

THE PROSODIC STRUCTURE OF
IRISH, SCOTS GAELIC, AND MANX

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This dissertation is an examination of the prosodic structure of the closely related Goidelic languages: Irish, Scots Gaelic, and Manx. Several important claims about the prosodic hierarchy are made, using facts of stress placement, weight-to-stress effects, and syllabification. Evidence from non-Goidelic languages is brought to bear as well.

The approach is both synchronic and diachronic; the theoretical underpinnings are those of prosodic phonology and Optimality Theory. A theory of how phonological change is to be captured in an Optimality Theoretic framework is presented: it is argued that a phonological change happens when a constraint against a marked phonological pattern is promoted above other constraints. Further, it is shown that paradigm leveling can be accounted for within OT by means of faithfulness constraints governing related output forms.

The continuing role of the Weight-to-Stress Principle (WSP) in the history of the Goidelic languages is examined. It is shown that the WSP has had a recurring effect on the prosodic development of Old Irish from Proto-Insular Celtic and on the evolution of Old Irish into Middle and Early Modern Irish, and thence to the modern Goidelic languages.

It is further argued that a prosodic constituent called the colon must be included in the prosodic hierarchy between the prosodic word and the foot, with evidence from both Goidelic and non-Goidelic languages that certain facts of stress and prosodic size cannot be explained adequately without reference to the colon. In particular, it is shown that the so-called "forward stress" pattern of Munster Irish, East Mayo Irish, and Manx are most insightfully explained with the colon.

Finally, syllabification of consonants and consonant clusters is reviewed, with an argument that a requirement that stressed short vowels be in close contact with a consonant results in ambisyllabicity in Irish. The syllabification of rising-sonority consonant clusters is examined, and it is shown that shallower rises in sonority are permitted only at higher levels on the prosodic hierarchy; also examined is epenthesis in Irish and Scots Gaelic into clusters of falling sonority.

BIOGRAPHICAL SKETCH

Antony Dubach Green was born on July 7, 1968, in Santa Barbara, California, to Douglass M. Green and Marquita Dubach. He received a Bachelor of Arts in 1990 from the University of Texas at Austin, with a double major in linguistics and classics. In 1991 he received a Master of Arts in linguistics from Yale University in New Haven, Connecticut, and in 1997 he received a Doctor of Philosophy in linguistics from Cornell University in Ithaca, New York.

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TABLE OF CONTENTS

Chapter 1: Introduction	1
1.1 General introduction	1
1.2 Optimality Theory	4
1.3 Representing phonological change in Optimality Theory.....	11
1.3.1 The Promotion of the Unmarked	12
1.3.2 Building new inputs: Insular Celtic.....	15
1.3.3 Re-solving problems: Modern English.....	17
1.3.4 A previous analysis of constraint reranking	20
1.4 Paradigm leveling and output–output correspondences.....	24
1.5 Assumptions about foot and syllable structure.....	29
1.6 Sources	30
1.7 Transcription	32
1.8 Summary	33
1.9 Overview of the dissertation.....	33
Chapter 2: Introduction to the Goidelic languages.....	35
2.1 Position of Goidelic in Indo-European.....	35
2.2 Dialects of Irish and Scots Gaelic.....	36
2.3 Sound inventories.....	39
2.3.1 Old Irish	39
2.3.2 Modern Irish (Lárchanúint)	41
2.3.3 The spoken dialects of Irish.....	43
2.3.4 Gaelic	44
2.3.5 Manx	45
2.3.6 A note on nasalized vowels	45
2.4 Initial consonant mutations.....	46
2.4.1 Old Irish	48
2.4.2 Modern Irish.....	49
2.4.3 Gaelic	51
2.4.4 Manx	53
2.5 Syllable structure.....	53
2.5.1 Irish	53
2.5.2 Gaelic	55
2.5.3 Manx	56

