ihir'	'soil'
	<u>an ithir</u>	ən' ihir'	'the soil' f sg nom def

The final nasal of the definite article in all the examples above precedes a high front vowel and becomes palatalized.[46]

However, palatalization fails to occur preceding a number of stems that have identical initial high front vowels in the citation form, as in the examples in (56).

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[45] Genitive case is marked in (55)(i) and (ii) by Final Palatalization which causes fronting of a preceding (unstressed) central vowel.

[46] The environments in which the nominal forms in the examples in (55) occur are Lenition environments. I return to this point in §2.4.5.

(56)

(i)	aois	i:s'	'an age'
	an aois	ən i:s'	'the age' f sg nom def
(ii)	aoileach	i:l'əx	'dung'
	an aoileach	ən i:ləx	'the dung' m sg dat def
(iii)	uisce	is'k'i	'water'
	an uisce	ən is'k'i	'water' m sg gen def
(iv)	uimhir	iv'ir'	'a number'
	an uimhir	ən iv'ir'	'the number' f sg nom def

Although the examples in (56) appear to be identical to those in (55) with respect to the initial vowel, they clearly differ. The final consonant of the proclitic in the examples in (56) does not become palatalized preceding either the long high front vowel, (56)(i) or (ii), or the short high front vowel, (56)(iii) or (iv).[47]

There are also examples where palatalization occurs preceding a back vowel, (57), an environment in which palatalization would not be expected, as seen in the examples in (58).

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[47] Notice that the exceptional behaviour of these vowel-stems is reflected by the orthography: all the nominal forms in (56) have initial 'back' vowels in the orthographic representation.

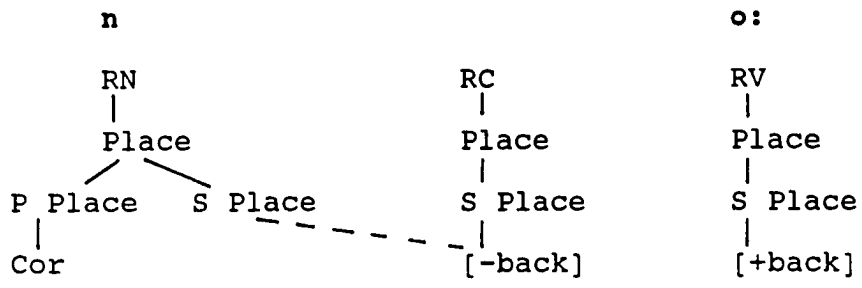
(57)	(i)	eolas	o:ləs	'information'
		an eolais	ən' o:lis'	'the information' m sg gen def
	(ii)	eaglais	ɑ:glis'	'a church'
		an eaglais	ən' ɑ:glis'	'the church' f sg nom def
(58)	(i)	ór	o:r	'gold'
		an óir	ən o:r'	'the gold' m sg gen def
	(ii)	áthas	ɑ:həs	'joy'
		an áthais	ən ɑ:his'	'the joy' m sg gen def

The nominal forms in (57) and (58) have identical initial vowels in the citation forms; compare (57)(i) with (58)(i), which both have an initial long mid back vowel **o:**. However, the forms in (57) appear to be exceptional in that the final nasal consonant of the proclitic becomes palatalized when preceding these forms.

We can account for the unpredictable behaviour of vowel-stems in (57) by proposing that the stems in question have underspecified onsets to which a secondary place feature [-back] is associated. Palatalization is the result of spreading [-back] from the onset to the preceding nasal consonant, as illustrated in (59). In the representation in (59) and in the representations that follow, I include only those features that are relevant. As before, I use the

abbreviations **RN**, **RC** and **RV** to represent the root nodes of a nasal, an obstruent and a vowel, respectively; P Place and S Place represent the primary and secondary place nodes, respectively.[48]

(59) <u>an eolais</u> **ən' o:lis'** =(57)(i))



The final nasal consonant of the proclitic is lexically unspecified for [back]. It acquires a [-back] specification by spreading from the following underspecified onset.

Empty C-slots have been proposed in the literature in accounts assuming a CV-skeleton, e.g. Clements & Keyser (1983), Kornfilt (1986), Michelson (1986). However, the empty C-slots in the works referred to are not specified for any segmental features. This contrasts with the account I propose where the underspecified onset carries a secondary place specification.

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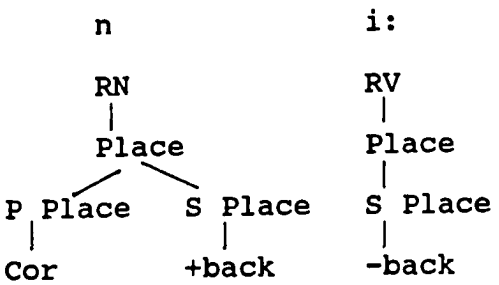
[48] I argue for independent Primary and Secondary Place nodes in the following chapter.

Gussmann (1986) proposes a similar account of these exceptional cases in Irish. He proposes that the exceptional vowel-stems have an empty C-slot on the CV-tier, to which an autosegmentalized specification for [back] is associated. Palatalization is the result of resyllabification where the final consonant of the proclitic associates to the empty onset of the following syllable, thereby acquiring the secondary place specification associated to this position. I argue, however, that an account in which vowel stems have underspecified onsets must be generalized to <u>all</u> vowel stems and not be restricted to those that behave exceptionally with respect to the spreading of secondary place features.

The argument for an underspecified onset for all vowel-stems appears initially not to be as straightforward as for those cases in (57). I argue in Chapter 3 that consonants are lexically specified for [-back] and non-low long vowels for [+back]. The default values for consonants and vowels thus differ. Recall the examples in (56) where palatalization fails to occur preceding the initial high front vowel of the stem. Assuming the approach to unspecification just outlined, the initial vowel would be unspecified for [back]; [-back] and [+back] would be assigned by default to the vowel and the final consonant of the proclitic, respectively. Therefore there appears to be no reason to posit an underspecified onset in such cases.

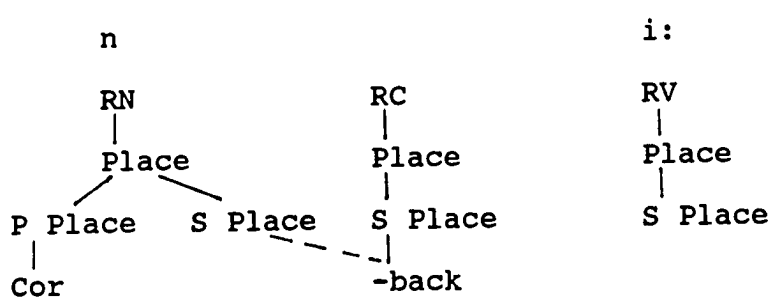
(60) <u>an aois</u> ən i:s' (=(56)(i))



Default specifications are represented by dashed lines.

However, consider now the 'unexceptional' cases of palatalization, that is, where palatalization occurs preceding a high front vowel. There is no reason to expect these forms to be represented differently to that in (60). However, if the final nasal consonant of the proclitic is to acquire a [-back] specification, there must be an intervening consonant that is lexically specified for [-back], as in (61).

(61) <u>an iontais</u> ən' i:ntis' (=(55)(i))



Spreading of [-back] is directional in Irish, spreading from right to left. [-back], therefore, spreads from the onset to the nasal consonant; [-back] is assigned to the underspecifed vowel by default. It is clear that the underspecified onset is well-motivated to account for these examples. If this account is generalized to <u>all</u> vowel-stems, all vowel-stems are lexically represented with an underspecified onset comprising a root node and, in some cases, a root node with a dependent secondary place feature.

We can return then to the prothetic consonants discussed earlier in this section. If all vowel-stems actually have (consonantal) onsets, we could expect that they should undergo the initial consonant mutations in the appropriate environments. In the following sections, I argue that if we pursue this account we can derive the different prothetic consonants: the prothetic consonants are surface realizations of the underspecified onset that are determined by both the morphological (mutation or non-mutation) and the phonological environment in which the stem occurs.

The representation I assume of the underspecified onset is given in (62).

(62)

Non-palatalizing	Palatalizing
[-voc -approx -son]	[-voc -approx -son] | Place | S Place | [-back]

I include [approximant] as a root specification as discussed in §2.3.2. The motivation for this will become clear in §2.4.4 below when I discuss vowel-stems in eclipsis environments.

2.4.3 Vowel-stems in Non-mutation Environments

The prothetic consonants that occur in environments in which no mutation occurs are repeated in (63).

(63)

	Phonological environment	
	C-final	following a proclitic or V-final
Morphological environment		
No mutation	**t-**	**h-**

The examples in (64) contain vowel-stems that occur following a consonant-final and a vowel-final proclitic in a non-mutation environment.

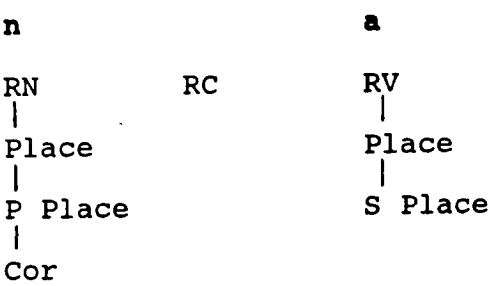
(64)	(i)	asal	asəl	'a donkey'
		an t-asal	ən tasəl	'the donkey' m sg nom def
	(ii)	asail	asil'	'donkeys'
		na h-asail	nə hasil'	'the donkeys' pl nom def

Both the nominative singular and plural forms of masculine nouns are marked by the absence of mutation. In (61)(i), the vowel-stem is preceded by consonant-final proclitic. In (64)(ii), on the other hand, the proclitic is vowel-final. The prothetic consonants differ in these cases: following the consonant-final proclitic the prothetic consonant is realised as **t-**, while it is realised as **h-** following the vowel-final proclitic. The different realizations are accounted for as follows:

A. Vowel-stems following Consonant-final Proclitics in Non-mutation Environments

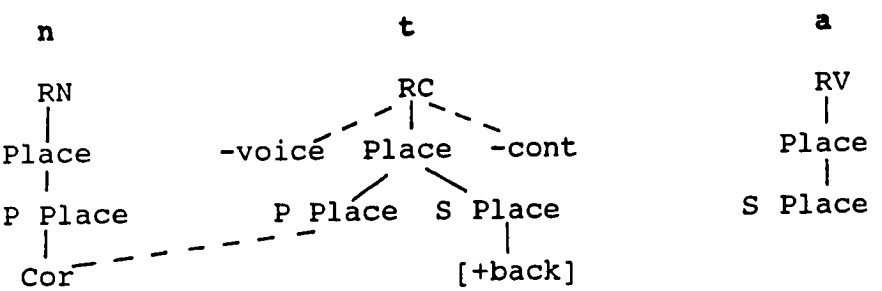
The initial representation of the example in (64)(i) is given in (65). **RC** in the examples that follow represents the root specifications [-vocoid, -approximant, -sonorant].

(65) an t-asal ən tasəl



The prothetic consonant is derived as follows: [-voice], [+back] and [-cont] are assigned by default rules, the latter being the default value for obstruents; [Coronal] spreads from the preceding segment. A prothetic consonant with a primary place specification will always be realized as a coronal segment as all consonant-final nominal proclitics end on a coronal consonant. The resulting segment is realised as **t-**, as in (66). The dashed lines represent the derived structure.

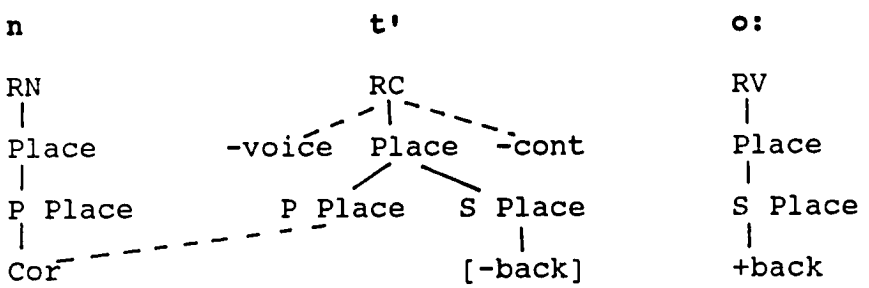
(66) an t-asal ən tasəl



If the stem has a palatalized onset, the resulting prothetic consonant is palatalized, i.e. **t'-**. This is illustrated in (67), represented structurally in (68).

(67)	eolas	o:ləs	'information'
	an t-eolas	ən t'o:ləs	'the information' m sg nom def

(68) an t-eolas **ən t'o:ləs**



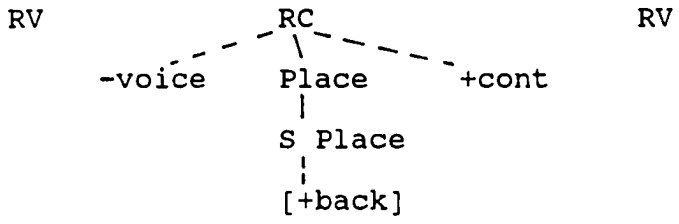
B. Vowel-stems following Vowel-final Proclitics in Non-mutation Environments

In the example in (64)(ii), repeated below, the vowel-stem is preceded by a vowel-final proclitic.

(69)	na h-asail	nə hasil'	'the donkeys' pl nom def

There is no primary place feature to spread in this case - recall that in the previous example the primary place specification of the preceding consonant spread to the underspecified onset. The prothetic consonant in this case is therefore realised as **h-**, the default 'placeless' consonant.[49]

(70) <u>na h-asail</u> nə hasil'



The derivations outlined in **A.** and **B.** above involve the following steps:

(i) If the underspecified onset is preceded by a consonant-final proclitic, the primary place specification of that consonant is spread to the underspecified consonant.

(ii) The default feature values that are assigned are the following:

---

[49] Compare the representation in (70) to that of a lenited coronal stop, **t: t → h**, which is similarly represented, see (6).

[-voice], [+back]; [-cont], if specified for Primary Place, otherwise [+cont].

2.4.4 Vowel-stems in Eclipsis Environments

The prothetic consonants which occur in Eclipsis environments are repeated in (71).

(71)

	Phonological environment	
	following a C-final or proclitic	V-final
Morphological environment		
Eclipsis	**n-**	**n-**

The examples in (71) contain vowel-stems following both vowel-final and consonant-final proclitics, (71)A. and B., respectively.

(72)

A.	(i)	asail	asil'	'donkeys'
		na n-asal	nə nasəl	'the donkeys' pl gen def
	(ii)	eaglais	ɑ:glis'	'church'
		na n-eaglaisi	nə n'ɑ:glis'i:	'the churches' pl gen def

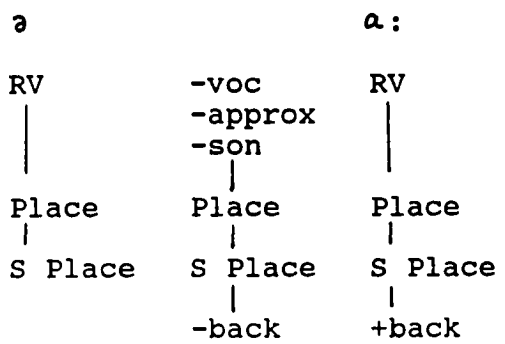
B. (i)	asal	asəl	'donkey'
	an asal	ən asəl	'the donkey' m sg dat def
(ii)	eolas	o:ləs	'knowledge'
	bhur n-eolas	wu:r n'o:ləs	'your (pl) knowledge'

Both the dative singular and the genitive plural of feminine and masculine nouns are marked by Eclipsis. In (72)A.(i) and (ii), the onset is realised as **n-** and **n'-**, respectively, following a vowel-final proclitic. In (72)B.(i), the vowel-stem is preceded by a proclitic that ends in a nasal consonant. I argue that the onset is realised in the latter case also but that since the consonant-final proclitic ends on a nasal consonant, degemination applies resulting in a single segment. This account is supported by the fact the the nasal consonant is indeed realized when the final consonant of the proclitic is non-nasal, as is the case in (72)B.(ii).

A. Vowel-stems following Vowel-final Proclitics in Eclipsis Environments

The input to Eclipsis in the case of (72)A.(i) is represented structurally as follows.

(73) <u>na n-eaglaisí</u> nə n'ɑ:glis'i:



Recall that Eclipsis involves a minimal change along the sonority scale defined in (43). Eclipsis of the underspecifed onset is represented as in (74).

(74)

-voc -approx -son	→	-voc -approx +son

The addition of one positive specification results in a change in the specification for [sonorant]. In order to achieve this result, that is, deriving a [+sonorant] specification rather than a [+voice] specification, we must assume that since there is no voicing contrast within the (primary) placeless obstruents, this feature is not relevant for calculating the sonority value of these segments. The resulting segment is further specified as follows:

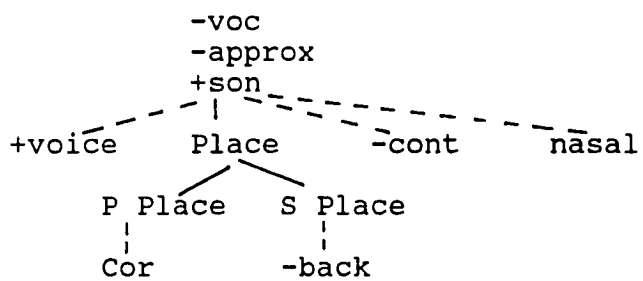
(i) The root specification [-vocoid, -approximant, +sonorant] entails a [nasal] specification.

(ii) A [nasal] specification must be supported by a primary place of articulation. [Coronal] is assigned to fulfill this requirement. This is the only instance of [Coronal] being assigned as a default place specification. Recall that I argued in §2.2.5.3 that primary place cannot be lexically unspecified in Irish.

(iii) [+voice] and [-cont] are assigned by redundancy rules.

The resulting segment is represented as follows.

(75)



The prothetic consonant is therefore realized as a palatalized coronal nasal.

B. Vowel-stems following Consonant-final Proclitics in Eclipsis Environments

The relevant example of a vowel-stem preceded by a consonant-final proclitic in an Eclipsis environment, (72)B.(i), is repeated in (76).