Chapter 3: Stress in Goidelic and the role of the Weight-to-Stress Principle.....	58
3.1 Quantitative and accentual consequences of WSP and Grouping Harmony	58
3.1.1 Fijian	61
3.1.2 Yana	62
3.2 The metrical structure of the Goidelic languages.....	64
3.3 From Proto-Insular Celtic to Early Modern Irish	67
3.3.1 Shortening of unstressed long vowels in Proto-Goidelic.....	67
3.3.2 New noninitial long vowels: WSP violation in Early Modern Irish.....	69
3.3.3 Lengthening of monomoraic words in Old Irish	71
3.4 The modern Goidelic languages	73
3.4.1 WSP \gg MAX(μ) in Ulster and Gaelic	73
3.4.1.1 Ulster shortening of unstressed long vowels	74
3.4.1.2 Variation in OT: Ulster trochaic shortening	75
3.4.1.3 Gaelic shortening.....	79
3.4.2 WSP \gg ALL-FT-L in Munster, East Mayo and Manx.....	81
3.4.2.1 Munster stress shift.....	81
3.4.2.2 East Mayo stress shift.....	86
3.4.2.3 Manx shortening and stress shift.....	90
3.4.3 Retention of MAX(μ) \gg WSP in Connacht	93
3.5 Conclusions.....	95
Chapter 4: Forward stress in Goidelic and the role of the prosodic colon	98
4.1 Introduction to the colon.....	98
4.2 The colon and tertiary stress	102
4.2.1 Hungarian.....	102
4.2.2 Passamaquoddy.....	104
4.3 The colon as “super-foot”	109
4.3.1 Eastern Ojibwa.....	109
4.3.2 Asheninca.....	112
4.4 The colon and prosodic size: Neo-Štokavian	115
4.5 The question of the unbounded colon: Garawa.....	116
4.6 The colon in Goidelic.....	120
4.6.1 Munster stress: the data	121
4.6.2 Munster stress: the problem.....	123

4.6.3	Munster stress: the solution	126
4.6.4	Stress in East Mayo.....	130
4.6.5	Stress in Manx	131
4.7	Conclusions	133
Chapter 5:	Issues in the syllable structure of Irish and Gaelic	134
5.1	Ambisyllabicity	134
5.2	Prosodic licensing of onsets.....	139
5.2.1	Syllabification in Connacht and Ulster	142
5.2.2	Syllabification and epenthesis in Munster	146
5.2.3	Summary	149
5.3	Clusters of falling sonority	149
5.3.1	Irish	150
5.3.1.1	Epenthesis.....	150
5.3.1.2	Metathesis.....	154
5.3.2	Gaelic	157
5.4	Conclusions.....	160
Chapter 6:	Conclusions, historical overview, and directions for future research.....	162
6.1	Conclusions.....	162
6.2	The prosodic history of the Goidelic languages.....	163
6.3	Directions for future research	167
6.3.1	Vowel lengthening.....	167
6.3.2	Vowels before <i>h</i>	171
References	173

LIST OF FIGURES

Figure 1:	Goidelic in Indo-European	24
Figure 2:	Locations of the Modern Goidelic languages	25

CHAPTER ONE INTRODUCTION

1.1 General Introduction

This dissertation, first and foremost, is an examination of the prosodic structure, at and below the word level, of the closely related Goidelic languages: Irish, Scots Gaelic, and Manx, which comprise a sub-branch of the Celtic branch of the Indo-European language family. Facts of stress placement, syllable weight, weight-to-stress effects, syllabification, and epenthesis will be presented as evidence for a prosodic constituency between the word and the segment. Although the dissertation focuses on the Goidelic languages, evidence from other languages will be brought to bear as well.

My approach is both synchronic (exploring the relation between the abstract underlying representation and the surface representation) and diachronic (tracing developments from Proto-Insular Celtic through Old Irish and Early Modern Irish to the modern languages). The theoretical underpinnings are those of prosodic phonology as described by authors including Hayes (1980, 1985, 1987, 1995), Selkirk (1980, 1981, 1984b), Prince (1983, 1985, 1990), Itô (1986, 1989), Nespor & Vogel (1986), Zec (1988), Inkelas (1989), Kager (1992, 1993ab), Hung (1993, 1994), among others. The approach to the relationship between underlying forms and surface forms is not derivational, but rather relies on Optimality Theory (McCarthy & Prince 1993a, 1994, 1995; Prince & Smolensky 1993, and others), a constraint-based framework which considers the correspondences between underlying forms and surface forms, and between related surface forms.

I present a hypothesis of how phonological change is to be captured in an Optimality Theoretic framework. Previous accounts of phonological change within OT (e.g. Bermúdez-Otero 1996) have argued that phonological change happens when two immediately adjacent constraints first become unranked with respect to each other, resulting in free variation between two output forms, and then become reranked in an order opposite to their original ranking. However, I argue that both sociolinguistic and methodological considerations are troublesome for this analysis.

First of all, the previous account of constraint reranking assumes that during the intermediate period, the two surface variants (the original form and its newer replacement) are judged to be equally harmonic in the gram-

There is no language like the Irish for soothing and quieting.

John M. Synge, *The Aran Islands*

mar of each individual speaker. I believe that it is far more likely that one form is strongly preferred by some speakers while the other form is preferred by other speakers; it is thus likely that each form has sociolinguistic connotations of speaker's age, social status, geographic location, speaking style, etc. Further, the analysis has the methodological flaw of predicting that free variation results from the unranking of crucial constraints. But the usual assumption in OT is that ties are broken on the basis of lower-ranked constraints; therefore, unranked constraints will not result in free variation.