(76)	asal	asəl	'a donkey'
	an asail	ən asil'	'the donkey'(dat sg)

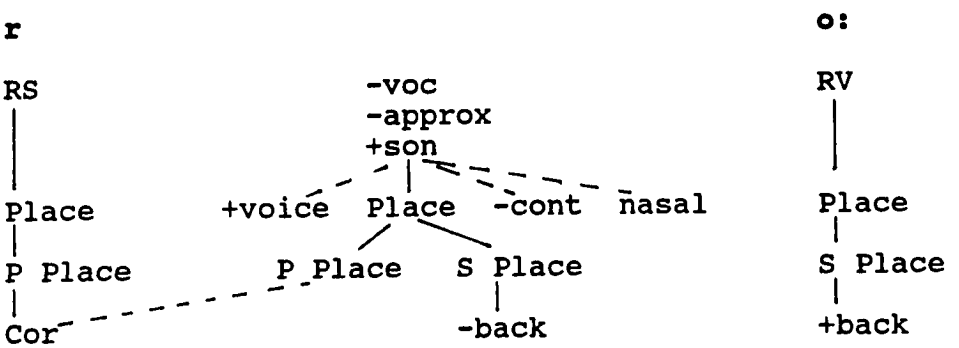
The (underspecified) onset appears not to be realised in the above example. However, I propose that a nasal segment is derived exactly as in the case of a vowel-stem following a vowel-final proclitic, as proposed in the preceding section. The resulting representation undergoes degemination to derive a single nasal consonant.

This account is supported by the example in (72)B.(ii), repeated in (77).

(77)	eolas	o:ləs	'knowledge'
	bhur n-eolas	wu:r n'o:ləs	'your (pl) knowledge'

The prothetic palatalized coronal nasal is derived as in (78).

(78) bhur n-eolas wu:r n'o:ləs



2.4.5 Vowel-stems in Lenition Environments

A vowel-stem occurring in a Lenition environment is marked by the absence of a prothetic consonant in all cases. This is illustrated in (79).

(79)

(i)	asal	asəl	'a donkey'
	an asail	ən asil'	'the donkey' m sg gen def
(ii)	eolas	o:ləs	'information'
	an eolais	ən' o:lis'	'the information' m sg gen def

Genitive singular of masculine nouns is marked by Lenition and Final Palatalization, e.g. **bád** **ba:d** 'a boat', **an bháid** **ən wa:d'** 'the boat'(m sg gen). The nominal forms in (79) are both masculine and the second of both pairs occurs in a

lenition environment. The underspecified consonant is not realised in either case.

If we are to maintain the account being pursued, lenition of vowel-stems must result in the deletion of the underspecified onset. Recall that labiodental fricatives, which undergo Lenition vacuously, are deleted by the default rule of Total Deletion, see §2.2.6. The account I propose for the underspecified onset hinges on the concept of vacuous rule application. The input to the Lenition rule in the case of a vowel-stem is represented in (80), that is, Lenition applies to the underspecified onset.

(80)

This onset cannot be lexically specified for [+cont] because the prothetic consonant derived as a result of default fill-in in a non-mutation environment is **t-**, **t'-** (i.e. [-cont]) where a primary place specification spreads from a preceding segment, otherwise **h-**, **h'-**, see §2.4.3. We can derive these alternations only if [cont] is unspecified lexically for the underspecified onset and the default specification for a

segment specified for primary place is [-cont]. Instead, I suggest that the underspecified segment in (80) is interpreted by the rule as having a [+cont] specification precisely because it does not have a primary place specification. The spirantization rule then applies vacuously and the segment is deleted, by the application of the default rule.

Lenition of underspecified onsets in fact shares a particular property with the lenition of the labiodentals, see §2.2.6. Whenever a lenited underspecified onset or a labiodental fricative is specified for the palatalization feature [-back], this feature is realised on a preceding consonant of a consonant-final proclitic following deletion.

(81)	eolas	o:ləs	'information'
	an eolais	ən' o:ləs	'the information' m sg gen def
(82)	féar	f'e:r	'grass'
	an féar	ən f'e:r	'the grass' m sg nom def
	an fhéir	ən' e:r'	'the grass' m sg gen def

When the vowel-stem in (81) occurs in a lenition environment, the underspecified onset, which has a [-back] specification associated to it, is deleted. The palatalization feature is then realised on the preceding

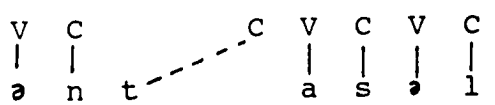
nasal consonant. In (82), we have two contrasting examples: the final nasal of the proclitic in the nominative form **an féar** **ən f'e:r**, which is marked by the absence of any mutation, is not realized as palatalized; however, the final nasal of the proclitic in the genitive form **an fhéir** **ən' e:r'**, which is marked by Lenition, hence deletion of the underspecified consonant in the onset, is realised as a palatalized consonant. Therefore, in this domain, palatalization spreads to a consonant only when it would otherwise not be realised.

In these sections I have argued for partially specified onsets to vowel-stems in Irish. I argued that this approach enables us to account for the unpredictable palatalization that occurs preceding a number of vowel-stems. Furthermore, this approach also enables us to give a principled account of the different prothetic consonants that occur preceding vowel-stems in different environments. The account developed captures the correlation between the realisation of the different prothetic consonants and the phonological and morphological environment in which a particular vowel-initial stem occurs.

2.4.6 Underspecified Onsets vs. Floating Segments

An alternative approach that has been pursued in the literature, see, for example, Gussmann (1986), Kelly (1989), involves positing 'floating consonants'. Floating consonants are unsyllabified consonantal melodies and in the case of Irish, these consonants would be part of the lexical representation of particular lexical items. The singular definite article **an** ən, for example, would have two distinct lexical forms: **an** ən (for example, f sg nom, m sg gen), and **an(t)** ən(t) (m sg nom). In addition, vowel-stems bear an initial C slot underlyingly. Whenever **an(t)** occurred preceding a vowel-initial stem, it would be syllabified as the onset of that word, as illustrated as in (83).

(83) an t-asal ən tasəl 'the donkey'
masc sg nom

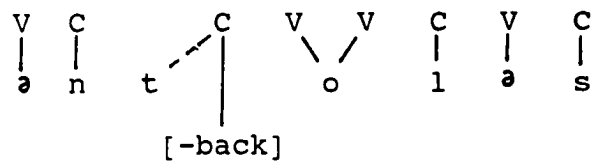


This second approach involves positing a number of floating consonants - **t, h, n,** - which must be attached to the appropriate forms in the lexical representations.[50] A

[50] Since h, h' occur only when the proclitic is vowel-final. An alternative way to derive these particular prothetic consonants would be by a hiatus rule.

palatalized prothetic consonant would be the result of resyllabifying to an initial C-slot specified for [-back], as in (84).

(84) <u>an t-eolas</u> ən t'o:ləs



Both accounts posit empty or partially specified onsets for vowel-stems. The account proposed in this study, in §2.4.2-5, derives the prothetic consonants as realizations of this onset. The consonant becomes fully specified as the result of mutation, spreading and default rules. The alternative account outlined above requires, in addition to underspecified onsets to vowel-stems, more complex lexical representations of the proclitics involved. The proclitics have distinct representations depending on morphological features as exemplified in the case of the definite article, **<u>an</u>** **ən** (f sg nom, m sg gen) and **<u>an(t)</u>** **ənt** (m sg nom). Apart from the proliferation of floating material, this approach fails to capture the correlation between the consonant realised and the environment in which it occurs.

2.5 Summary

The main conclusions put forward in this chapter are summarized as follows:

- Both lenition and eclipsis are rules; neither process is the result of affixation.
- Lenition is a complex rule comprising Spirantization, §2.2.2,, Coronal Delinking, §2.2.5.1, and a default process, Total Deletion, §2.2.6.
- Eclipsis involves a minimal chain-shift along a sonority scale defined in terms of positive feature specifications, §2.3.2.
- Both Lenition and Eclipsis are formulated so as to be blocked by linked heteromorphemic structure as a result of Inalterability. Both processes are therefore blocked by linked heteromorphemic coronal nodes derived in certain domains by Coronal Fusion. The Inalterability effects are captured by a general condition on rules requiring strict interpretation of structural conditions on rules, §2.2.5.2, §2.3.4.
- Vowel-stems in Irish have underspecified onsets that may be specified for secondary place features, §2.4.1. The different prothetic consonants that precede vowel-stems in certain environments are shown to be surface realizations of these onsets, §2.4.2-5.

- Vowel stems and labiodental fricatives form a class with respect to the application of Lenition. Both undergo Total Deletion and, in the case of the palatalized members of this class, the palatalization feature [-back] is realized on the preceding consonant following deletion, §2.4.5.
- Labial nasals pattern with the obstruents with respect to Lenition and with the sonorants with respect to Eclipsis. This ambiguous status is captured by underspecifying the labial nasals for [son], §2.2.5.4.
- [Primary Place] cannot be underspecified in Irish, §2.2.5.3.

CHAPTER 3

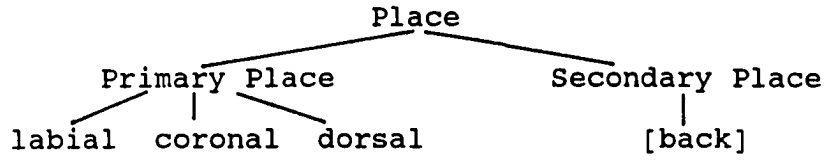
THE PLACE FEATURES

3.1 Introduction

The phonology of Modern Irish is characterized, in particular, by the initial consonant mutations - the focus of the previous chapter - and distinctive palatalization. The representation of palatalization, and more generally, the representation of secondary place features, is the focus of this chapter. An investigation of the interaction of the initial consonant mutations and palatalization is essential in order to establish the structural representation of the secondary place features. In the first part of this chapter I argue that primary and secondary place features in Irish must be represented independently. I propose a structure in which the [Primary Place] and [Secondary Place] nodes are both dependent on a [Place] class node, as in (1).[1]

[1] A similar structure has been independently arrived at by Clements (1989) from different evidence, see §3.4.1.6.

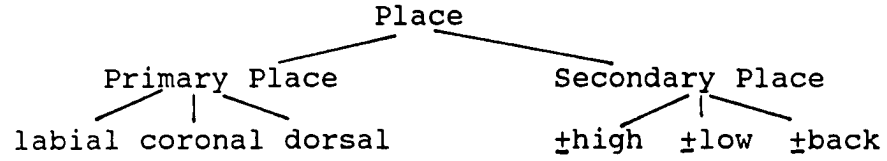
(1)



This structure is motivated primarily by data that involve two processes discussed in the previous chapter - Coronal Fusion and Coronal Delinking, along with data involving Nasal Assimilation. I argue that alternative proposals in the literature for the representation of palatalization cannot account for these processes.

In the second part of this chapter, I examine the representation of vowels in Irish. This involves an investigation of the character of the [Secondary Place] node and its dependents. The structure in (1) above is elaborated to include the features represented in (2).

(2)



I argue that the secondary place (vowel) features are binary features, in contrast with the primary place features, which are privative.

I also argue for context-sensitive Radical Underspecification for Irish, on the basis of the behaviour of the feature [back]. The phonemic inventory forms two

classes with respect to lexical specification of [back]. [back] is underspecified for both consonants and vowels, however, these classes are distinctly specified and both values of this feature are lexically present. Consonants are specified for [-back], long vowels are specified for [+back], and short vowels are unspecified for [back]. Assuming these specifications and assuming spreading to be strictly local, I propose an account of consonant-vowel interactions in Irish. A consequence of this account is that palatalization is not triggered by front vowels as is typically the case cross-linguistically. This fact provides strong support for the proposal made in the previous chapter that all vowel-stems have an underspecified (consonantal) onset.

I also return to the rule of Glide Formation alluded to in the previous chapter and investigate further the relation between consonant and vowel features.

3.2 The Representation of Palatalization

In this section I show how adopting the representation in (1) enables us to account straightforwardly for the independent behaviour of the primary and secondary place features in Coronal Fusion §3.2.1, Coronal Delinking §3.2.2 and Nasal Assimilation §3.2.3 in Irish. Indeed, it emerges

that this is the only possible representation to account for these processes. This will become evident in §3.3, where I discuss alternative proposals in the literature for the representation of palatalization.

3.2.1 Coronal Blocking and Linked Place Features

Recall the account of Coronal Blocking proposed in Chapter 1: adjacent heteromorphemic coronal consonants undergo Coronal Fusion in certain word-formation domains, namely, in compounds and prefixed forms as well as in a clitic domain. As a consequence of Inalterability, Coronal Delinking, a sub-rule of lenition, fails to apply to a coronal obstruent that is part of a linked structure. Coronal Delinking is repeated in (3).

(3) Coronal Delinking

$$[_{Wd} \quad \begin{matrix} -son \\ \not| \\ Cor \end{matrix}$$

The examples in (4), discussed in §2.2.5.2, illustrate Coronal Blocking in prefixed forms.

(4) Coronal Blocking: prefixed forms

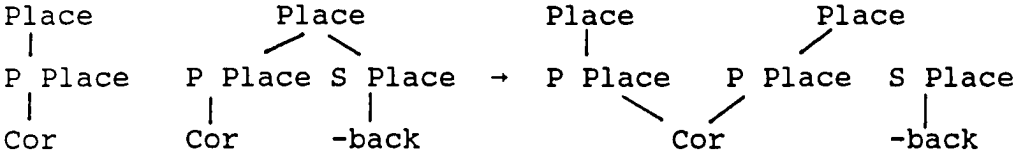
a.	leas- + dearthair	→	leasdearthair	*leasdhearthair
	l'as d'r'əha:r'		l'asd'r'əha:r'	l'asjr'əha:r'
	'step-''a brother'		'a stepbrother'	
b.	in- + dóite	→	indóite	*indhóite
	in' do:t:i		in'do:t'i	in'ɣo:t'i
	(-able) 'burnt'		'burnable'	
c.	in- + tuigthe	→	intuigthe	*inthuigthe
	in' tig'h'i		in'tig'h'i	in'h'ig'h'i
	(-able)'understood'		'intelligible'	
d.	il- + siollach	→	ilsiollach	*ilshiollach
	il' s'uləx		il's'uləx	il'h'uləx
	'multi-''syllabic'		'multisyllabic'	

In the examples in (4), lenition is blocked by the linked heteromorphemic coronal node. Notice, however, that there must be linked coronal structure even between segments that disagree in palatalization. In (4)a., for example, the final consonant of the first word is non-palatalized while the initial consonant of the second word is palatalized. Palatal assimilation does not occur when the prefix is attached to the second word. In (4)b. the reverse order holds, that is, the final consonant of the first word is palatalized while the initial consonant of the second word is non-palatalized. Again, the secondary place specifications of the adjacent linked consonants remain

distinct. In neither case does the linked structure include the secondary place feature. The linked structure which blocks lenition includes only the primary place specification of the cluster, that is, the primary [Coronal] specification. Therefore, homorganic coronal clusters require a shared primary place only; thus we need a formal characterization of primary place and a rule that fuses Coronal nodes.

If we adopt the representation proposed in (1) in which [Primary Place] and [Secondary Place] are distinct nodes, fusion of the primary place of coronal segments is represented as in (5).[2]

(5) l'a**s-** + **d'**r'əhɑ:r' (= (4)a.)



The secondary place feature [-back] that marks palatalization of the initial consonant of the second word is dependent on the [Secondary Place] node and is unaffected by fusion of the primary coronal nodes. The final consonant of the prefix, therefore, does not become palatalized.

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[2] [Primary Place] and [Secondary Place] is represented in examples as [P Place] and [S Place], respectively.

3.2.2 Coronal Delinking and Palatalization

Recall that in the case of the voiceless coronal segments, Coronal Delinking results in laryngeal fricatives, as illustrated in (6) and (7).

(6) **s, t → h**

a.	toitín tet'i:n	mo thoitín mə het'i:n'
	'a cigarette'	'my cigarette'
b.	talamh talə	mo thalamh mə halə
	'land'	'my land'
c.	solas soləs	mo sholas mə holəs
	'a light'	'my light'
d.	suim si:m'	mo shuim mə hi:m'
	'interest'	'my interest'

(7) **s', t' → h'**

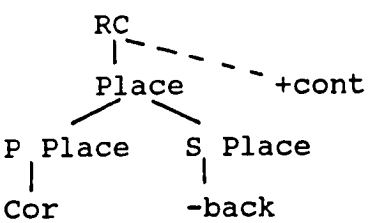
a.	tine t'in'i	mo thine mə h'in'i
	'a fire'	'my fire'
b.	teocht t'o:xt	mo theocht mə h'o:xt [h^{y}o:xt]
	'temperature'	'my temperature'

c.	seol s'o:l	mo sheol mə h'o:l	[h^{y}o:l]
	'a sail'	'my sail'	
d.	silín s'il'i:n'	mo shilín mə h'il'i:n'	
	'a cherry'	'my cherry'	

In the above examples, lenition is induced by the possessive pronoun mo mə 'my'. In the examples in (7) deletion of the coronal node is not accompanied by delinking of the palatalization feature. This is perceived most clearly in (7)b. and c., where a phonetic palatal off-glide preceding the long back vowel indicates that the palatalization feature has been retained.

Coronal Delinking, therefore, involves delinking only of the primary coronal place node. The secondary place node of a palatalized coronal segment is retained. The application of Coronal Delinking in (7)c. above may be represented within the current proposal as in (8).

(8) seol → sheol (=(7)c.)
s'o:l h'o:l



The resulting (primary) placeless segment is interpreted as a palatalized laryngeal fricative **h'**.

A further argument for this representation is one of 'descriptive necessity': if laryngeals are indeed (primary) placeless, only a representation in which primary and secondary place features are represented independently can characterize laryngeals with secondary articulations in known phonetic/phonological inventories, e.g. (i) palatalized or labialized laryngeal fricatives, h^{y} (see above) and h^{w}, respectively (the latter segment occurs in four languages of those surveyed by Maddieson (1984): Igbo (Kwa), Amharic (Semitic), Hupa (Athapaskan) and Siona (Tucanoan)); (ii) a labialized glottal plosive, $?^{w}$ (Kabardian (Caucasian)).

3.2.3 Nasal Assimilation

In the previous two sections I have argued that the primary and the secondary place features must be represented independently. When we look at Nasal Assimilation, a sandhi phenomenon in Irish, it is clear that the two classes of features are nevertheless dominated by the same node, a [Place] class node. Nasal Assimilation is optional, it applies to coronal nasals and involves spreading either of (i) both primary and secondary features or (ii) only a

primary [Dorsal] feature. The secondary place feature assimilates only if the primary place feature assimilates. The data in (9) and (10) illustrate the first type of assimilation, that is, assimilation of both primary and secondary place features.