In contrast, I argue that a phonological change happens when a constraint against a marked phonological pattern is promoted above other constraints. It is characteristic of child grammar to avoid highly marked phonological patterns. Part of the process of a child's acquisition of language is the attainment of the marked patterns of adult phonology. This is achieved by the gradual acquisition of adult-grammar ranking, in which faithfulness constraints are high-ranking, and abandoning the child-grammar ranking, in which phonological constraints against marked patterns are high-ranking (Gnanadesikan 1995). But if the high rank of a certain phonological constraint in child grammar is perpetuated in the adult grammar of a speech community, a phonological change occurs in the language. I call this phenomenon the "Promotion of the Unmarked". Speakers whose language has undergone the phonological change have, I argue, a separate grammar from those speakers whose language has not undergone the change. Thus, while this analysis agrees with the previous one that the newer and older phonological forms are likely to be found side by side, my account makes neither the undesirable prediction that any individual speaker will find both the newer and older forms equally harmonic, nor the methodologically questionable assumption that unranked constraints will result in free variation between two tied candidates.

I further show that paradigm leveling can be accounted for within OT by means of faithfulness constraints governing related output forms. Thus the traditional historical linguistic notion of analogy has a place in the center of a generative approach to historical change; previous generative accounts (Halle 1962; King 1969, 1973; Kiparsky 1965, 1968, 1982, 1988, 1995) have been required to put analogy in the periphery of the analysis.

But OT allows us to account for analogical change and phonological change in manners equally central to the theory. Under the Correspondence version of OT (McCarthy & Prince 1995), relationships between related

output forms, such as the members of a morphological paradigm, are governed by the same general faithfulness constraints that hold between input (underlying) representations and output (surface) forms. This theory is able to capture paradigmatic pressure directly, thus permitting us to analyze historical analogical change in as fully a theory-central manner as phonological change.

Within prosodic phonology, the dissertation makes several important claims about the prosodic hierarchy: To begin with, I examine the continuing role of the Weight-to-Stress Principle (WSP: Prince 1990) in the history of the Goidelic languages. The WSP is a statement of the generalization that heavy syllables tend to be stressed, and that unstressed syllables tend to be light. I show that the WSP has had a recurring effect on the prosodic development of Old Irish from Proto-Insular Celtic and on the evolution of Old Irish into Middle and Early Modern Irish, and thence to the modern Goidelic languages.

As stated above, the WSP makes two predictions: heavy syllables are stressed, and unstressed syllables are light. Both predictions are realized by phonological change in the Goidelic languages: in some dialects, unstressed long vowels are made short, and in others, (historically) unstressed long vowels become stressed. I show that this is due to the promotion of the WSP constraint (a constraint against a marked pattern, namely WSP violations) above a constraint against vowel shortening (in the first instance) or a constraint against noninitial stress (in the second instance).

In addition, I argue that a prosodic constituent called the colon (Halle & Clements 1983, Hammond 1987, Hayes 1995) must be included in the prosodic hierarchy between the prosodic word and the foot. I provide evidence from both Goidelic and non-Goidelic languages that certain facts of stress and prosodic size cannot be explained adequately without reference to the colon. In particular, I show that the so-called "forward stress" patterns of Munster Irish, East Mayo Irish, and Manx are most insightfully explained with the colon.

Further, I review the syllabification of consonants and consonant clusters, arguing that a requirement that stressed short vowels be in close contact with a consonant results in ambisyllabicity in Irish. And finally, I examine the syllabification of rising-sonority consonant clusters, and show that shallower rises in sonority are permitted only at higher levels on the prosodic hierarchy. In general, it seems that the higher levels of the pro-

sodic hierarchy, the foot and prosodic word, tolerate less well-formed onsets than do the lower levels, the syllable and mora. For example, many Slavic languages permit a wide range of consonant clusters word-initially, but restrict the range of onset clusters word-initially. In Munster Irish, the mora permits no onset at all, the syllable permits only single-consonant onsets, the foot permits single consonants and clusters with a steep sonority rise, and the prosodic word permits single consonants and clusters with both steep and shallow sonority rises. This analysis converges with my other findings on prosodic structure.

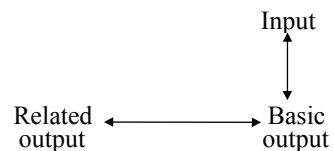
Thus I propose a unified analysis of the prosodic structure of the Goidelic languages: the facts of stress placement, syllable weight, and syllabification all converge on the analysis of the prosodic hierarchy presented here.

1.2 Optimality Theory

The analysis I propose is couched in terms of Optimality Theory (OT: McCarthy & Prince 1993ab, 1994, 1995, Prince & Smolensky 1993, and others), which is an output-based theory of linguistics. OT is an attractive theoretical base on which to conduct linguistic research, as it provides a very clear and convenient method of expressing our intuitions about the nature of language. In addition, as we shall see, the fact that OT is output-based permits an obvious analysis of paradigm leveling in historical change, something that previous rule-driven accounts had difficulty with. Here I shall briefly describe the general properties of OT, and show how it can be an effective approach to both synchronic and diachronic processes.

According to the Correspondence version of OT (Benua 1995, McCarthy & Prince 1995, among others), reference can be made to the relationships between (i) the input form and its corresponding output, and (ii) a basic output form and a related output form. The basic schema for the relationships considered is shown in (1), where a double-headed arrow indicates a correspondence relationship.

(1) Schema for correspondence relationships



In this section, I focus on synchronic input–output (IO) correspondences, indicated by the vertical line in the schema in (1). In § 1.3 I turn to diachronic facts, showing how the ranking of constraints governing an input–output relationship can change over time. In § 1.4 I discuss paradigm leveling, arguing that this is controlled by constraints on output–output (OO) correspondences, indicated by the horizontal line in the schema.

Traditional generative phonology uses rules like $A \rightarrow B / C _ D$ to change an underlying string /CAD/ to the surface string CBD; this is known as a derivational approach. But under Optimality Theory, there are no rules and no sequential derivations. Rather, it is argued, there is in the Universal Grammar of human language a function called *Gen* that generates all possible outputs corresponding to an (underlying) input string /CAD/; the (infinite) set of possible outputs would include both CAD, which is entirely faithful to the input, and CBD, in which surface B corresponds to (i.e. has replaced) underlying /A/. Another function of UG, called *Eval*, evaluates all the candidates against a set of ranked constraints on output forms and marks the optimal (best-formed) candidate to be the surface representation.

In the case at hand, CBD would be marked as the optimal candidate. All candidates may violate some constraint, but Eval finds the candidate that complies best with the constraints, either by not violating the highest-ranking constraints, or at least by violating them less often than the other candidates. For example, CAD may violate constraint K, while CBD violates constraint L. If K is ranked above L (represented $K \gg L$), then Eval judges that a violation of K is worse than a violation of L, and picks CBD as optimal, in effect “the lesser of two evils.” This can be illustrated in a tableau, where an asterisk (*) marks a violation of a constraint, an exclamation point (!) marks a violation that is fatal to a candidate, and the pointing finger (☞) marks the candidate judged to be optimal.

(2)

/CAD/	K	L
CAD	* !	
☞ CBD		*

The shading of the cells in the L column indicates that this constraint is not crucial in the evaluation of the candidates considered in the tableau, since a decision has already been made on the basis of a higher-ranked constraint.

Although a constraint can be violated in an optimal candidate, viola-

tion must be minimal. Consider the candidate *CBDB*; say it violates *L* twice. In this case, *CBD* is preferred because it violates *L* as few times as possible, while still not violating *K*.

(3)

/CAD/	K	L
CAD	* !	
☞ CBD		*
CBDB		**!

Sometimes, two candidates will tie on a constraint. Say there is a constraint *M*, ranked between *K* and *L*, and say that both *CBD* and *CBDB* violate *M* once. If two candidates violate a constraint the same number of times, Eval cannot decide between them based on that constraint, and moves on to a lower constraint. In the case at hand, *CBD* and *CBDB* both violate *M* once, and tie on that constraint. Although *L* is ranked below *M*, *L* is needed as a “tie-breaker”; the fact that *CBD* violates *L* less often than *CBDB* means that *CBD* is judged to be the optimal candidate.

(4)

/CAD/	K	M	L
CAD	* !		
☞ CBD		*	*
CBDB		*	**!

In all languages, there are certain constraints that are not dominated by any other constraint. These constraints are unranked with respect to each other; in this case, a violation of one constraint is equally bad as a violation of the other.¹ If the number of violations between two unranked constraints is the same for all competing candidates, Eval must move on and decide on the basis of a lower constraint. Say there are three constraints *M*, *N* and *P*; *N* is unranked with *M*, while *P* is ranked below them both. In (5), *CBD* violates *M* and meets *N* and *P*, but a candidate *CED* meets *M* and violates *N* and *P*. In this case, *CBD* and *CED* tie on violations of *M* and *N*, and the fact that *CED* violates *P* means that Eval picks *CBD* as optimal. Unranked constraints are separated in a tableau by a dashed line.