(9) Assimilation to both primary and secondary place features of a following dorsal consonant[3]

a.	ceann	ceann gearr
	k'ɑ:n	k'ɑ:ŋ'g'ɑ:r
	'one'	'a short one'
b.	gan	gan chiall
	gan	gaŋ'x'i:l
	'without'	'with no sense'
c.	móin	móin dhubh
	mu:n'	mu:ŋ ɣuv
	'turf'	'black turf'
d.	in-	inchurtha
	in'	əŋxurhə
	(-able)	'comparable'

(10) Assimilation to both primary and secondary place features of a following labial consonant

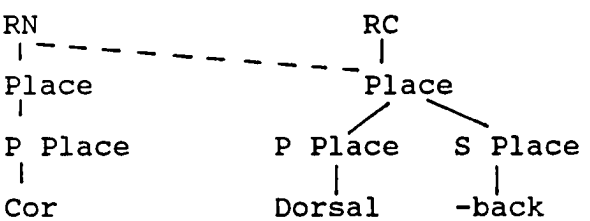
a.	caorán	Caorán Beag
	ki:rɑ:n	ki:rɑ:m'b'eg
	'a moor'	'a small moor (place name)

[3] Similar data is described in a number of dialect descriptions, e.g. de Bhaldraithe (1945:§259-60), de Búrca (1970:§331).

b.	amhrán	amhrán binn
	o:ra:n	o:ra:m'b'i:n'
	'a song'	'a sweet song'

In (9)a.and b., a non-palatalized coronal nasal assimilates to the following palatalized dorsal stop, becoming both dorsal and palatalized. We may illustrate this assimilation using the representation I have proposed as in (11).

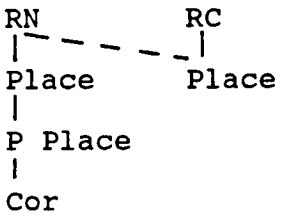
(11) k'a:n g'a:r → k'a: ŋ' g'a:r



In (9)c. and d., a palatalized coronal nasal assimilates to the following non-palatalized dorsal stop, becoming dorsal and non-palatalized.[4] The examples in (10) illustrate comparable assimilation to labial segments. [Place]-Assimilation is formulated in (12).

[4] Assimilation in (9)c. and d. may be to either both primary and secondary place or to the primary dorsal as will be discussed with regard to the examples following.

(12) [Place]-Assimilation



The second type of Nasal Assimilation involves assimilation to only the primary place feature of the following dorsal consonant. The examples in (13)a. and b. involve assimilation of a palatalized coronal nasal to a non-palatalized dorsal segment. In this case palatalization is usually retained, as in (13)a., (spreading of [Dorsal] only). However, depalatalization may also occur, as in (13)b. (spreading of both primary and secondary place features, as in (9) and (10)).

(13) cinn 'ones'
k'i:n'

a. [Dorsal]-Assimilation

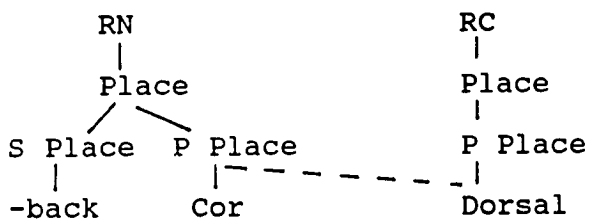
na cinn chorcra 'the purple ones'
nə k'i:ŋ' xorkrə

b. [Place]-Assimilation

na cinn dhubha 'the black ones'
nə k'i:ŋ ɣu:wə

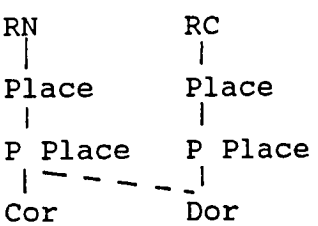
In (13)a., the final palatalized coronal nasal of **cinn k'i:n'** 'ones' assimilates only to the primary place of the following non-palatalized dorsal consonant, thus retaining its secondary place specification, as in (14).

(14) **k'i:n' xorkrə → k'i:ŋ' xorkrə**



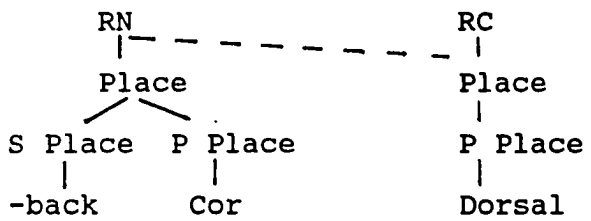
[Dorsal]-Assimilation is formulated in (15).

(15) [Dorsal]-Assimilation



The example in (13)b. differs only in that assimilation is to the [Place] node of the following dorsal consonant, as in the examples in (9). This is represented in (16).

(16) k'i:n' ɣu:wə → k'i:ŋ ɣu:wə



As pointed out, assimilation is an optional process. If we represent the place features as proposed in (1), we can characterize the possible rules as (a) **Spread [Place]** and (b) **Spread [Dorsal]**, as formulated in (12) and (15), respectively.

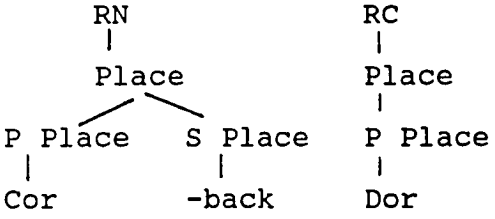
If, on the other hand, the primary and secondary place features are not dominated by the same node, the rules we must posit instead of the first rule above, that is **Spread [Place]**, are (a) **Spread [Primary Place]** and (b) **Spread [Secondary Place]**. This alternative is problematic in the following two respects:

(i) If both rules are optional, we would expect the following cases to be found in Modern Irish: (1) spreading of both primary and secondary place features, (2) spreading of primary place only, and (3) spreading of secondary place only. The first case described is found in Modern Irish, as illustrated in (9) and (10) above, but the second case is found only with Dorsal (hence I have called it **Spread**

[Dorsal]), illustrated in (13)a., and the third case is not found (in this domain). Here we cannot naturally capture these facts.

(ii) I argue in a later section that [+back] is unspecified for consonants. Since there is no evidence that default values are present in the phonology, a non-palatalized dorsal will have only a primary place node. If we had two rules, **Spread [Primary Place]** and **Spread [Secondary Place]**, we could not represent the example in (9)c. and d. where a palatalized coronal nasal assimilates to a non-palatalized dorsal consonant. The nasal becomes both dorsal and non-palatalized. In this alternative approach we could only spread [Primary Place], as the non-palatalized Dorsal segment has no [Secondary Place] node at this stage.

(17)



[+back] is assigned (by default) to the dorsal consonant following spreading. It therefore does not affect the preceding consonant.[5]

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[5] I am assuming that unspecified nodes or class nodes dominating unspecified features cannot spread.

The rule I propose, that is, **Spread [Place]**, automatically entails the loss of the secondary place feature of the nasal in this example.

The three processes discussed above, that is, Coronal Fusion, Coronal Delinking and Nasal Assimilation, may be straightforwardly accounted for if we adopt the structure proposed in (1). Coronal Fusion and Coronal Delinking apply to the primary place feature of a coronal segment but not to the secondary feature - fusion or delinking of [Coronal] without fusion or delinking of a palatalization feature. Nasal Assimilation may involve only [Dorsal]. These facts require a representation in which primary and secondary place features are independent. Nasal Assimilation may also involve both primary and secondary place features. I argued in this section that this fact must be taken as evidence that both primary and secondary place nodes are dominated by the same class node.

In the following sections I examine alternative proposals in the literature, in particular with respect to the accounts they provide of the processes I have focussed on thus far.

3.3 Alternative Proposals for the Representation of Palatalization

Among the alternative proposals for the representation of palatalization in current feature geometry literature are those in which the palatalization feature is represented either as a dependent of [Coronal] or as a dependent of [Dorsal]. I will argue in the following sections that neither of these proposals can adequately account for the data presented in the previous section.

3.3.1 Palatalization as Coronalization

The proposal I am concerned with in this section is that in which palatalization is represented as coronalization, for example Mester & Itô (1989) for Japanese, Broselow & Niyondagara (1989) for Kirundi, Lahiri & Evers (1989). Clements (1976) argues for the coronality of front vowels and glides, in effect proposing that palatalization is coronalization.[6] The relationship between front vowels and coronal segments is also discussed in Hume (1989), E.G. Pulleyblank (1989) and Cheng (1989).

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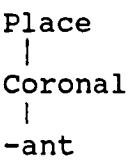
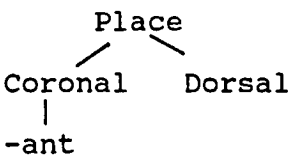
[6] Clements (1989) also represents palatalization as coronalization; however his approach differs from the coronalization approach being discussed here in that secondary place specifications are represented independently of primary place specifications.

What this proposal captures is the fact that the secondary articulation which results in palatalization involves raising the tongue body from the neutral position, a gesture entailed in the articulation of coronal segments and also entailed in the articulation of front vowels and glides, which typically trigger palatalization.[7] A palatalized segment is therefore represented within this approach as having a coronal specification. The structures proposed by Mester and Itô, for example, are illustrated in (18) for palatalized coronal and dorsal segments.

(18) a. Palatalized coronal



b. Palatalized dorsal



[7] See Bhat (1974) for a broad survey of palatalization cross-linguistically, including front vowels and glides as triggers of palatalization.

An argument presented by Mester and Itô (1989) in support of this approach involves the claim that palatalization of coronals involves a shift in primary place of articulation, whereas palatalization of non-coronals does not. They argue that the structures proposed, in which palatalized coronals are represented as simplex segments and palatalized non-coronals as complex segments, capture this distinction. In the case of a coronal segment, the palatalization feature [-ant] is directly dependent on the primary place node, as in (18)a. A palatalized dental or alveolar segment will thus be realised as a palato-alveolar or a palatal segment. In the case of a palatalized non-coronal, a coronal node must be projected for the palatalization feature [-ant] to dock onto, which results in a secondary articulation being imposed on the primary articulation while that primary articulation remains unchanged.

The different representations in (18)a. and b. may capture such a difference, but the claim that only palatalized coronals involve a change in place of articulation is incorrect. Palatalization of dorsal segments can indeed involve a change in the primary place of articulation. Palatalized dorsal segments in Irish are articulated in the palatal region, a shift in place of articulation comparable to that from dental or alveolar to palato-alveolar in coronal segments. Moreover,

palatalization of velar segments in Polish, in which palatalization is also distinctive, results in dental, post-alveolar or fronted velar segments, depending on the palatalization process involved (see Gussmann (1980, 1987), Rubach (1984), Czaykowska-Higgins (1988), Szpyra (1990) for discussion of palatalization in Polish).[8]

Moreover, if we return to the data presented in (4) in §3.2.1 above, involving Coronal Fusion, we see that palatalization in Irish cannot be represented as in (18). If the palatalization feature were directly dependent on the coronal node, fusion of the coronal nodes would entail shared secondary place features. Within this approach we would incorrectly predict that as a result of Coronal Fusion, the final non-palatalized coronal fricative **s-** of the prefix in (19) would assimilate to the following palatalized coronal stop **d'**, yielding a palatalized coronal fricative **s'**. This is not the case.[9]

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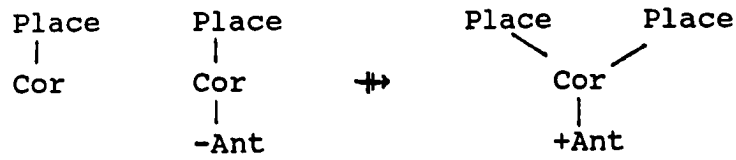
[8] Also, from a diachronic perspective, as pointed out by Maddieson (1984,38), dorsal segments in palatalizing environments become palatals or palato-alveolars.

[9] The following morphological alternation shows that palatalization of the non-palatalized alveolar fricative **s** results in a palato-alveolar fricative **s'**:

(i) cleas k'l'a**s** 'a trick' (nom)
(ii) clis k'l'i**s'** 'a trick' (gen)

Genitive case is marked by Final Palatalization; [-back] then spreads to the preceding short vowel with independent height adjustment.

(19) l'as- + d'r'əhɑ:r' (=(4)a)



That Coronal Fusion has applied is evidenced by the blocking of Lenition which would be expected in this environment (Compound Formation), see §2.2.1.

Coronal Delinking (§3.2.2) is also problematic for this approach. Coronal Delinking applies to delink the primary place specification of a coronal segment. Recall that in the case of the voiceless palatalized coronal segment, Coronal Delinking results in a palatalized laryngeal fricative. The relevant examples are repeated in (20) below.

(20) **s', t' → h'**

a.	tine	mo thine	
	t'in'i	mə h'in'i	
	'a fire'	'my fire'	
b.	seol	mo sheol	
	s'o:l	mə h'o:l	[h^{y}o:l]
	'a sail'	'my sail'	

If palatalization were represented as dependent on a primary [Coronal] node, we would expect the dependent feature to be

delinked along with the [Coronal] node when Coronal Delinking applied.

If we examine the usual assumptions that hold of dependency relations, it would seem that palatalization is incommensurate with the feature geometry dependents of [Coronal], i.e. [anterior], [distributed], and [strident].[10] Consider, for example, the feature [distributed] which distinguishes apical segments - segments formed with the tip of the tongue - from laminal segments - segments formed with the tongue blade - which are [-distributed] and [+distributed], respectively. The distinctions made with this dependent feature are meaningless in the absence of coronality.[11] [distributed], [anterior] and [strident] are defined only for coronal segments. It makes sense, therefore, that these features are represented as dependents of [Coronal]. Palatalization, on the other hand, is not definitionally dependent on a coronal articulator. The secondary gestures involved in palatalization, that is, tongue fronting or tongue raising, may be superimposed on consonants formed at

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[10] [lateral] may not be considered a dependent of [Coronal] in Irish, see e.g. Levin (1987). Rather it must be directly dependent on the root node in Irish. If it were dependent on the coronal node, we would expect Coronal Fusion to be blocked when a lateral and a nonlateral coronal segment are adjacent in the relevant domain. Coronal Fusion is not blocked in such cases, see (4)d.

[11] See McCarthy (1988) for an overview of secondary dependency entailments.

each place of articulation. A representation that encodes the non-dependence of palatalization on any particular place of articulation is therefore desirable.

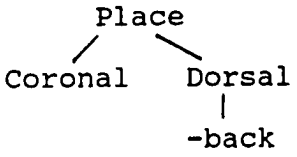
The preceding discussion may be generalized to accounts within a dependency framework in which secondary place features are represented as dependent on primary place features, in the spirit of Mester (1986) and as pursued by Selkirk (1988). The same problems are encountered: (i) we would expect linked primary place nodes to entail shared (dependent) secondary place features and (ii) we would expect delinking of a primary place node to include also delinking of the dependent secondary place feature. Neither (i) nor (ii) is borne out.

3.3.2 Palatalization as Dorsalization

An alternative account that has been proposed in the literature is one in which the palatalization feature is represented as dependent on the dorsal node, e.g. Sagey (1986), Halle (1986), Schein & Steriade (1986). Most theories since SPE have used the tongue body features [high] or [back] to represent secondary articulations involving the tongue body. High front vowels, palatal segments and palatalized segments are all represented as [+high, -back], thus capturing the relation between these segments, as well

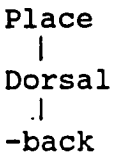
as the idea that palatalization, and secondary articulations in general, involve superimposing vowel qualities on consonants. In the accounts being considered in this section, the vowel features are represented as dependents of the dorsal node. A palatalized coronal segment is represented in this approach as in (21).

(21)

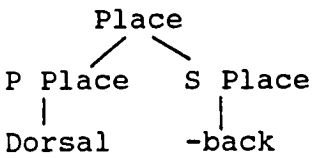


While Coronal Fusion and Coronal Delinking can be satisfactorily accounted for within this alternative approach, Nasal Assimilation, in particular [Dorsal]-Assimilation, cannot. I argue that only a representation in which the primary and secondary place features are independent can represent this type of assimilation as a spreading process. In an approach in which the palatalization feature is represented as dependent on [Dorsal], palatalized dorsal segments are represented as simplex segments, whereas in the the approach I am proposing, palatalized dorsal segments, like all palatalized segments, are represented as complex segments. The different representations are illustrated in (22).

(22) a. **Palatalization as dorsalization**



b. **Independent primary and secondary place nodes**



Consider Nasal Assimilation as described in §3.2.3, in particular [Dorsal]-Assimilation, where a palatalized coronal nasal optionally assimilates only to the [Dorsal] feature of the following segment, rather than to the [Place]-node, i.e. **n' g → ŋ' g.**[12] An account in which the palatalization feature is dependent on the dorsal node cannot represent this kind of assimilation as a spreading process.

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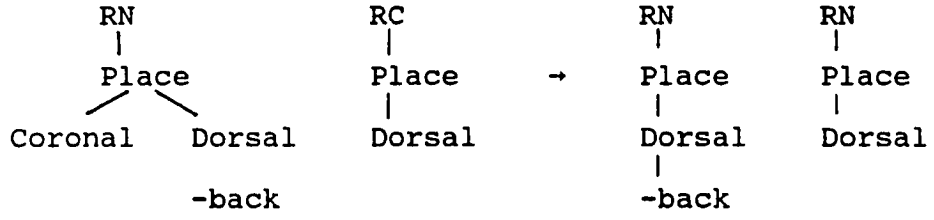
[12] Nasal-Assimilation can also, of course, involve assimilation to both primary and secondary place features, that is, **Spread [Place]**, which in this case would entail depalatalization.

(23) n' g → ŋ' g



If this assimilation process were represented as a spreading process (spreading of Dorsal with subsequent delinking of the (primary) Coronal feature of the nasal), the result would be a segment which was doubly specified for dorsal; this, under normal feature geometry assumptions, is disallowed. Deletion of one or other of the dorsal nodes would not yield the correct representation.
However, this assimilation can be straightforwardly represented using a structure in which the primary and secondary place features are independent - assimilation to only [Dorsal] entails retention of the secondary place feature.

I discussed such a case in §3.1.3, and showed how it could be accounted for if the primary and secondary place nodes were represented independently. The relevant example involves nasal-assimilation where either [Dorsal] or [Place] may spread, and is repeated in (24).

(24) **cinn** k'i:n' 'ones'

a. [Dorsal]-Assimilation: **n' → ŋ'**

na cinn chorcra
nə k'i:ŋ' xorkrə

'the purple ones'

b. [Place]-assimilation: **n' → ŋ**

na cinn dhubha
nə k'i:ŋ ɣu:wə

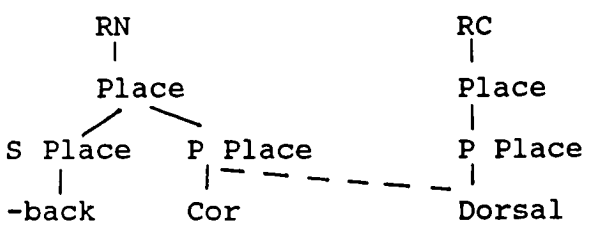
'the black ones'

The two possibilities may be represented as spreading processes if the primary and secondary place nodes are represented as separate nodes. The proposed representations are repeated below.

(25)

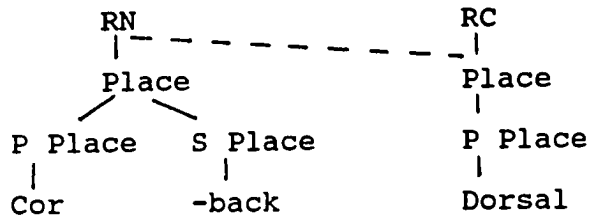
a. [Dorsal]-Assimilation

k'i:n' xorkrə → k'i:ŋ ' xorkrə



b. [Place]-assimilation

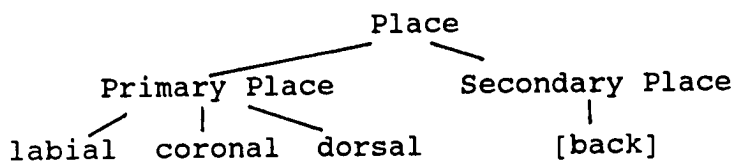
k'i:n' ɣu:wə → k'i:ŋ ɣu:wə



Therefore, we may conclude that the feature marking palatalization in Irish is not dependent on the dorsal node or on any primary place node.

The data discussed in this section illustrating Primary Place assimilation of a coronal nasal shows that the primary and secondary place features, although dominated by the same node, are nevertheless not in a dependency relationship. The only structure that can account for the different nasal assimilation processes in Irish is the structure being proposed in this work, repeated in (26).

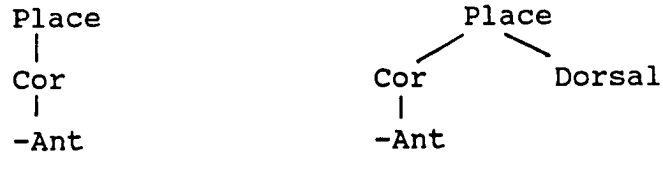
(26)



3.3.3 Uniformity of Representation

Apart from enabling us to account for the different processes in Modern Irish, the structure proposed is characterized by uniformity of representation of palatalized segments, that is, all palatalized segments are complex segments (except for the palatalized laryngeal fricative **h'**). This would seem desirable for a language such as Irish in which palatalization is distinctive throughout the consonant system. The accounts discussed in the preceding sections, where palatalization was represented as coronalization or dorsalization, lack this uniformity. Palatalized segments in these accounts are represented alternately as simple or complex segments. In an account where palatalization is represented as coronalization, palatalized coronal segments are represented as simple segments while non-coronal palatalized segments are represented as complex segments, as illustrated in (27).

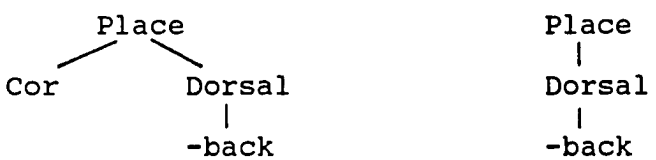
(27) Palatalization as coronalization



palatalized coronal palatalized dorsal

Similarly, accounts in which palatalization is considered to be dorsalization represent palatalized dorsal segments as simple while palatalized non-dorsal segments are represented as complex segments, as illustrated in (28).

(28) Palatalization as dorsalization



palatalized coronal palatalized dorsal

While uniformity of representation is not a necessary consideration, it does reflect the fact that palatalization is contrastive across the consonant system in Irish. No single class of consonants is represented as more or less complex than another.

A more important point arises when we consider Final Depalatalization, a productive process in the morphology of Irish, illustrated in (29)and (30).

(29)	(i)	cuir	kir'	'put'(imper)
		cur	kur	'put'(verbal noun)
	(ii)	siúil	s'u:l'	'walk'(imper)
		siúl	s'u:l	'walk'(verbal noun)

(30)	(i)	feoil	f'ol'	'meat' (f sg indef nom)
		feola	f'olə	'meat' (f sg indef gen)
	(ii)	bádóir	bɑ:do:r'	'a boatman' (ms sg indef nom)
		bádóra	bɑ:do:rə	'a boatman' (ms sg indef gen)

The verbal nouns in (29) are formed by depalatalizing the final consonant of the verb stem. Similarly, the genitive form of the nouns in (30) are formed by depalatalizing the final consonant of the nominative (citation) form along with suffixation. Where palatalized segments are uniformly represented, depalatalization may be represented as delinking of [-back] as formulated in (31).

(31) Depalatalization

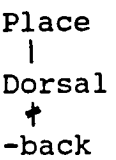
$\not|$
-back

In accounts where the palatalization feature is dependent on a primary place node, Final Depalatalization must be formulated non-uniformly for simplex and complex segments. Where palatalization is represented as dorsalization, for example, depalatalization of a palatalized dorsal segment simply involves delinking [-back] as illustrated in (32)a. However, depalatalization of a palatalized labial segment

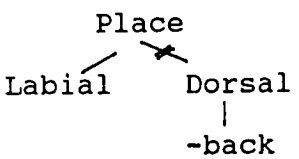
requires delinking also of the dorsal node to which the palatalization feature is attached, as illustrated in (32)b.

(32)

a. Depalatalization of a palatalized dorsal segment



b. Depalatalization of a palatalized labial segment



If depalatalization were uniformly represented as delinking [-back], the result of depalatalizing a palatalized labial segment would be a (non-palatalized) labio-dorsal segment. The same problem is faced if palatalization is represented as coronalization.

3.4 Secondary Place Features

In the following sections, I will be concerned primarily with the vowel (secondary place) features. I first discuss the set of features required to represent the vowels in Irish and then examine the processes that affect these features.

The vowel system of Irish is a three height system. A further front/back distinction must be represented lexically for the non-low long vowels. No lexical distinction in backness is made for the non-low short vowels, however. On the surface these vowels are predictably front or back. The stressed vowel inventory is given in (33).[13]

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[13] A similar system is proposed by Ó Siadhail & Wigger (1975), see also Ó Siadhail (1989).

(33)

Long vowels					
underlying	i:	u:	**surface**	i:	u:
	e:	o:		e:	o:
		ɑ:		a:	ɑ:

Short vowels					
underlying	I[14]		**surface**	i	u
	E			e	o
	a			a	

3.4.1 Binary Vowel Features and Underspecification

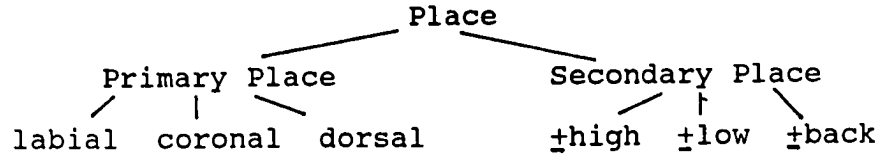
In this section I examine assimilatory consonant-vowel interactions. These are restricted to the feature [back]. I argue for a version of Radical Underspecification that is context-sensitive. Both values of [back] are present lexically, however not within the same class. The lexical and default values of this feature differ for consonants and vowels: consonants are specified for [-back] and are assigned [+back] by default, long vowels are specified for [+back] and are assigned [-back] by default and short vowels

[14] As noted in §1.3.2 the underlying short high and mid vowels **I** and **E** are archisegments and not central vowels.

are unspecified for [back] and are assigned a specification for this feature by spreading from an adjacent consonant.

The remaining vowel features - those representing height - are also equipollent. The representation I propose for the Place features in Irish is given in (34).

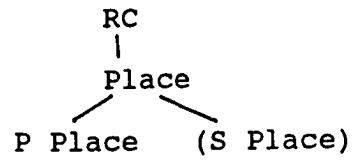
(34)



The (primary) consonant features [labial], [coronal] and [dorsal] are privative (see Sagey (1986)) and the (secondary) vowel features [high], [low] and [back] are equipollent.

Palatalized consonants are represented underlyingly with both a primary and a secondary place node. Non-palatalized consonants are represented underlyingly with only a primary place node - [+back] is assigned by a default rule and a secondary place node is then projected. Vowels, on the other hand, are represented with only a secondary place node.

(35) **Consonants:**



Vowels:

RV
|
Place
|
S Place

3.4.1.1 Consonant-vowel Interaction and the Feature [back]

The following generalizations can be made about the surface distribution of short vowels:[15]

(i) Short vowels are front before palatalized consonants.

(ii) Short vowels are back before non-palatalized consonants.

The above distinctions are clearest in stressed syllables because unstressed vowels reduce. Examples of (i) and (ii) above are given in (36) and (37) below.

(36)

(i)	a.	mion	m'un	< m'In	'small'
	b.	min	m'in'	< m'In'	'grain'
(ii)	a.	col	kol	< kEl	'a prohibition'
	b.	scoil	skel'	< skEl'	'a school'

[15] For a more detailed description of these generalizations see Ó Siadhail (1989:35ff).

(37)

(i)	a.	cur	kur	< kIr	'put'(nonfin)
	b.	cuir	kir'	< kIr'	'put'(imper)
(ii)	a.	muc	muk	< mIk	'a pig' (nom sg)
	b.	mhuic	wik'	< wIk'	'a pig' (dat sg)

The examples in (36) illustrate morphologically simplex minimal pairs. In (36)(i)a., for example, a short high back vowel occurs preceding the final non-palatalized consonant, whereas in (36)(i)b., a short high front vowel occurs preceding the final palatalized consonant. The examples in (37), on the other hand, illustrate variations in derived (morphologically complex) forms, where a particular grammatical form (e.g. the imperative form of a verb, (37)(i)b., or the dative singular of a noun, (37)(ii)b.) is marked by Final Palatalization (along with Lenition in the case of (37)(ii)b.)[16]. In (37)(i)a., for example, the non-finite form of **cur** **kur** 'put' is marked by the final non-palatalized consonant; the preceding (short) vowel is therefore [+back]. In (37)(i)b. the imperative form is marked by Final Palatalization; [-back] then spreads to the preceding vowel.

The above examples are accounted for within any theory of underspecification by underspecifying non-low short

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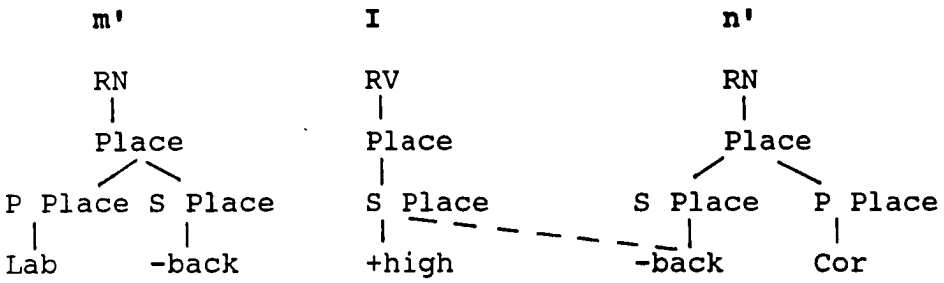
[16] Final Palatalization is discussed in §3.4.2.3.

vowels: non-low short vowels are lexically unspecified for [back]. The [-back] specification of a following palatalized consonant spreads to the secondary place node of the vowel, as illustrated in (38) for (36)(i)b.

(38) <u>min</u> m'in' (=(36)(i)b.)

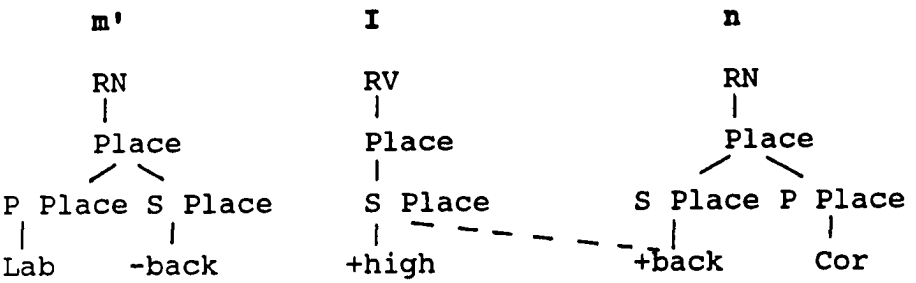


When a short vowel is followed by a non-palatalized consonant, it receives the default [+back] specification of the consonant by spreading.[17] This is illustrated in (39) for (36)(i)a. It is clear in this example that the secondary [-back] of the <u>preceding</u> consonant does not spread to the vowel. Assimilation to a preceding consonant occurs only when the vowel is word-final.

---

[17] [+back] is assigned to consonants by a default rule, see §3.4.1.3. Since the default value for vowels is [-back] (§3.4.1.4), the short vowel in (39) must be assigned [+back] by spreading.

(39) mion m'un < m'In (=(36)(i)a)



Clearly only [back] - and not the [Secondary Place] node of the consonant - spreads in both examples discussed. Spreading the [Secondary place] node would entail delinking the [Secondary Place] node of the vowel which consequently would entail loss of the height specification(s) of the vowel.

Long vowels in Irish, on the other hand, do not assimilate in backness to an adjacent consonant. The examples in (40) illustrate this.

(40)	a.	caol	ki:l	'narrow'
		coill	ki:l'	'a forest'
	b.	fíon	f'i:n	'wine'
		roinn	ri:n'	'a department'
	c.	súil	su:l'	'an eye'
		siúl	s'u:l	'walk'

d.	ciúin	k'u:n'	'quiet'
	dún	du:n	'a fort'

The examples in (40)a. and b. contain a long high front vowel, while those in (40)c. and d. contain a long high back vowel. The forms in (40)a., for example, are differentiated only by the final consonant, which clearly does not affect the preceding vowel. The assimilation process, Spread [back], therefore appears to affect only short vowels.

3.4.1.2 [back] as a Binary Feature

The conclusion that spreading of [back] affects short vowels, but not long vowels, is important when we consider the status of [back] in the phonology. This feature marks the front/back contrast in vowels and the palatalized/non-palatalized contrast in consonants - we are clearly concerned with the same feature in both cases. The first question we can address is whether or not this feature is privative. If the feature were privative across the segment inventory, only one member of the opposition would be marked. If we take the palatalized consonants to be the marked members of the palatalized/non-palatalized opposition, we must also take the front vowels to be the marked members of the front/back opposition. Following this

assumption, long back vowels would be lexically unspecified for [back]. However, assuming that the assimilation rule is minimal, i.e. Spread [back], we would then predict that these vowels would assimilate to the following consonant if that consonant were specified as palatalized, just as a short vowel unspecified for [back] would.[18] We can see that this is clearly not the case in (40)c. and d., repeated in (41).[19]

(41) a. súil su:l' 'an eye'

b. ciúin k'u:n' 'quiet'

The long high back vowels in both examples above are followed by palatalized consonants. Moreover, the long vowel in (41)b. is both preceded and followed by palatalized consonants. This is illustrated in (42).

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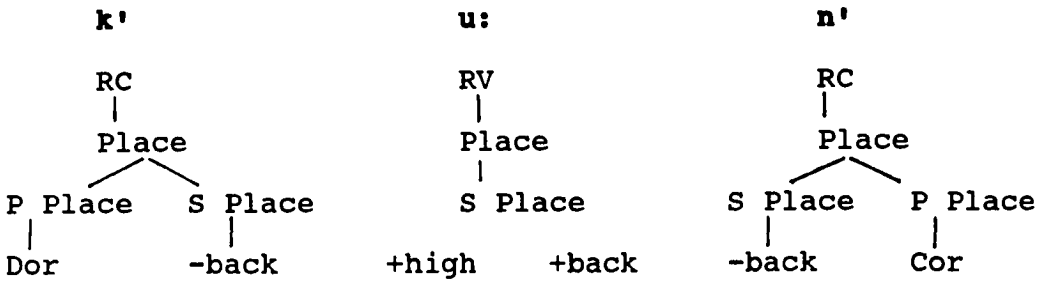
[18] Long and short vowels do not differ at the subsegmental level. They are differentiated by their moraic status, lexically moraic vs. nonmoraic, respectively, see Chapter 4.

[19] This problem could be circumvented by (lexically) specifying both values of [back] for non-low long vowels. However, I propose an alternative account which does allow for underspecification of [back] for this class of vowels.

(42) ciúin k'u:n' (=(41)b.)



We must conclude that [-back] does not spread from either adjacent consonant and that [+back] must be lexically specified for long vowels. The feature [back] is therefore equipollent.

3.4.1.3 Consonants and the Feature [back]

I assumed in the previous sections that [+back] is the unmarked value for consonants and is assigned by default. There is, in fact, evidence that this is the case. Word-internal clusters in Irish generally agree with respect to the feature marking palatalization - a cluster is uniformly palatalized or non-palatalized. In cases where a cluster whose members do not agree with respect to palatalization is derived by the application of a morphological process, the cluster becomes palatalized. This is illustrated in (43).

(43) (i)	a.	obair	obir'	'work'(nom)
	b.	oibre	aib'r'i	'work'(gen)
(ii)	a.	pobal	pobəl	'people'
	b.	poiblí	paib'l'i:	'public'(adj)

The forms in (43)(i)b. and (ii)b. are the result of a syncope rule that applies following suffixation and in the case of (43)(ii)b, Final Palatalization.[20] The initial consonant of the derived cluster in both cases becomes palatalized as the result of spreading from the following palatalized consonant. Spreading applies as a fill-in process and would be blocked if the initial consonant of the cluster were specified for [+back], as was the case with long vowels, see (41)a. and b. The vowel preceding the cluster is lengthened and diphthongized as a result of Mora Preservation which will be discussed in Chapter 4.

3.4.1.4 Underspecification of [back]

The status of the feature [back] with respect to current theories of underspecification can now be addressed. A theory of Restricted Underspecification (e.g. Steriade

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[20] I argue in §3.4.2 that Final Palatalization is an independent rule and that palatalization in this case is not triggered by the long high front vowel of the suffix.

(1987), Clements (1987) Mester & Itô (1989)), would predict that since [back] is contrastive in both the consonant and the vowel systems and since [back] is never redundantly specified, both values of the feature should be specified throughout the phonology. However, the preceding discussion in particular, in which I argue that there is evidence that [+back] must be unspecified for consonants, clearly runs counter to such a theory.

An alternative to this approach is to adopt a theory of Radical Underspecification, e.g. Kiparsky (1982), Archangeli (1984), Archangeli & Pulleyblank (1986), Itô & Mester (1986), Pulleyblank (1988).[21] Such a theory requires that one value of any feature be unspecified lexically.[22] However, it would appear that an account of the phenomena discussed in the preceding sections requires a context-sensitive version of Radical Underspecification, that is, one in which the lexical and default specifications can differ according to the class of segments for which they are defined. In Irish, we can argue for the following system:

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[21] The proposal made in Mester & Itô (1989) that certain features that seem to require radical underspecification may instead be privative features is untenable here -- I argued in the previous section that [back] is equipollent in Irish.