¹ It is apparently possible for two or more dominated constraints to be unranked with respect to each other. This notion is not part of OT as originally formulated, but some researchers (e.g. Ni Chiosáin to appear) have argued for unranking among dominated constraints.

(5)

/CAD/	M	N	P
CAD			
☞ CBD	*		
CED		*	* !

Those are the basic nuts and bolts of how OT works. In sum, the basic principles of OT as stated by McCarthy & Prince (1993a, 1–2) are these (the following is a direct quote):

(6) Principles of Optimality Theory

a. Violability

Constraints are violable; but violation is minimal.

b. Ranking

Constraints are **ranked** on a language-particular basis; the notion of minimal violation is defined in terms of this ranking.

c. Inclusiveness

The constraint hierarchy evaluates a set of candidate analyses that are admitted by very general considerations of structural well-formedness. There are no specific rules or repair strategies.

d. Parallelism

Best-satisfaction of the constraint hierarchy is computed over the whole hierarchy and the whole candidate set. There is no serial derivation.

Faithfulness constraints are those that govern the relationship between the input form and the output candidates. Following the formulation within Correspondence Theory (McCarthy & Prince 1995), some of the most important families of faithfulness constraints are DEP (no insertion), MAX (no deletion), and IDENT (no changing the values of features).

(7) **DEP** (McCarthy & Prince 1995)

Every element in the output has a correspondent in the input.

DEP can apply to segments or moras. If a candidate has an epenthetic vowel or consonant, it violates DEP(segment). If a candidate lengthens an input short vowel or consonant, it violates DEP(μ). Violations of DEP are

illustrated by the hypothetical forms in (8).

(8) Hypothetical DEP violations

	Input form	Output candidate	Constraint violated
a.	/amra/	ambra	DEP(seg)
b.	/adr/	adar	DEP(seg)
c.	/ti/	ti:	DEP(μ)
d.	/kosi/	kossi	DEP(μ)

MAX looks the opposite direction, from the input to the output. If anything in the input is absent in the output, in other words, if anything is deleted, a violation of MAX is incurred.

(9) **MAX** (McCarthy & Prince 1995)

Every element of the input has a correspondent in the output.

Like DEP, MAX can apply to segments or moras. If an output candidate deletes a vowel or consonant present in the input, it violates MAX(seg). If an output candidate shortens an input long vowel or consonant, it violates MAX(μ). Violations of MAX are illustrated by the hypothetical forms in (10).

(10) MAX violations

	Input form	Output candidate	Constraint violated
a.	/apkta/	apta	MAX(seg)
b.	/kimuna/	kimna	MAX(seg)
c.	/ta:gu/	tagu	MAX(μ)
d.	/gutta/	guta	MAX(μ)

IDENT covers features as opposed to segments. If any segment in an output candidate has a different value for any feature [F] from the corresponding segment in the input, there is an IDENT(F) violation.

(11) **IDENT(F)** (McCarthy & Prince 1995)

If a segment is [α F] in the input, then the corresponding segment in the output is [α F].

Examples of hypothetical IDENT violations are given in (12).

(12) Hypothetical IDENT violations

	Input form	Output candidate	Constraint violated
a.	/aka/	axa	IDENT(cont)
b.	/mra/	bra	IDENT(nas)
c.	/ki/	tʃi	IDENT(dor)
d.	/iso/	izo	IDENT(voi)

McCarthy & Prince (1995, 371 ff.) propose other faithfulness constraints: CONTIGUITY (no change in a sequence of segments), LINEARITY (no metathesis), UNIFORMITY (no coalescence), and INTEGRITY (no breaking); we shall see CONTIGUITY and LINEARITY in action in chapter 5.

The faithfulness constraints are the backbone of OT, as every time something changes between input and output, a faithfulness constraint is violated. Whenever a phonological constraint outranks a faithfulness constraint, we see the same effect as with derivational rules: the surface realization departs from the input form.

To see how OT compares with rule-based derivational phonology, let us examine a real-life example, that of coda devoicing in German. In German (Lombardi 1991, 1995 and references therein), syllable-final obstruents are devoiced.

(13) German obstruent devoicing

a.	/rund/	runt	'round' (singular)
	/rundə/	rundə	'round' (plural)
b.	/lø:zba:r/	lø:sba:r	'solvable'
	/lø:zən/	lø:zən	'to loosen, dissolve'
c.	/ve:g/	ve:k	'way' (singular)
	/ve:gə/	ve:gə	'way' (plural)

Under a derivational approach, one would posit a rule delinking laryngeal features from a coda consonant (Lombardi 1991).