[22] A theory of Radical Underspecification would also require that the unmarked values of the features [voice] and [cont] be lexically unspecified. Assigning the unmarked values of these features by default rules enables us to account for the different realizations of the underspecified onset, recall §2.4. This option would be denied in a theory of Restricted Underspecification.

consonants are lexically specified for [-back] and [+back] is assigned by default; short vowels are lexically unspecified for [back] and are assigned a value for this feature by spreading from an adjacent consonant; long vowels, on the other hand, are lexically specified for [+back] and are assigned [-back] by default.

(44) Lexical specification of [back]

Consonants	[-backl]
Long vowels	[+back]
Short vowels	[Ø]

I have already accounted for the behaviour of short vowels and consonants. It remains to be shown how the distribution of long vowels and the absence of consonant-long-vowel interaction can be accounted for within such a system. Consider the examples in (40), repeated in (45) and (46) below.

(45)

a.	caol	ki:l	'narrow'	(=(40)a.)
b.	coill	ki:l'	'a forest'	
c.	ciúin	k'u:n'	'quiet'	(=(40)d.)

(46)

a.	<u>súil</u>	su:l'	'an eye'	(=(40)c.)
b.	<u>siúl</u>	s'u:l	'walk' (V)	

The forms in (45) and (46) are derived as in (47) and (48), respectively. [+back] and [-back] are abbreviated as **+B** and **-B**.

(47)	a.	b.	c.
UR	k i: l	k i: l' | **-B**	k' u: n' | | | **-B +B -B**
Spreading & Default Rules	k i: l | | | **+B -B +B**	k i: l' | \ | **+B -B**	k' u: n' | | | **-B +B -B**

(48)	a.	b.
UR	s u: l' | | **+B -B**	s' u: l | | **-B +B**
Spreading & Default Rules	s u: l' \ | | **+B -B**	s' u: l | | | **-B +B +B**

In (47)a., **<u>caol</u> ki:l** 'narrow', all segments are lexically unspecified for [back]; the consonants are assigned [+back] and the vowel [-back], by default. In (47)b., the final consonant of **<u>coill</u> ki:l'** 'woods' is lexically specified for [-back]. It appears to be inconsequential whether [-back] spreads to the preceding

vowel or whether this segment is assigned [-back] by default. Since there is evidence that spreading of [back] is directional, right-to-left, I represent spreading only when this condition is satisfied, as it is in this example. In (47)c. **ciúin k'u:n'** 'quiet', all segments are lexically specified for [back].

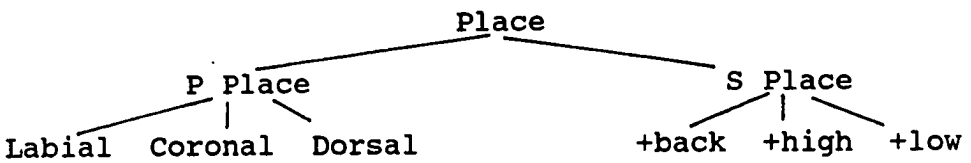
Having different lexical and default values for consonants and long vowels accounts for the absence of consonant-vowel interaction, in particular in (47)a. and (47)c. In the former all segments are lexically unspecified for [back] and in the latter all specifications of [back] are present lexically, thus pre-empting any C-V interaction we might otherwise expect. A consequence of this approach to underspecification is that we can now formulate the spreading rule as **Spread [back]** and require no restrictions as to the class of segments it affects. **Spread [back]** can therefore target unspecified long vowels, as pointed out in the case of (47)b.

3.4.1.5 Height Distinctions in the Vowel System

The remaining contrasts to be represented in the vowel system are those of height. A three-height system may easily be represented using the traditional binary features

[high] and [low]. The organisation of place features in Irish, therefore, is as in (49).

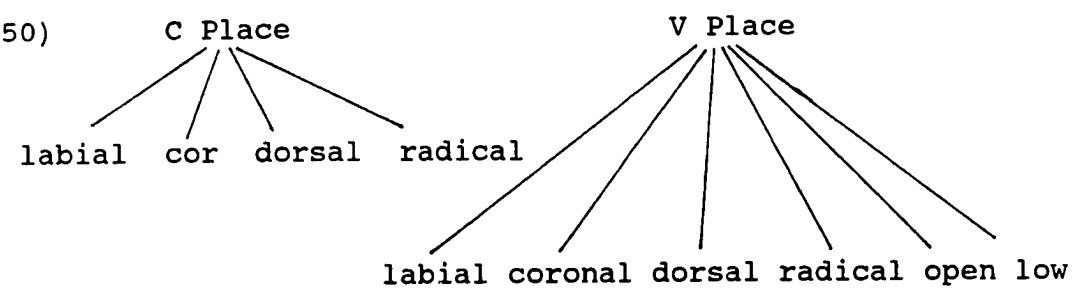
(49)



3.4.1.6 Alternative Proposals in the Literature

Clements (1989) proposes a unified set of 'potentially binary' (place) features for consonants and vowels. Vowels and secondary articulations are represented using the features [labial], [coronal], [dorsal], [radical], as well as [open] and [low] as in (50).

(50)



The features represented under [V Place] (Vocoid Place) in (50) correspond to the following classes of vocalic segments and secondary articulations:

[labial] - rounded vowels and glides; labialization

[coronal] - front vowels; palatalization

[dorsal] - back vowels; velarization

[radical] - ATR, pharyngealized vowels; pharyngealization

[open] - non-high vowels, i.e. mid and low vowels

[low] - low vowels

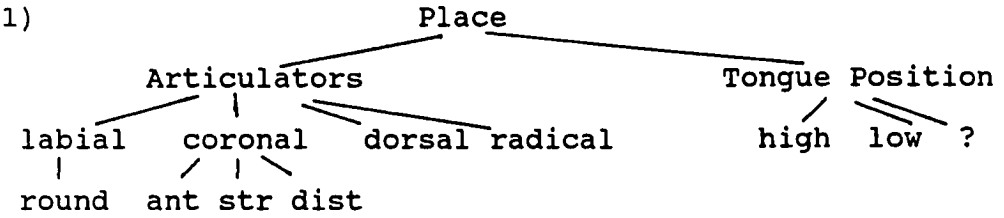
The introduction of the feature [coronal], for example, for vowels is motivated by the inherent relationship between high front vowels, palatal glides and the coronal consonants, see §3.3.1.1.

However, Irish poses a problem for Clements' conception of place feature organization. In the preceding sections I argued that an account can be given of consonant-vowel interaction in Irish in which the two classes of segments are distinctively specified: consonants are specified for [-back] and long vowels are specified for [+back]. In Clements' system these specifications would correspond to [+coronal] and [+dorsal], respectively. However the latter approach fails to capture the fact that we are concerned with one opposition here, that is, front vs. back, which may be satisfactorily captured using one (equipollent) feature, [back].

The representation of place features proposed by Lahiri & Evers (1989) differs from Clements' in that the tongue

body features [high] and [low] are represented independently of the primary place features as in (51).[23]

(51)



The primary and secondary place features are not strictly independent in the representation in (51) above, and palatalization is represented by the feature [anterior] dependent on [Coronal]. This model is indistinct in this respect from those discussed in §3.3.1 (where palatalization is represented as coronalization) and must be rejected for the reasons explicated in that discussion.

3.4.1.7 Glide Formation

Having motivated independent Primary and Secondary Place nodes, we can return briefly to the rule of Glide Formation alluded to in §2.2.3. I proposed in that section

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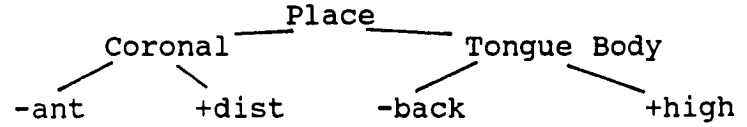
[23] A similar proposal is made by Keating (1987) for the representation of palatal segments which are represented as in (i).

(i)



that the alternations between fricatives and glides are independent of Lenition per se. The alternations, which involve voiced labial and dorsal fricatives, are repeated in (52).

(52)

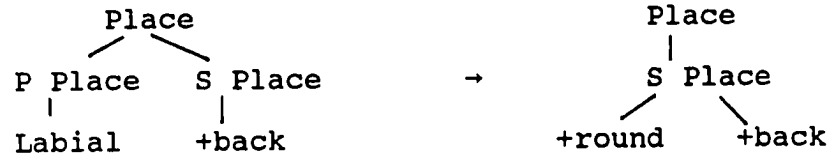
Non-lenited	**Lenited**
b m	v - w
b' m'	v'
d g	ɣ
d' g'	ɣ' - j

Glide Formation derives the corresponding glides from non-palatalized voiced labial and palatalized voiced dorsal fricatives, **v** and **'**, respectively. Glide-Formation does not apply to the palatalized voiced labial or non-palatalized voiced dorsal fricatives, **v'** and **ɣ**, respectively.

If we regard Glide Formation as a rule that involves (i) a change in major class feature specifications: [-son, +cons] → [+son, -cons], and (ii) 'demotion' of a primary place feature to the corresponding secondary place feature, we can account for the alternations in question. I assume the change in major class features to be straightforward and focus on the place features in this section. [Labial] and

[Dorsal] are demoted to [+round] and [+high], respectively.[24] Labial glides are derived as in (53).

(53)



[Labial is demoted to [+round]; we must assume that [+back], the default value for consonants, is assigned prior to the application of Glide Formation in order to block assignment of the default value for vowels, [-back]. The resulting segment is interpreted as a labial glide **w**.

Glide Formation does not apply to a palatalized labial fricative. Demotion of [labial] would result in a [+round, -back] segment. Since Irish has no rounded front vowels, see ((7) in §1.3.2, we must conclude that Glide Formation is subject to Structure Preservation and that this feature combination is disallowed.[25]

[Dorsal] demotes to [+high] (along with implied [+back] and [-round]). Glide Formation applies to palatalized dorsal fricatives yielding palatal glides.

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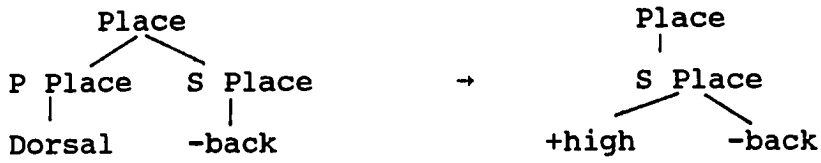
[24] It will become clear that [+high] derived from [Dorsal] also implies [-round].

[25] The labial palatal approximant ɥ is rare cross-linguistically - it occurs in only 4 of the 317 languages surveyed in Maddieson (1984). Furthermore, Maddieson points out that it is more likely to occur if a language also has the front rounded vowel **y**.

(54)



If Glide Formation were to apply to non-palatalized dorsal fricatives, the resulting vocoids would be [+high, +back, (-round)]. Since most dialects of Irish do not have high back unrounded vowels, rule application is again blocked by Structure Preservation.[26]

This account of Glide Formation is supported by a diachronic Glide Formation process: word-final, post-vocalic and intervocalic voiced fricatives became vocoids, resulting in diphthongs.

3.4.2 Spreading of Secondary Place Features

Assimilation of secondary place features is the result of a spreading rule, **Spread [back]**, which is directional (right-to-left) and subject to adjacency. Since vowels are unspecified for [-back] we predict that palatalization is never triggered by a high front vowel, rather it is

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[26] Like the labial palatal approximant, the velar approximant ɣ is rare cross-linguistically. Its vowel counterpart, the high back unrounded vowel ɯ, occurs only in the northern dialects of Irish.

triggered only by palatalized consonants (§3.4.1.3) or by an independent palatalization rule.

In the following sections I show that palatalization is never triggered by a high front vowel. I first discuss morphologically simple and complex forms containing long high vowels which do not interact with adjacent consonants. Where it appears that a front vowel initial suffix does cause palatalization I argue that this is in fact the result of an independent palatalization rule for which there is ample evidence in the phonology. The behaviour of consonant-initial suffixes supports the arguments presented. Finally I return to the vowel-initial stems of the preceding chapter. The argument made in this section provides strong support for the proposal that vowel-initial stems have unspecified onsets, see §2.4.

3.4.2.1 High Front Vowels in Stems

Consider first monomorphemic instances of consonants occurring before a (long) high front vowel.

(55)	a.	saol	si:l	'life'
	b.	síol	s'i:l	'a seed'

(56) a. caol ki:l 'narrow'

b. ciall k'i:l 'sense'

In the examples in (55) and (56), the high front vowel is preceded by a non-palatalized consonant, (55)a. and (56)a., and a palatalized consonant, (55)b and (56)b. The distribution of palatalized and non-palatalized consonants within morphemes is clearly not conditioned by (high) front vowels. The vowels in both examples are unspecified for [back] and are assigned [-back] by default. Likewise, the initial consonants in (55)a. and (56)b. are unspecified for [back] and are assigned [+back] by default. The initial consonants in (55)b. and (56)b. are lexically specified as [-back].

3.4.2.2 High Front Vowels in Morphologically Complex Forms

The second set of examples concerns morphologically complex forms where a consonant is followed by a high front vowel across a morpheme boundary. There are a number of suffixes in Irish with an initial high front vowel. The examples in (57) illustrate three different plural forms, using the plural suffixes **-(a)í** i:, **-(a)íocha**

i:xə and **-aíl i:l'**. None of these suffixes conditions palatalization of the final consonant of the word to which they are attached.

(57) a. **-(a)í i:**

(i)	coinín	kin'i:n'	'a rabbit'
	coiníní	kin'i:n'i:	'rabbits'
(ii)	léacht	l'e:xt	'a lecture'
	léachtaí	l'e:xti:	'lectures'

b. **-(a)íocha i:xə**

bonn	bun	'a coin'
bonnaíocha	buni:xə	'coins'

c. **-aíl i:l**

(i)	múr	mu:r	'a shower'
	múraíl	mu:ri:l'	'showery conditions'
(ii)	slám	slɑ:m	'an amount'
	slámaíl	slɑ:mi:l'	'large amount'

(Ó Siadhail (1989:164)

In (57)a., the suffix **-(a)í i:** is attached to words ending in either a palatalized or a non-palatalized consonant. Palatalization does not occur in the latter case. Nor does palatalization occur in (57)b. or c. where the high front vowel initial suffixes are similarly attached to words

ending on a non-palatalized consonant. Palatalization is not caused by spreading of [-back] from an adjacent front vowel in either underived or derived forms. This is exactly what we predict since front vowels are, at this stage, unspecified for [-back].

There are two suffixes in Irish, however, that appear to trigger palatalization. The first of these is the diminutive suffix **-ín i:n'**. The final consonant of a word to which the diminutive suffix is attached becomes palatalized.

(58) a.	bád	bɑ:d	'a boat'
	báidín	bɑ:d'i:n'	'a little boat'
b.	éan	e:n	'a bird'
	éinín	e:n'i:n'	'a little bird'

Both examples above have final non-palatalized coronal consonants before the diminutive suffix is attached which then become palatalized. Similarly, the agentive suffix **-éara e:rə**, in the western dialect triggers palatalization of the preceding consonant.

(59)[27] sábh sɑ:w 'a saw'

sáibhéara sɑ:v'e:rə 'a sawyer'

(Ó Siadhail (1989:85)

I argue in the following section that palatalization in the above cases, however, is not triggered by the initial high front vowel of the suffix but rather is the result of an independent rule of Final Palatalization.

3.4.2.3 Final Palatalization

There is ample evidence for a rule of Final Palatalization in the morphology of Irish. Final Palatalization marks certain plural forms. It also marks a number of grammatical cases, e.g. vocative singular, genitive singular.

(60) Plural formation

a. bád bɑ:d 'a boat'

báid bɑ:d' 'boats'

---

[27] The alternation between fricative and glide illustrated in this exampleis expected, see §3.4.1.7 The final non-palatalized labial fricative **v** becomes a labial glide **w**, (59)a, **sɑ:v > sɑ:w**. Glide formation is not possible in the case of the palatalized labial fricative **v'** in (59)b.

b.	leabhar	l'awr	'a book'
	leabhair	l'awr'	'books'

(61) Vocative singular

a.	Seán	s'ɑ:n	(man's name)
	a Sheáin	ə h'ɑ:n'	(man's name (voc))
b.	fear	f'ar	'a man'(nom)
	a fhir	ə ir'	'man'(voc)

(62) Genitive singular

a.	bád	bɑ:d	'a boat'(nom)
	báid	bɑ:d'	'a boat'(gen)
b.	lón	lo:n	'a lunch'(nom)
	lóin	lo:n'	'a lunch'(gen)

In (61)a., for example, vocative case is marked by lenition of the initial consonant and palatalization of the final consonant of the word. Thus the initial palatalized coronal fricative **s'** undergoes Coronal Delinking (§2.2.5.1) to become a palatalized laryngeal fricative **h'**, and the final non-palatalized nasal consonant becomes palatalized. Similarly, in (61)b., the initial labial fricative is lenited, which entails deletion (§2.2.6), and the final consonant is palatalized. This latter change also causes a change in vowel quality, raising the short vowel to a high

front vowel in a palatalized environment.[28] The examples in (60) and (62) involve similar palatalization of the final consonant of the word.

Final Palatalization is clearly an independently motivated rule. As there are a number of suffixes with an initial high front vowel that do not trigger palatalization of the preceding consonant, see (57) above, we may conclude that in those cases where palatalization does occur, Final Palatalization applies along with suffixation. This conclusion is supported by the following examples where the comparative form of the adjective is marked by (i) suffixation of a short (unstressed) vowel and (ii) Final Palatalization. There is no reason to anticipate palatalization when this suffix is added - the short (unstressed) vowel is unspecified for [back] and gets its specification for this feature by spreading from the adjacent consonant.[29]

(63) a.	bán	bɑ:n	'white'
	(níos) báine	bɑ:n'i	'whiter'

---

[28] Recall that the palatalization feature of lenited palatalized labial fricatives is retained (Phantom Limb phenomena), §2.2.6. The vowel in this example will therefore both be preceded by the palatalization feature [-back] and followed by a palatalized segment.

[29] Recall that spreading is directional right-to-left except when an unspecifed vowel occurs word-finally. In this case [back] spreads from the preceding consonant.

b.	óg	o:g	'young'
	(nios) óige	o:g'i	'younger'

In (63)a., the final nasal consonant becomes palatalized when the comparative form of the adjective is formed. Moreover, the unstressed vowel of the suffix is fronted as a result of this palatalization. Vowel suffixation and Final Palatalization are separate processes, therefore, and can co-occur.