(14) Devoicing

$$\begin{array}{c} C \quad]_{\sigma} \\ \neq \\ \text{Laryngeal} \end{array}$$

This rule would then apply to forms like /rund/, /lø:zba:r/, and /ve:g/, but not to /rundə/, /lø:zən/, and /ve:gə/.

- (15)
- | | | | | |
|----|-----------|---------|------------|---------|
| a. | UR | /rund/ | /lø:zba:r/ | /ve:g/ |
| | Devoicing | runt | lø:sba:r | ve:k |
| | SR | runt | lø:sba:r | ve:k |
| b. | UR | /rundə/ | /lø:zən/ | /ve:gə/ |
| | Devoicing | — | — | — |
| | SR | rundə | lø:zən | ve:gə |

Under OT, one approach is to posit two constraints: the phonological constraint LICENSELARYNGEAL (following Lombardi 1991, 1995) and the faithfulness constraint IDENT(voice).²

(16) **LICENSELARYNGEAL**

Align-L(Laryngeal; σ)

Laryngeal features are aligned with the left edge of a syllable.

On the assumption that voiced obstruents are marked [voice] and voiceless obstruents are unmarked, this constraint has the effect of permitting voiced obstruents only in onset position. A voiced obstruent in coda position incurs a violation.

The ranking of these constraints is LICENSELARYNGEAL ≫ IDENT(voice), which means that IDENT(voice) may be violated if doing so spares a violation of LICENSELARYNGEAL.

- (17)
- | | /rund/ | LICLAR | IDENT(voice) |
|----|------------|--------|--------------|
| a. | .rund. | * ! | |
| | ☞ .runt. | | * |
| b. | /rundə/ | LICLAR | IDENT(voice) |
| | ☞ .run.də. | | |
| | .run.tə. | | * ! |

² This account is intentionally much simplified from that of Lombardi (1995). The point of this section is not so much to account for devoicing in German as it is to illustrate OT in practice, using a simple example with only two constraints and only two competitive candidates in each tableau.

A violation of IDENT(voice) can be fatal, as in (17b), if it serves no purpose, such as sparing a violation of LICENSELARYNGEAL. Thus we see that in OT, constraints are violable, since *runt* violates IDENT(voice); but violation must be minimal, since a bootless violation of IDENT(voice) in **runtə* is ungrammatical.

1.3 Representing phonological change in Optimality Theory

Traditional historical phonology uses rules like A > B / C _ D to mean that what was *CAD* in an earlier (form of a) language corresponds to *CBD* in a later (form of the) language. Both forms are output forms at the respective points in history, and what they represent underlyingly in the synchronic phonology of the language is not always of primary interest to the historical linguist.

Since generative linguistics before OT dealt primarily in rules, previous generative approaches to sound change considered it a matter of rule addition, rule insertion, rule loss, and rule reordering (Halle 1962; Kiparsky 1965, 1968, 1982, 1988, 1995; King 1969, 1973; Dresher 1978; 1993; Kaisse 1993; Zec 1993). But an OT approach to sound change must necessarily deal in constraints rather than rules. Since the only way for different outputs to surface from the same input is through different constraint rankings, any OT approach to sound change must seek to explain constraint reranking. In this section I sketch out an analysis of sound change based on the OT model, and show that much sound change is the result of constraint promotion. OT also permits a straightforward analysis of analogical change, an issue which was often evaded in earlier generative approaches.

Every historical change must at some point have been a synchronic change. Returning to the example of A > B / C _ D, before *CBD* is fully ensconced as the replacement of *CAD*, there must be a time when some people (often younger people, or people in certain geographic areas, or people speaking informally) are saying *CBD* or something close to it, while other people (often older people, or people speaking more formally) are saying *CAD*. After some time, *CBD* may become the only “correct” way of saying the word, and, depending on the specific circumstances, the input form itself may change to /*CBD*/. But it is at the moment when *CBD* is still identifiable as being the output form of /*CAD*/ that OT can be used to explain the change. In the following sections I present an argument for an OT-based approach to sound change, showing that sound change is the result of the promotion of a constraint against a marked phonological pattern.

1.3.1 The Promotion of the Unmarked

For a concrete example of a historical sound change, I return to coda devoicing in German. Historically, coda devoicing happened between Old High German and Middle High German; that is, coda obstruents that were voiced in Old High German (OHG) became voiceless in Middle High German (MHG) (Braune & Eggers 1987).

(18)	OHG	MHG	Gloss
a.	rund	runt	'round' (sing.)
	runde	runde	'round' (pl.)
b.	weg	wek	'way' (nom.)
	wege	wege	'way' (dat.)

The alternations in MHG prove that the underlying forms have voiced consonants: /rund/ and /weg/.