3.4.2.4 Consonant-initial Suffixes

The conclusion reached in the previous subsection, that is, that palatalization is not triggered by a high front vowel, is supported by facts about consonant-initial suffixes. The initial consonant of a consonant-initial suffix, when attached to a consonant-final stem, assimilates in palatalization to the final consonant of that stem if that consonant is specified for [-back]. Otherwise both the final consonant of the stem and the initial consonant of the suffix are assigned [+back] by a default rule. The future autonomous and the past habitual autonomous forms, for example, are marked by attaching suffixes to the verb stem. The past habitual autonomous is marked also by lenition of the initial consonant of the verb stem.

(64)	tóg	to:g	'take'
	a. tógfar	to:gfəɾ	'will be taken' future autonomous
	b. thógtaí	ho:gti:	'used to be taken' past habitual autonomous
(65)	cuir	kir'	'put'
	a. cuirfear	kir'f'əɾ	'will be put'
	b. chuirtí	xir't'i:	'used to be put'

The verb in (64), **tóg** **to:g** 'take', ends on a non-palatalized consonant. The initial consonants of the suffixes in (64)a. and b. are also non-palatalized. The verb in (65), **cuir** **kir'** 'put', on the other hand, ends on a palatalized consonant. The initial consonant of both suffixes become palatalized. We can account for the behaviour of the suffixes by underspecifying the initial consonant for [back]. When a consonant-initial suffix is attached to a stem with a final palatalized consonant, [-back] spreads from the stem consonant. Otherwise [+back] is assigned by default.[30]

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[30] I will not attempt to account for vowel-final stems here. The variation in these cases is not consistent and an account necessarily becomes complex. The variation may be accounted for by positing an underspecified segment that carries a secondary place feature, as proposed for vowel-initial stems.

3.4.2.5 Vowel-stems

I argued in §3.4.1 that vowels are unspecified for [-back] and showed in §3.4.2 that palatalization is never triggered by high front vowels - rather, it is the result either of spreading [-back] from a following palatalized consonant or of a rule of Final Palatalization. It follows then that vowel-stems must have underspecified onsets. Recall the examples discussed in §2.4.2 where the final consonant of a proclitic becomes palatalized preceding a high front vowel.[31]

(66)	(i)	iontas	i:ntəs	'a wonder'
		an iontais	ən' i:ntis'	'the wonder' m sg gen def
	(ii)	iasc	i:əsk	'a fish'
		an iasc	ən' i:əsk	'the fish' m sg dat def

Since the initial vowel of the vowel-stems in (66) cannot be specified for [-back] and since [-back] must be lexically present in order to spread - this is not an environment in which Final Palatalization occurs - we must posit an onset to which this feature is attached.

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[31] Note the the environments in which palatalization occurs are Lenition environments (m sg gen and sg dat). Palatalization occurs following (total) deletion of the onset, see §2.4.5.

3.5 Summary

The main conclusions put forward in this chapter are summarized as follows:

- Primary and Secondary Place features are represented independently in Irish. The data that motivate this representation involve Coronal Fusion, §3.2.1, Coronal Delinking, §3.2.2 and Nasal Assimilation, §3.2.3. An account of the first two processes requires independent Primary and Secondary Place nodes while an account of the third requires both nevertheless to be dominated by a Place class node.
- Data involving consonant-vowel interaction in Irish argue for context-sensitive Radical Underspecification. Consonants and vowels have different lexical specifications for [back]: consonants are specified for [-back], long vowels are specified for [+back] and short vowels are unspecified for [back]. This proposal allows for an account of consonant-vowel interaction and provides strong support for the account of vowel-stems proposed in §2.4.
- Glide Formation is the result of 'demoting' primary place features to secondary place features. This conception of the rule allows for an account of its restricted application.

CHAPTER 4

COMPENSATORY EPENTHESIS AND LENGTHENING

4.1 Introduction

In this chapter an account of various epenthesis and vowel-lengthening processes in Irish is presented within Moraic Theory (Hyman (1984), McCarthy & Prince (1986, 1988), Hayes (1988) Itô (1989)). I argue that these processes are compensatory and are motivated by a general principle of Mora Preservation whereby the moraic representation of a given form remains unchanged by prosodically defined processes, such as delinking of moraic segments. Rather, prosodic weight is transferred following these processes and thus preserved. This particular theoretical framework is pursued because it allows for a unified, prosodically motivated account of the different processes that are discussed.

The following are the desriptive generalizations that are accounted for in this chapter.

1. Epenthesis occurs into certain clusters in Irish whose first member is a sonorant consonant, as illustrated in (1).

(1)	a.	gorm	gorəm	'blue'
		dearmad	d'arəməd	'a mistake'
	b.	dearg	d'arəg	'red'
		airgead	ar'ig'ə d	'money'

The examples in (1) contain non-homorganic clusters that are preceded by a short vowel. Epenthesis is not conditioned in an obvious syllabic way - it does not occur to facilitate syllabification of certain consonant sequences or as a result of a condition on certain syllable positions. Epenthesis does not occur into the same clusters if the cluster is preceded by a long vowel as is the case in the examples in (2).

(2)	a.	téarma	t'e:rmə	'a term'
	b.	léargas	l'e:rgəs	'insight'

Epenthesis also does not apply to homorganic nasal-stop clusters, (3), or if the second member of the cluster is voiceless, (4).

(3)	a.	bambairne	bambir'n'i	'big, strong'
	b.	meandar	m'andər	'an instant'
	c.	mangach	maŋgəx	'a pollock'

(4)	a.	coirce	kər'k'i	'oats'
	b.	cearc	k'ark	'a hen'
	c.	spailpín	spal'p'i:n	'a labourer'
	d.	seilp	s'el'p'	'a shelf'

In the account of epenthesis proposed, the first consonant of a cluster that is preceded by a short (monomoraic) vowel and followed by a voiced non-homorganic consonant is assigned a mora by the application of Weight-by-Position (see Hayes (1988), among others) which applies in the course of syllabification. Weight-by-Position is a template-driven process that applies to maximize syllable internal prosodic structure. The syllable template in Irish is bimoraic; Weight-by-Position applies in a monomoraic syllable adding an additional mora. The consonant is later delinked from the mora by a rule of Moraic Consonant Delinking, but the moraic structure is preserved by epenthesis. I propose a principle of Mora Preservation which requires moraic structure to be preserved. We must stipulate that epenthesis (rather than lengthening) is the default mora-preserving process, resulting in an extra syllable in the surface forms in (1). Epenthesis is thus compensatory.

The clusters in (2) are preceded by a long (bimoraic) vowel. The syllable template is therefore already maximally expanded and Weight-by-Position does not apply.

Consequently, neither Moraic Consonant Delinking nor epenthesis applies to these forms.

I argue that Weight-by-Position does not apply to a consonant that shares a primary place specification with the following consonant or that is followed by a voiceless stop. - this accounts for the lack of epenthesis into the clusters in (3) and (4). Weight-by-Position is also subject to extrasyllabicity.

2. A series of vowel-length alternations occurs in Irish preceding sonorant consonants. These alternations are exemplified in (5).

(5)	a.	gleann	g'l'ɑ:n	'a valley'(nom)
	b.	gleannta	g'l'ɑ:ntə	'valleys'
	c.	gleanna	g'l'anə	'a valley'(gen)

The vowels in the examples in (5) are long when the sonorant consonant is tautosyllabic with the vowel and short when the sonorant consonant forms the onset of the following syllable. The vowel-length alternations do not always occur, however, as is seen in (6) and (7), where vowel-length is constant whether the sonorant consonant is tautosyllabic or not.

(6)	a.	bán	bɑ:n	'white'(sing)
	b.	bána	bɑ:nə	'white'(pl)
(7)	a.	glan	glan	'clean'(adj sg)
	b.	glana	glanə	'clean'(adj pl)

The class of words in which vowel-lengthening occurs is a restricted class and the sonorant consonants before which the alternation applies occur in an environment where Weight-by-Position does not occur. I argue that the sonorant consonants in the examples in (5) nevertheless are moraic; however they are not assigned moraic status during the derivation, rather they are lexically specified as moraic. This proposal allows for a unified account of vowel-lengthening and epenthesis.[1] As with the examples where epenthesis occurs, Moraic Consonant Delinking applies to the moraic consonant. The mora is preserved in these cases by Compensatory Lengthening, since epenthesis cannot apply for reasons to be discussed. The postvocalic consonant is not deleted, rather its prosodic status changes - it is resyllabified as non-moraic.

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[1] O Baoill (1979, 1980) discusses data involving these processes of vowel-lengthening and epenthesis and proposes that they be examined within a framework based on moras. The approach taken in this work, however, differs from that proposed by O Baoill.

Finally, I show that a number of optional vowel-lengthening processes can be accounted for within the approach being adopted.

4.2 Moraic Structure and Syllabification

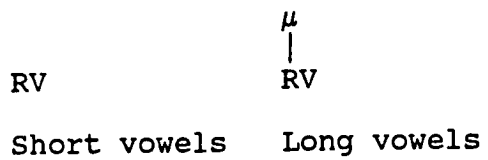
In this section I outline an approach to syllabification within Moraic Theory. The approach is templatic, whereby syllabification involves mapping to a language-particular syllable template. The ensuing discussion is concerned with this mapping and the conditions that hold of it. I argue that an account may be given of various vowel-lengthening and epenthesis processes in Irish that follows from the conditions imposed on the mapping process.

A central issue in recent work on Compensatory Lengthening and Epenthesis (Hayes 1988, Itô 1989) has been the role of a theory of syllabification that is based on quantity or weight distinctions within the syllable. Such a theory was originally proposed by Hyman (1985) and also by McCarthy and Prince (1986, 1988) who encode the light vs. heavy syllable distinction in terms of distinctive moraic structure: a light syllable is monomoraic [$_{\sigma}$ μ], whereas a heavy syllable is bimoraic [$_{\sigma}$ μ μ]. In the account pursued

in this chapter, syllabification is a template-based process (see Itô (1989) and references therein). The segmental string is exhaustively mapped to a template that is stated in terms of moraic constituency. The class of possible moraic segments and a syllable template is prespecified for Irish, as for any language, along with language-particular well-formedness conditions and constraints on the mapping process.

Following the works referred to above, and in particular McCarthy & Prince (1988) for lexical representations, I assume that contrastive length (quantity) distinctions are represented by lexical moras. Long vowels are represented 'moraically' whereas short vowels are 'nonmoraic' at this stage.

(8)

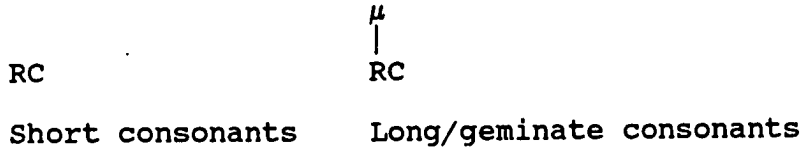


Short vowels are predictably moraic in syllabified representations - their moraic status, along with the bimoraic status of long vowels is therefore derived during syllabification.

Length distinctions within the consonant system (short vs. long/geminate) are similarly represented: long or

geminate consonants are represented as underlyingly moraic, while short consonants are nonmoraic.

(9)



The syllabification algorithm is given in (10).

(10) (1) All [-cons] segments project a mora.

(2) All moras that dominate a [-cons] segment project a syllable.

(3) Map exhaustively to the template.

Double linking of long vowels is derived by (10)(1). Long vowels are thus bimoraic in the syllabified representation while short vowels are monomoraic.

(11) All [-cons] segments project a mora. (= (10)(1))

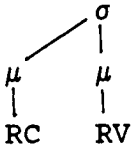
A language that has long vowels has, by extension, bimoraic syllables. By applying the principle that prosodic

constituents are maximized, a bimoraic vowel projects only one syllable, see (10)(2), as in (12).

(12)

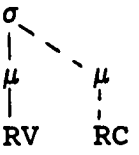
All remaining unsyllabified material is syllabified by exhaustive mapping to the syllable template, subject to language-particular constraints and well-formedness conditions. A prevocalic moraic consonant is adjoined to its right, becoming doubly linked, although not bimoraic as in the case of long vowels.

(13)



In a language that has a bimoraic template, i.e. $\sigma \rightarrow \mu\ (\mu)$, an unsyllabified postvocalic consonant that is a member of the class of possible moraic segments may receive Weight-by-Position (see Hayes (1989), among others) if the preceding vowel is monomoraic. This means that the consonant in question is assigned a mora and is incorporated into the preceding syllable, thus maximizing the template, as in (14).

(14) Weight-by-Position



As part of the mapping process, Weight-by-Position is constrained by language-particular conditions.

4.3 Weight-by-Position, Moraic Consonant Delinking and Epenthesis

The class of moraic segments in Irish is restricted to [+sonorant] segments and the syllable template is bimoraic, i.e. $\sigma \rightarrow \mu\ (\mu)$.[2] In order to allow for maximal expansion of the template, a sonorant consonant that follows a short (monomoraic) vowel which does not form the onset of the following syllable is assigned a mora by a process of Weight-by-Position.

In this section, I present an account of epenthesis in Irish in which Weight-by-Position is pivotal. I argue that this rule is quite constrained - it may apply only to a sonorant consonant that is followed by a non-homorganic voiced consonant. Epenthesis applies into exactly this

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[2] See Zec (1988) on defining classes of moraic segments in languages.

class of clusters. The account I propose involves positing a rule of Moraic Consonant Delinking that delinks a moraic consonant from its mora. A principle of Mora Preservation is invoked which requires that moraic structure be preserved. The mora in this case is preserved by the application of epenthesis.

I argue that while this account is necessarily abstract - it involves a process of assigning moras during syllablification to represent a weight distinction in consonants that is never realised on the surface (rather these moras are transferred to adjacent vowels) - it captures the generalization that epenthesis in Irish is compensatory, preserving suprasegmental structure in the same way as with compensatory lengthening of vowels. Epenthesis applies to particular clusters only when those clusters are preceded by a short vowel. It is not motivated by a constraint on possible sequences in syllabification or by a constraint on particular syllable positions, for example, a constraint on consonants in coda position.

The discussion is set out as follows: I first discuss the process of Weight-by-Position as well as the rule of Moraic Consonant Delinking. I then move from epenthesis to the vowel-length alternations and argue that the account I present of epenthesis may be extended to these cases.

4.3.1 Epenthesis

Consider the following examples.

(15)	a.	gorm	gorəm	'blue'
	b.	dearmad	d'arəməd	'a mistake'
	c.	ainm	an'im'	'a name'
	d.	ainmhí	an'iv'i:	'an animal'
	e.	dearg	d'arəg	'red'
	f.	airgead	ar'ig'əd	'money'
	g.	dealg	d'aləg	'a thorn'

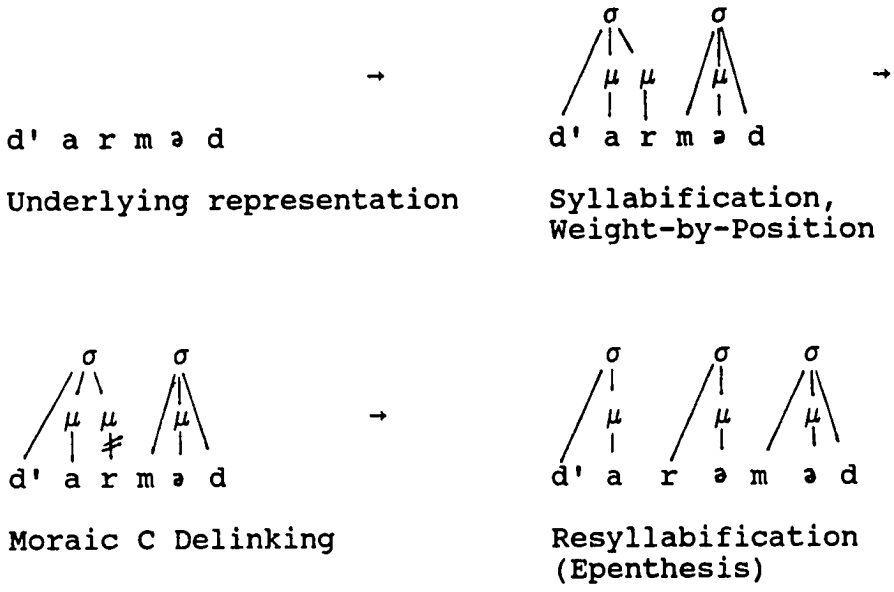
The examples in (15) illustrate a process of epenthesis that applies to a cluster that is preceded by a short vowel and in which the first member is a sonorant consonant and the second is voiced. This process is entirely predictable - there are no surface (phonetic) forms in which the clusters in the above examples occur intact, preceded by a short vowel.

We can account for the forms in (15) by assigning the first consonant in the cluster a mora by Weight-by-Position during syllabification. This consonant is always a sonorant consonant. As I observed, in each example above the sonorant consonant is preceded by a short (monomoraic) vowel. The syllable template is therefore not maximally expanded and the postvocalic consonant is assigned a mora.

This mora is delinked later in the derivation by a rule of Moraic Consonant Delinking, which involves delinking a moraic consonant from its mora. This rule is stated in (16). Subsequent reassociation results in epenthesis, as illustrated in (17).

(16) Moraic Consonant Delinking

(17) dearmad d'arəməd (=(15)b.)



The underlying form in (17) above contains no moraic consonants. The sonorant consonant in the coda of the first syllable is assigned a mora by Weight-by-Position.

Following Moraic Consonant Delinking, the mora is preserved by epenthesis.

4.3.2 Epenthesis as a Compensatory Process

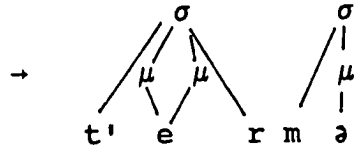
Weight-by-Position as illustrated in the previous section is a template-driven process that applies to maximize the syllable-internal prosodic structure of a given form. In Irish, a sonorant consonant that is preceded by a short (monomoraic) vowel becomes moraic by Weight-by-Position to allow maximal expansion of the bimoraic template.

Conversely, when the template is already maximally expanded, as in the case of a syllable containing a long (bimoraic) vowel, Weight-by-Position does not apply. The examples in (18) illustrate this case.

(18)	a.	<u>téarma</u>	t'e:rmə	'a term'
	b.	<u>léargas</u>	l'e:rgəs	'an insight'

(19) <u>téarma</u> t'e:rmə

Mora projection



Syllabified representation

The (surface) long vowel of <u>téarma</u> **t'e:rmə** 'a term' is represented as underlyingly moraic, as in (19). It projects a second mora during syllabification, by (10)(i). The syllable template is therefore maximally expanded. Weight-by-Position does not apply and the post-vocalic sonorant consonant is syllabified as non-moraic.