Almost all work that has been done on sound change in OT terms has agreed that constraint reranking is responsible for a large amount of diachronic variation (see e.g. Jacobs 1995, Bermúdez-Otero 1996, Ham to appear).³ This assumption certainly seems valid in this case: in OHG, IDENT(voice) outranked LICENSELARYNGEAL, but in MHG, the ranking is reversed.

(19) IDENT(voice) \gg LICENSELARYNGEAL in Old High German

/rund/	IDENT(voice)	LICLAR
☞ .rund.		*
.runt.	* !	

(20) LICENSELARYNGEAL \gg IDENT(voice) in Middle High German

/rund/	LICLAR	IDENT(voice)
.rund.	* !	
☞ .runt.		*

The question for researchers interested in an OT approach to sound

³ Albright (1996) also deals with diachronic effects in OT terms. Albright argues that output-output correspondence constraints can govern the relationship between a parent's output and a child's output. The result is that the child can build a new input distinct from the parent's input as long as the outputs remain the same.

change, then, is this: How do constraint rankings change? The answer, I argue, comes from an extension of the theory of the Emergence of the Unmarked (McCarthy & Prince 1994), which says that constraints against marked phonological patterns can make their presence felt in the grammar of a language even when they are widely violated in the language. For example, closed syllables are cross-linguistically marked, but a language that generally permits closed syllables might prohibit them in certain domains, such as reduplicating syllables. The extension of this theory that I argue for in historical change is what I call the "Promotion of the Unmarked": a constraint against a marked pattern is promoted up the constraint hierarchy, passing other constraints and playing an increasingly surface-true role in the grammar of the language.

Certain phonological patterns are generally assumed to be universally less marked than other patterns: for example, a single onset consonant is less marked than a cluster; open syllables are less marked than closed syllables; voiceless obstruents are less marked than voiced obstruents. The most straightforward examples of sound change are ones that change a marked pattern to an unmarked pattern, e.g. the loss of *s* + consonant onsets in Western Romance (Latin *scho.la* > Spanish *es.cue.la*), coda devoicing in German seen above (OHG *rund* > MHG *runt*).

In OT, which implicitly embraces markedness considerations, there are constraints against marked phonological patterns, called phonological constraints, which generally come into conflict with other constraints (McCarthy & Prince 1994). A candidate that complies with a phonological constraint may violate a faithfulness constraint, as we saw in German devoicing: the optimal candidate *runt* complies with the phonological constraint LICENSELARYNGEAL but violates the faithfulness constraint IDENT(voice). I contend that phonological change results when an unmarked pattern comes to predominate in the phonology, or in OT terms, when a constraint against a marked pattern is promoted. It is also possible for an output-output faithfulness constraint to be promoted, as paradigm uniformity is less marked than allomorphy. I shall return to this in the discussion of analogy in § 1.4.

Kiparsky (1965, 1968) argues that historical phonological change is the result of a child grammar surviving into adulthood and spreading throughout a speech community. And as Gnanadesikan (1995) points out, in child phonology, phonological constraints uniformly outrank faithfulness constraints, and the process of acquiring adult phonology is a process

of promoting the faithfulness constraints above the phonological constraints. For example, a child's *fɛn* for 'friend' shows that phonological constraints against consonant clusters outrank faithfulness constraints against deleting consonants.⁴

Usually, as the child's language develops, the faithfulness constraints will get promoted above the phonological constraints, and the child correctly produces the adult form (e.g. *fɹɛnd*). But if the high rank of a certain phonological constraint in child grammar is perpetuated in the adult grammar of a speech community, a phonological change occurs in the language. This is one part of the Promotion of the Unmarked: a constraint requiring phonological unmarkedness in a certain domain is promoted above other constraints.

The Old High German example illustrates the Promotion of the Unmarked well. Compliance with LICENSE LARYNGEAL is phonologically unmarked, and at some point this phonological constraint is promoted in the grammars of some speakers, and passes IDENT(voice) in the constraint hierarchy. The innovative grammar shows the Promotion of the Unmarked in the ranking LICENSE LARYNGEAL ≫ IDENT(voice).

When a phonological constraint is promoted, it can naturally pass several constraints, usually not just one. However, quite frequently there is only one constraint that becomes visibly violated when it is passed by the constraint that is being promoted; very frequently, but not exclusively, that newly violated constraint is a faithfulness constraint (it was IDENT(voice) in the case of coda devoicing). But if several constraints are visibly violated, it may look like the language is undergoing several sound changes achieving the same result, in other words, a phonological conspiracy. A famous phonological conspiracy is the so-called Open Syllable Law of Proto-Slavic (Bräuer 1961, Carlton 1990, and references therein).