Epenthesis clearly does not occur to facilitate syllabification of particular segmental sequences or as the result of a constraint on certain syllable positions, for example the coda. Compare the examples in (18) and (20) - these examples contain the same medial cluster underlyingly, that is, **-rm-** and **-rg-**.

(20)	a.	<u>dearmad</u>	d'arəməd	'a mistake'
	b.	<u>airgead</u>	ar'ig'əd	'money'

This cluster is broken up by epenthesis only when preceded by a short vowel as in (20). Epenthesis must therefore be seen as a compensatory process.

4.3.3 Sonority Constraints on Weight-by-Position

Weight-by-Position fails to apply to sonorants followed by voiceless stops. Consider the following examples.

(21)	a.	cairpéad	kar'p'e:d	'a carpet'
		corp	korp	'a body'
	b.	coirce	kor'k'i	'oats'
		cearc	k'arc	'a hen'
	c.	spailpín	spal'p'i:n'	'a labourer'
		seilp	s'el'p'	'a shelf'
	d.	olc	olk	'bad'

In these examples, a sonorant consonant is preceded by a monomoraic vowel and followed by a nonhomorganic voiceless stop. In (21)a., for example, the word-medial and word-final clusters consist of a coronal liquid followed by a voiceless labial stop. Assuming the account proposed so far, in principle there should be no reason why Weight-by-Position should not apply: the syllable template is not maximally filled. If Weight-by-Position applied to the

initial sonorant consonant of these clusters, Moraic Delinking would result in epenthesis. Since this is not the case, we must conclude that Weight-by-Position is blocked. Compare the examples in (21) with the examples in (22).

(22)	a.	carbad	karəbəd	'a chariot'
		borb	borəb	'rude'
	b.	airgead	ar'ig'əd	'money'
		fearg	f'arəg	'anger'
	c.	Alba	aləbə	'Scotland'
	d.	tolg	toləg	'a couch'

The examples in (21)a. and (22)a., for example. are close to being minimal pairs underlyingly. The crucial difference between the two sets of examples is that the second member of the cluster in (22) is voiceless while it is voiced in (21).

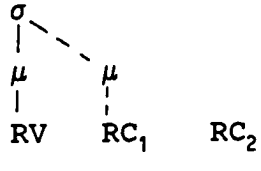
The examples in (21) contain liquid + voiceless stop clusters. Weight-by-Position is not blocked, however, when the second member of the cluster is a voiceless fricative, as illustrated in (23).

(23)	a.	foirfe	fir'if'i	'perfect'
	b.	anfa	anəfə	'a storm'
	c.	dorcha	dorəxə	'dark'

Weight-by-Position must be revised in order to account for blocking in the cases in (21). It must be formulated in such a way that it applies only to a sonorant consonant that is followed either by a voiced consonant or by a voiceless fricative.

We can think of this condition as a minimal sonority distance requirement (see, for example, Steriade (1982), Selkirk (1984), Clements (1987)). Weight-by-Position and subsequent delinking and epenthesis applies to clusters that contain consonants that are close in relative sonority value, that is, sonorant consonants and voiced obstruents and voiceless fricatives. Weight-by-Position does not apply, on the other hand, when the second consonant is voiceless and non-continuant. The members of the cluster, in this case, are more distant on a scale of relative sonority values. Weight-by-Position would then be formulated as in (24) - 'close' can be translated into integer values.

(24) Weight-by-Position



RC_1 and RC_2 are 'close' on a scale of relative sonority value.

Weight-by-Position, by its nature, is a quantity sensitive process. It may seem unusual that such a process is sensitive to a minimal sonority distance requirement. However, as pointed out, sonority constraints on the class of moraic segments are not unusual. Epenthesis is also blocked by linked structure, for example, **bambairne** **bambə r'n'i** 'a predicament', **meandar** **m'andər** 'an instant', but I must defer discussion of these forms until after the following section.

The following table summarizes the relevant cases that were examined in this section:

(25)

			Weight-by-Position
-rg-	airgead	ar'ig'ə d	Yes
-rg-	téarma	t'e:rmə	No, template already maximal
-rk-	coirce	kir'k'i	No, C_2 = [-voice]

4.4 Vowel-length Alternations

4.4.1 Moraic Consonant Delinking and Compensatory Lengthening

As already noted, a limited class of words undergo a vowel-length alternation in Irish preceding sonorant consonants, as illustrated in (26), (27), (28) and (29).

(26)	a.	gleann	g'l'ɑ:n	'a valley'(nom)
	b.	gleannta	g'l'ɑ:ntə	'valleys'
	c.	gleanna	g'l'anə	'a valley'(gen)
(27)	a.	im	i:m'	'butter'(nom)
	b.	ime	im'i	'butter'(gen)
(28)	a.	cill	k'i:l'	'a churchyard'(nom)
	b.	cille	k'il'i	'a churchyard'(gen)
(29)	a.	bearr	b'ɑ:r	'shave!'(imper)
	b.	bearradh	b'arə	'shaving'

In (26)a. and b., the sonorant consonant is tautosyllabic with the preceding vowel, whereas in (26)c., the sonorant consonant forms the onset of the following syllable.

It is important to note that some vowels don't alternate, even when the structural description is

apparently met. This can be seen in the following examples where vowel-length remains constant regardless of whether the sonorant consonant is tautosyllabic with the vowel.

(30) Long vowel only:

a.	bán	bɑ:n	'white'(sg)
b.	bána	bɑ:nə	'white'(pl)

(31) Short vowel only:

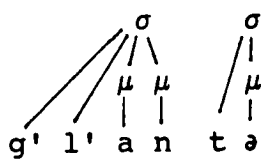
a.	glan	glan	'clean'(adj sg)
b.	glana	glanə	'clean'(pl)

The long vowel remains long in (30)b. when the following sonorant consonant forms the onset of the following syllable and the short vowel in (31)a. does not lengthen when followed by a tautosyllabic sonorant consonant. I argue in a later section that the the vowel-length alternations I discuss in the present section are the result of lengthening and not of shortening. The underlying vowels in (26), (27), (28) and (29) are therefore short. The difference between these forms and the forms in (31), I suggest, lies in the the underlying status of the following sonorant consonant. In the forms where vowel-length alternations occur, the sonorant consonant is represented with a lexical mora, as in (32), for (26)b.

(32) gleannta

This form is then syllabified with a bimoraic first syllable.

(33)

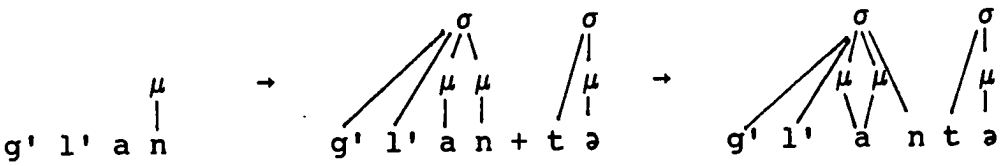


The rule of Moraic Consonant Delinking, repeated below, applies later in the derivation.

(34) Moraic Consonant Delinking

A consonant that is linked to a mora is delinked by this rule. (26)b. is derived as follows:

(35) gleannta g'l'a:nt ə



Underlying representation | Syllabified form, Moraic C Delinking | Reassociation, (Compensatory Lengthening)

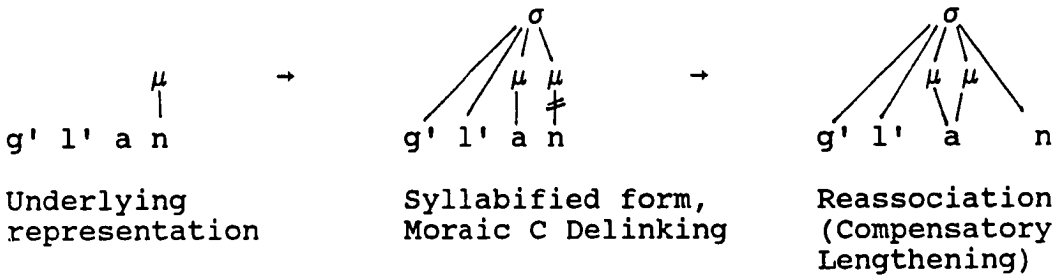
The final nasal consonant of the stem is lexically moraic. Moraic Consonant Delinking, I suggest, is a word-level rule and applies to the fully syllabified representation (stem + suffix), delinking the nasal consonant that is linked to the mora. Notice that Moraic Consonant Delinking is not sensitive to subsegmental structure - it is not blocked by the linked place specification of the nasal-stop cluster. The vowel preceding the delinked consonant associates to the mora, thus becoming bimoraic.

In the previous section we saw epenthesis apply as a result of Moraic Consonant Delinking. Epenthesis cannot apply here, however. We may assume that this is due to the linked structure in the homorganic nasal-stop cluster. In fact, all the cases involving vowel-lengthening rather than epenthesis display such linked structure. Lengthening is therefore a "resort" process - it applies when epenthesis (the default process) is blocked. The prosodic structure is preserved by Mora-Preservation, that is, the syllable

remains bimoraic, but the post-vocalic sonorant consonant is resyllabified as a non-moraic coda.

This form of compensatory lengthening differs from the usual cases of compensatory lengthening in that no segmental material is deleted. Rather, both the segmental melody and the prosodic structure remain unchanged and lengthening is the result of **quantitative metathesis**, that is, a mora that is lexically linked to the sonorant consonant is transferred to the vowel. The derivation of the unaffixed form **gleann** **g'l' :n** is given in (36).

(36) gleann g'l'ɑ:n (=(26)a.)

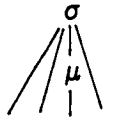


As in (35), the final nasal of the stem is lexically moraic. Following Moraic Consonant Delinking, the preceding vowel associates to the mora, thus becoming bimoraic (long). We must stipulate that epenthesis fails to apply word-finally - the insertion of an epenthetic vowel word-finally would preserve the moraic structure but would result in a bisyllabic rather than a monosyllabic word.

4.4.2 Word-final Extrasyllabicity

Vowel lengthening occurs only in forms in which the post-vocalic sonorant consonant is lexically moraic. We can compare the derivation just outlined in (36) for **gleann g'l' :n** to the derivation of (31)a. **glan glan**. The final nasal of the latter form does not have a lexical mora and the syllable is therefore monomoraic.

(37) glan glan (=(31)a.)



g l a n g l a n

Underlying representation — Syllabified form

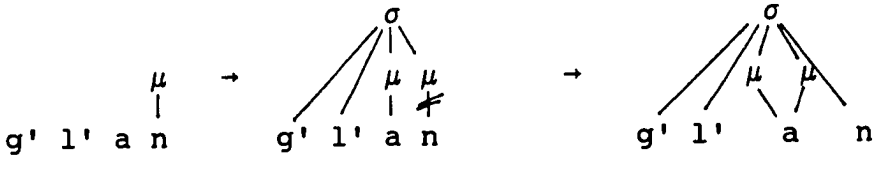
Furthermore, word-final sonorant consonants are extrasyllabic for the purposes of the process of Weight-by-Position - word-final moras are lexical. Compare the forms in (38)a. and b.

(38) a.	gleann	g'l'a:n	'a valley'
b.	glan	glan	'clean'

Apart from the difference in palatalization of the initial cluster, these forms differ only in the quantity of the

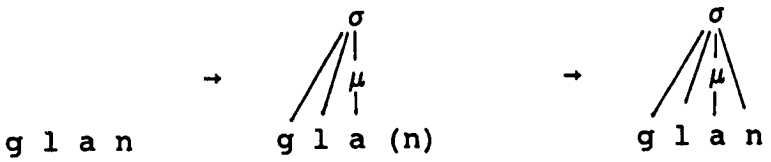
vowel. The final sonorant consonant in the form in (38)a. is underlyingly moraic. Moraic Consonant Delinking applies to this consonant followed by Compensatory Lengthening, as illustrated in (36). The final sonorant consonant in the form in (38)b. is underlyingly nonmoraic and cannot be assigned Weight-by-Position. If this consonant were to be assigned Weight-by-Position, the difference in vowel quantity in the forms in (38) could not be accounted for. The two forms would be structurally indistinguishable following syllabification as the final consonant in both forms would be moraic. Moraic Consonant Delinking would then apply followed by Compensatory Lengthening. Since this is not the case, the final consonant in (38)b must be extrasyllabic and therefore not subject to Weight-by-Position. The derivations of these forms is repeated in (39).

(39) a. gleann g'l'a:n



Underlying Representation | Syllabification, Moraic C Delinking | Compensatory Lengthening

b. glan glan



Underlying Representation | Syllabification, Final extrasyllabicity

4.4.3 Linked Primary Place

Although Weight-by-Position is a rule that builds prosodic structure, it is constrained by conditions on segmental structure in addition to the constraint on the sonority values of a cluster discussed in §4.3.3. Consider the following examples which contain homorganic nasal-stop sequences in precisely the environment where Weight-by-Position would be expected to apply.

(40)

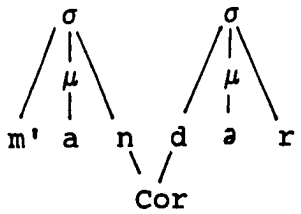
A.	(i)	bambairne	bambər'n'i	'a predicament'
	(ii)	gaimbín	gam'b'i:n'	'(exhorbitant) interest'
B.	(i)	planda	plandə	'a plant'
	(ii)	meandar	m'andər	'an instant'

C. (i) <u>mangach</u> maŋgəx 'a pollock'

(ii) <u>teanga</u> t'aŋgə 'a tongue'

The examples in (40)A., B. and C. contain labial, coronal and dorsal nasal-stop sequences, respectively. In each case, the nasal consonant is preceded by a short (monomoraic) vowel. Weight-by-Position, if it applied, would be followed by Moraic Consonant Delinking. Epenthesis would be blocked in these cases by the linked structure. However, we have now seen that Compensatory Lengthening could apply instead. Since the vowel remains short in the examples in (40), however, we can conclude that Weight-by-Position does not apply. The blocking structure is illustrated in (41). In this example, the linked coronal specification blocks the application of the rule.

(41) <u>meandar</u> m'andər (=(40)B.(ii))



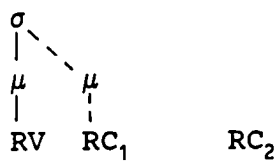
Blocking is not restricted to homorganic nasal-stop clusters. Weight-by-Position is also blocked by certain homorganic sonorant clusters. The short vowel preceding the

sonorant consonant in (42) as before, points to the failure of the vowel-lengthening that would follow Moraic Delinking.[3]

(42)[4]a.	malrach	malrəx	'a boy'
b.	banríon	banr'i:n	'a queen'
c.	anraith	anrə	'soup'

Recall the condition on rule application proposed in §2.2.5.2. accounting for the Inalterability effects in the initial consonant mutations. This condition may give us the means to predict these instances of blocking. The sonority distance constraint on Weight-by-Position requires the rule to refer to a consonant sequence.

(43) Weight-by-Position



C_1 and C_2 are 'close' on a scale of relative sonority values.

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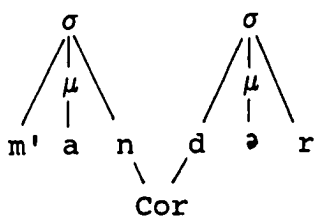
[3] rn-clusters, however, do not block epenthesis, as seen in corn korən 'a horn', dorn dorən 'a fist'.

[4] Alternative forms of these words contain intrusive consonant in these clusters, e.g. **malrach maldrəx**, **banríon bantri:n** (see de Bhaldraithe (1945,36)).

The condition on rule application, recall, requires that structural conditions be strictly interpreted. Suppose we interpret this condition as holding also of the output of a rule. A sonorant consonant that is assigned moraic status by Weight-by-Position is thereby assigned to the coda. This consonant, if place-linked to the following onset consonant, does not strictly occupy the coda position of the first syllable as seen in (44). The coronal stop in the medial cluster in (44) forms the onset of the second syllable. The preceding homorganic nasal, by virtue of the place linking, does not strictly occupy the coda position of the first syllable. Therefore, Weight-by-Position cannot apply.

(44) meandar m'andɜr



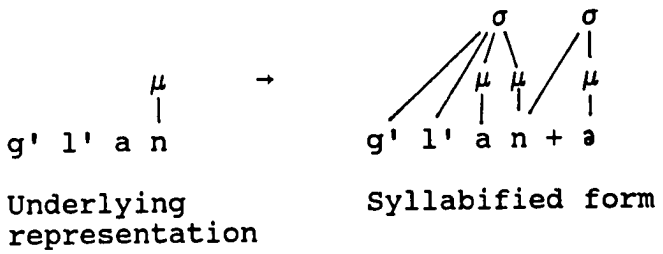
4.4.4 Moraic Consonant Delinking and Linked Structure

Let us return to the remaining form in (26), repeated in (45) below.

(45) c. gleanna g'l'anə

As was the case with (26)b., **gleannta** **g'l'a:ntə** 'valleys', this form is morphologically complex, consisting of the stem (=(26)a.) and a vowel-initial suffix. The final consonant of the stem is therefore syllabified as the onset of the following syllable. Vowel-lengthening does not occur in this form, as is shown in (46).

(46) gleanna g'l'anə

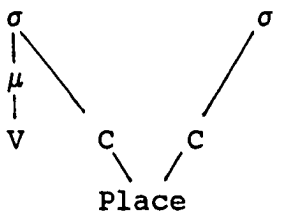


The moraic consonant in (46) is doubly linked in the syllabified form: it is simultaneously attached as a moraic coda in the first syllable and, because it is intervocalic, it also forms the onset of the second syllable. Moraic Consonant Delinking, repeated in (47), delinks a singly linked moraic consonant. The doubly linked moraic consonant in (46) does not fit the structural description of Moraic Consonant Delinking, and the rule does not apply.

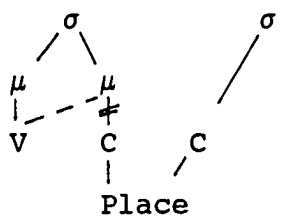
(47) Moraic Consonant Delinking

The environment in which Weight-by-Position is blocked is one in which Moraic Consonant Delinking applies. The relevant structural configurations are given in (48).

(48) a. Weight-by-Position blocked; C_1 syllabified as a non-moraic coda:



b. Moraic Consonant Delinking applies followed by compensatory lengthening of the preceding vowel:



We predict exactly this situation. Weight-by-Position must independently refer to a consonant sequence. The interpretation of the structural condition on rule application outlined in the previous section requires the first consonant to be a coda consonant. When this consonant

is place-linked to a following onset consonant, the condition is not fulfilled and Weight-by-Position is blocked. Moraic Consonant Delinking, on the other hand, refers only to a singly linked moraic consonant. While the link between mora and consonant is strictly interpreted, as seen in (46), the rule is not blocked in the configuration in (48)b.

The account proposed of the vowel-length alternations can be summarized as follows: The vowel-length alternations discussed occur only sometimes preceding a sonorant consonant. In such cases, the sonorant is represented as lexically moraic. A rule of Moraic Consonant Delinking delinks a consonant that is linked to a mora. This rule fails to apply to a doubly-linked mora, as illustrated in (46). Since epenthesis cannot apply word-finally (by stipulation) nor into linked structure, vowel-lengthening is the result of reassociation - the vowel preceding the sonorant consonant links to the mora, thus preserving moraic structure.

4.4.5 Intervocalic Moraic Consonants: Degemination

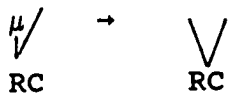
A question of phonetic interpretation arises at this stage. A consequence of the account developed so far is

that we derive representations in which Moraic Consonant Delinking does not apply to certain moraic consonants - those that occur intervocalically. However these consonants are not realised as geminates. In fact they are phonetically non-distinct from non-moraic intervocalic sonorant consonants. Compare the representations of **gleanna g'l'anə** , (26)c. and **glana glanə**, (31)b.

(49) a. gleanna g'l'anə b. glana glanə

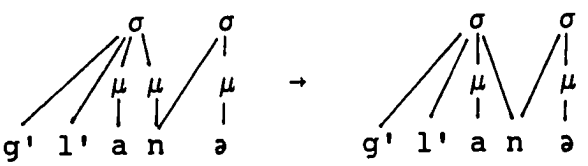
The sonorant consonant in (49)a. is lexically moraic, whereas in (49)b. it is non-moraic. I represent the sonorant consonant in (49)b. as ambisyllabic - an onset consonant or the first consonant of a complex onset is perceived as ambisyllabic when it is preceded by a short vowel, as is the case in the example above. In order to account for the phonetic non-distinctness of the nasal consonant in these forms, we must stipulate that a rule of Degemination applies which results in the loss of the mora.

(50) Degemination



The sonorant consonant is then resyllabified as non-moraic, as in (51).

(51)



In the account proposed then, consonant length distinctions are represented underlyingly that are never realised as such on the surface. Rather, the distinction is transferred to the preceding vowel (quantitative metathesis) or else neutralized by Degemination. The abstract nature of these representations is motivated by the restricted distribution of the vowel-length alternations. The fact that the account of epenthesis involving Moraic Consonant Delinking extends so naturally to these cases also argues for this analysis.

4.4.6 Cross-dialectal Support for Abstract Lexical Representations

We may also consider cross-dialectal evidence to motivate the representations containing lexical moras that are proposed in the preceding sections. The northern dialects of Irish have a length distinction in the coronal sonorants, (see, for example, Sommerfelt (1922), Wagner (1959), Ó Baoill (1979, 1980)).[5] The forms discussed in the previous section in which the vowel-length alternations occur, are found in the northern dialects instead with long sonorants and no vowel-length alternations. Compare, for example, the forms in (52).

(52)		**Western dialects**	**Northern dialects**	
a.	gleann	g'l'ɑ:n	g'l'an:	'a valley'
b.	gleannta	g'l'ɑ:ntə	g'l'an:tə	'valleys'
c.	gleanna	g'l'anə	g'l'an:ə	'a valley' (gen)

The forms in (52) in the northern dialects have a perceptibly longer nasal consonant than those in the western dialects which is represented as n:.

[5] The quantity distinctions in these consonants has been referred to in the literature as both a length distinction and a tense/lax distinction.

The sonorant consonants in tnese dialects are given in (53).

(53) m m' n n: n' n': ɲ ɲ'
l l: l' l':
r r'

The length distinction is restricted to the nasal and lateral coronal sonorants, as seen in (53) above. The following examples which contain long and short coronal nasals illustrate the length distinction in this dialect.

(54)	a.	nigh	n'i	'wash'(past)
		nigh	n':i	'wash'(imper)
	b.	bainis	ban'is'	'a wedding'
		bainne	ban':i	'milk'
	c.	sin	s'in'	'that'
		sinn	s'in':	'us'
	d.	móna	mo:nə	'turf'(gen)
		modhanna	mo:n:ə	'ways, means'
	e.	gleannta	g'l'an:tə	'valleys'
		glanta	glantə	'cleaned'

The distribution of these consonants is quite free. Both long and short sonorant consonants can occur in all positions, that is, word-initially, (54)a, word-internally

intervocalically, (54)b. and d., and preconsonantally, (53)e., and word finally, (54)c.

The long sonorant consonants in the northern dialects are represented with lexical moras, as in the western dialects. The difference between the dialects may be accounted for as follows: The western dialects have rules of Moraic Consonant Delinking and Degemination that result in demorification of any underlying moraic consonant. In the northern dialects, by contrast, the latter rule does not apply while the former is constrained. While the northern dialects do not have the series of vowel-length alternations discussed in this section, they do have the form of epenthesis discussed in §3.3, where epenthesis is the result of delinking a derived mora. Moraic Consonant Delinking is clearly sensitive to the distinction between underlying and derived moraic status in these dialects.

4.4.7 Vowel-lengthening vs. Vowel-shortening

The vowel-length alternations discussed in §4.3 are such that they could be viewed either as the result of a rule of vowel-lengthening, as I propose, or as the result of a rule of vowel-shortening. In this section I compare these two possible accounts and show that although both accounts are abstract - that is, both involve positing abstract

underlying representation that are not realised on the surface - an account of vowel-shortening is necessarily more abstract than the account pursued in §4.4 and fails to capture the relation between vowel-lengthening and epenthesis.

The relevant examples we must consider are repeated below.

(55) **V: ~ V** = (26)

a.	gleann	g'l'ɑ:n	'a valley'(nom)
b.	gleanna	g'l'anə	'a valley'(gen)

(56) **V: only** = (30)

a.	bán	bɑ:n	'white'(sg)
b.	bána	bɑ:nə	'white'(pl)

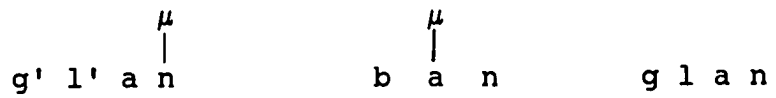
(57) **V only** = (31)

a.	glan	glan	'clean'(adj sg)
b.	glana	glanə	'clean'(pl)

Within a vowel-lengthening approach, we must account for why the vowel in (57)a., **glan** **glan**, does not undergo

lenthening. In the account proposed, the lexical representations of (55)a., (56)a. and (57)a. are as in (58)a., b. and c., respectively.

(58) a. gleann b. bán c. glan



The vowel in (58)a. becomes long (bimoraic) when it associates to the mora of the following consonant following Moraic Consonant Delinking. The vowel in (58)b. becomes long (bimoraic) when a second mora is assigned during suyllabification. The final consonant in (57)c. is extrasyllabic and so cannot be assigned a mora by Weight-by-Position. The vowel preceding this consonant therefore remains short, see §4.4.2.

If we pursue the alternative to vowel-lengthening, that is, a vowel-shortening process, we must account for the failure of vowel-shortening in (56)b., **bána** **baːnə**. The lexical representations of the stem contained in both (55) and (56) would be as in (59). The vowel in each form would project a second mora by (10)(2), thus becoming bimoraic as in (60).

(59) a. gleann g'l'a:n b. bán ba:n

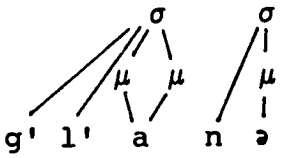
(60)

However vowel-shortening, following the addition of a vowel-initial suffix would only occur in (60)b. It would seem, therefore, that we need to distinguish these two forms lexically. One possibility would be to represent the final consonant of (56)a. **bán ba:n** as moraic, as in (61).

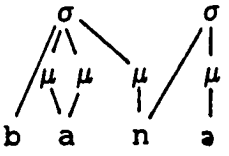
(61) a. gleann b. bán

The syllabified forms of (55)b. and (56)b. would be as in (62).

(62) a. gleanna

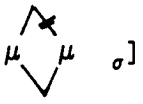


b. bána



We would then formulate a rule to delete a mora from the first syllable in (62)a. to derive the short vowel of this form, for example, delete a mora of a bimoraic vowel syllable finally, as in (63).

(63)



The moraic consonant in (62)b. would be deleted by the rule of Degemination proposed in §4.4.5.

The account outlined above faces two major objections, however. The first, and more serious, is that the representations allowed by this account violate the syllable template for Irish, that is, the bimoraic template. The syllabified representation in (62)b. contains a trimoraic syllable. This would be the case for all words in Irish containing underived long vowels. There is no evidence in the phonology that trimoraic syllables are required at any level. By allowing such syllables, we would be forced to

abandon the bimoraic syllable on which the account of Weight-by-Position and subsequent processes is based.

The second objection to the alternative account outlined above is that it fails to give a unified account of epenthesis and vowel-lengthening. We can motivate a rule of Moraic Delinking to account for the epenthesis examples - it is clear we should attempt to generalize the account to the vowel-length alternations.

4.5 Optional Vowel-lengthening Processes

There are a number of optional vowel-lengthening processes that occur in Irish that I will discuss briefly in this section. These are not the result of the rules discussed in the previous sections; however, they do provide support for the approach taken, that is, one in which weight distinctions are central.

4.5.1 Syncope

Syncope occurs in Irish when a vowel-initial suffix is attached to a bisyllabic stem. Vowel-lengthening or diphthongization which occurs optionally following syncope may be accounted for by the principle of Mora Preservation -

the vowel preceding the derived cluster associates to the mora that remains following syncope.

(64)

a.	obair	obir'		'work'(nom)
	oibre	eb'r'i	- aib'r'i	'work'(gen)
d.	paidir	pad'ir'		'a prayer'
	paidreacha	pad'r'əxə	- pɑ:d'r'əxə	'prayers'
c.	solas	soləs		'a light'
	soilse	sel's'i	- si:l's'i	'lights'
d.	inis	in'is'		'tell'
	inseoidh	in's'o:j	- i:n's'o:j	'tell'(FUT)
e.	saibhir	sev'ir'		'rich'
	saibhreas	sev'r'əs	- saiv'r'əs	'riches'

Syncope is illustrated for (64)a. in (65). The third and fourth steps in (65) represent the two possible derivations for this form. In the first case reassociation does not apply and the stray mora is erased. In the second case the (short) vowel preceding the derived cluster associates to the mora thus becoming bimoraic.[6]

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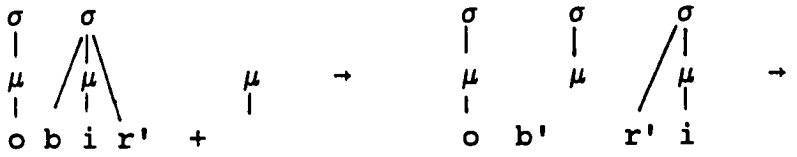
[6] This long vowel is diphthongized by a later rule of diphthongization.

(65) <u>obair</u> obir' (=(64)a.)

<u>oibre</u> eb'r'i - aib'r'i



Syncope

No reassociation
Stray Erasure

Reassociation
Compensatory Lengthening

4.5.2 Vowel-lengthening preceding Homorganic Nasal-Stop Clusters

The vowel-lengthening exemplified in this section is optional, even within a dialect, and is quite restricted in its application: it applies only to (stressed) high vowels that are followed by a nasal-voiceless stop cluster. This form of vowel-lengthening is illustrated in (66).

(66)

a. <u>simplí</u> s'im'p'l'i: - s'i:m'p'l'i: 'simple

<u>impire</u> im'p'ir'i - i:m'p'ir'i 'an emperor'

b.	muintir	min't'ir'	- mi:n't'ir	'a people'
	contae	kunte:	- ku:nte:	'a county'
c.	unsa	uns	- u:ns	'an ounce'

The examples in (66)a. and b. contain labial and coronal nasal + voiceless stop clusters, respectively. The example in (66)c. contains a coronal nasal + voiceless fricative cluster. In (66)a., for example, the high front vowel preceding the cluster alternates between short (monomoraic) and long (bimoraic). These vowel-length alternation cannot be assumed under the account developed in this chapter. There are a number of reasons why they must be viewed as different. First, this vowel-length alternation is optional and it is restricted to high vowels. Second, the clusters involved are exactly those that block Weight-by-Position - namely, they are homorganic and the second consonant is voiceless. The alternations are therefore the result of an unrelated rule.

4.5.3 Open-syllable Lengthening

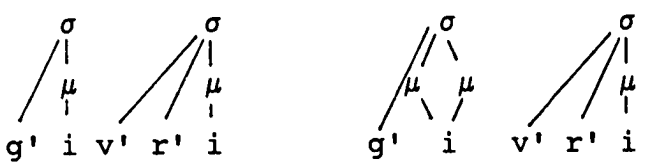
A final case of vowel-length alternations involves those vowels that occur preceding clusters that are possible onsets in Irish. Examples of this form of vowel-lengthening are given in (67). Lengthening is optional in these cases

resulting in the different syllabified forms represented in (68).

(67)

a.	geimhreadh	g'iv'r'i	-	g'i:v'r'i	'winter'
b.	coimhlint	kiv'l'in't'	-	kaiv'l'in't'	'rivalry'
c.	Aibreán	eb'r'ɑ:n	-	aib'r'ɑ:n	'April'
d.	eaglais	aglis'	-	ɑ:glis'	'a church'

(68) geimhreadh (=(67)a.)



4.6 The Structure of the Phonological and Morphological Components

The rules and processes proposed to derive syllable representation in Irish are as follows:

Syllabification (including Weight-by-Position)

Moraic Consonant Delinking

Epenthesis/Compensatory Lengthening

When we look at a number of morphological processes, it becomes clear that Moraic Delinking is a rule that applies late in the derivation following morphological rules. Consider, for example, the rule of Final Palatalization, which was discussed in the previous chapter (§3.4.2.3). Final Palatalization marks a number of grammatical cases, for example, the vocative case and the genitive case of some nominal stems.

(69)	a.	Colm	koləm	(a man's name)(nom)
	b.	a Choilm	ə xel'im'	(voc)[7]

(70)	a.	bolg	boləg	'a stomach'(nom)
	b.	boilg	bel'ig'	'a stomach'(gen)

The initial sonorant in the final cluster in both (69) and (70) is assigned Weight-by-Position during syllabification. Moraic Consonant Delinking applies to all the forms above followed by epenthesis. In the previous chapter, I argued that short vowels are unspecified for [back] and that the specification for this feature is the result of spreading from an adjacent consonant. The epenthetic vowel in each of the examples above is front or back, depending on whether the following consonant is palatalized or not. Consonants,

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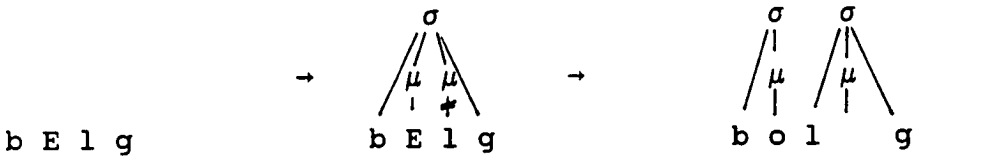
[7] Vocative case is marked by both Final Palatalization and Lenition.

on the other hand, do not assimilate to vowels. Consonants may be underlyingly palatalized, or they may become palatalized either as a result of a morphological rule (Final Palatalization) or by spreading within a cluster. The final clusters in (69)b. and (70)b. must therefore become palatalized <u>before</u> Moraic Delinking, and thus epenthesis, applies.

The following are derivations for the forms in (70).

(71) <u>bolg</u> bol g (=(70)a.)

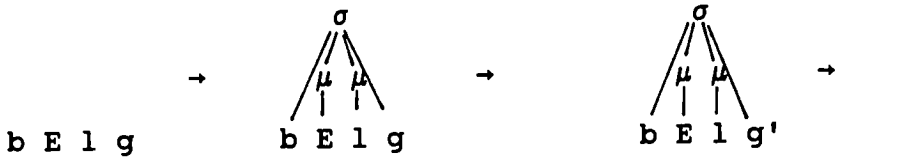


Underlying representation

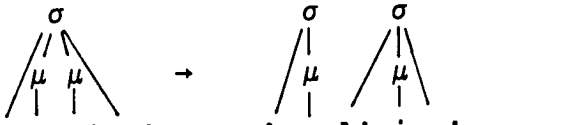
Weight-by-Position Moraic Consonant Delinking

Reassociation Spread [+back]

(72) boilg bel'ig (=(70)b.)



Underlying Representation | Weight-by-Position Syllabification | Final Palatalization



Cluster assimilation | Moraic Delinking Epenthesis Spread [-back]

If epenthesis preceded Final Palatalization, Final Palatalization would affect only the final consonant and the vowel that precedes it. Palatalization would not spread to the consonant preceding that vowel nor, in turn, to the vowel preceding that consonant.

The examples discussed in this section provide important support for the independence of primary and secondary place features. Epenthesis is blocked by a linked primary place specification - compensatory lengthening applies as a "resort" process to forms that contain a homorganic cluster the first consonant of which is moraic,

see §4.4.1.[8] Epenthesis is not blocked, however, by a linked secondary place specification, as seen above in (72).

4.7 Summary

The main conclusions put forward in this chapter are summarized as follows:

- A unified, prosodically motivated account is given of a number of epenthesis and vowel-lengthening processes. These processes are compensatory, preserving prosodic (moraic) structure.
- The syllable template in Irish is bimoraic. Prosodic structure is maximised by the application of Weight-by-Position which applies to sonorant consonants, is constrained by a minimal sonority distance condition and is blocked by linked structure. While prosodic structure is maximized during syllabification, moraic consonants do not retain their prosodic status - moraic consonants are delinked by a rule of Moraic Consonant Delinking, which results in compensatory epenthesis or lengthening.

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[8] These examples must contain lexical moras as Weight-by-Position would be blocked from applying to a linked structure, see §4.4.3.

- Epenthesis does not occur to allow syllabification of certain segmental sequences or as the result of a constraint on certain syllable positions; rather it applies to preserve moraic structure following the application of Moraic Consonant Delinking. Epenthesis is the default mora-preserving process in Irish while vowel-lengthening applies only when epenthesis is blocked (by linked structure).
- The vowel-lengthening discussed differs from usual cases of Compensatory Lengthening in that no segmental material is deleted; rather it is the result of the transfer of moraic status within the syllable.

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