Under the traditional view, Proto-Slavic underwent a series of sound laws that had the overall effect of creating open syllables: by the time of late Proto-Slavic, the only permitted CVC syllables were those with liquids in the coda. After the dialectal breakup of Proto-Slavic, even these closed syllables were eliminated, and in Proto-West Slavic, Proto-South Slavic,

⁴ This assumes that the child's input is /fɹend/, not /fɛn/. Certainly a large part of acquiring adult phonology is acquiring adult input forms, and probably at an early stage the child's input really is /fɛn/. However, children's competence usually outpaces their performance, and at some point the child's input will change from /fɛn/ to /fɹend/ even when the output remains *fɛn*.

and Proto-East Slavic, there were no closed syllables at all. The various processes that brought about open syllables included these: loss of word-final obstruents (Proto-Indo-European *suHnus*⁵ > Proto-Slavic *sy:nɔ* 'son'), the reduction of the inventory of consonant clusters to only those clusters that were permissible onsets (early Proto-Slavic *ob.vla:kɔ* > late *o.bla:kɔ* 'cloud'), the change of vowel + tautosyllabic nasal to long nasalized vowel (early Proto-Slavic *ron.ka:* > late *rō:ka:* 'hand'), and, after the breakup of Proto-Slavic, the metathesis (in West and South Slavic) or epenthesis (in East Slavic) of tautosyllabic vowel + liquid sequences (Proto-Slavic *gor.dɔ* > Proto-West and Proto-South Slavic *gra:dɔ*, Proto-East Slavic *go.ro.dɔ* 'fortress, city').

Traditional historical linguistics must list several unrelated rules to cover these facts, and has no formal way of capturing the generalization that Slavic is moving toward open syllables. But under the Promotion of the Unmarked, it is easy to show that the constraint NOCODA, prohibiting closed syllables, was promoted, step by step, over various other constraints (e.g. DEP, MAX, and LINEARITY) throughout the history of the Slavic languages.

1.3.2 Building new inputs: Insular Celtic

Frequently, after a sound change, there are no alternations or other circumstances that allow speakers to continue to posit the original input form. In this case, a new underlying representation may arise thanks to Lexicon Optimization (Prince & Smolensky 1993, 191 ff.), which says simply that inputs are as faithful to outputs as possible. Thus, different grammars can have different underlying forms because there has been a reanalysis of the surface forms. At this point, the high rank of the phonological constraint will no longer be recoverable to speakers, as it is no longer necessary to account for the surface form. In fact, since the new surface form is faithful to the new input form, it is likely that speakers will perceive the various faithfulness constraints as being high-ranking, even if the output form does not obviously violate a specific phonological constraint.

A very simple example may be seen in the reflexes of Proto-Insular Celtic (PIC) *kʷ*, which became *p* in the Brittonic languages (e.g. Welsh) and *k* (palatalized *k'* before front vowels) in the Goidelic languages (e.g. Irish) (Lewis & Pedersen 1937, Jackson 1953).⁶ An example is the word

⁵ *H* represents any of the so-called "laryngeals" of Proto-Indo-European.

⁶ The changes were not contemporaneous: early inscriptions show Brittonic *p* at

for ‘who’: PIC $*k^w$ eis; Middle Welsh *pu*; Old Irish *k’ia*.

I propose three constraints: two faithfulness constraints IDENT (dorsal) and IDENT(labial), and a phonological constraint $*COMPSEG$ (Padgett 1995) against complex articulations.

(21)

a. **IDENT(dorsal)**

A segment that is [dorsal] in the input is [dorsal] in the output.

b. **IDENT(labial)**

A segment that is [labial] in the input is [labial] in the output.

c. **$*COMPSEG$**

Consonants do not have more than one place specification.

In PIC, the two faithfulness constraints outranked $*COMPSEG$, so that $/k^w/$ could surface as k^w .

(22)

$/k^w/$	IDENT(dorsal)	IDENT(labial)	$*COMPSEG$
$\text{☞ } k^w$			*
k		* !	
p	* !		

In both branches of Insular Celtic, $*COMPSEG$ was promoted to undominated position. As a result, one of the faithfulness constraints had to be demoted in order for an output form to be possible: if all three constraints in (22) were undominated, none of the candidates would be able to surface. As it happened, the two branches of Insular Celtic demoted different constraints.

In the dialect ancestral to the Brittonic languages, IDENT(dorsal) was demoted below the other two, and the surface form was labial.

(23)

$/k^w/$	IDENT(labial)	$*COMPSEG$	IDENT(dorsal)
k^w		* !	
$\text{☞ } p$			*
k	* !		

a time when Goidelic still had k^w distinct from k . The Brittonic change $k^w > p$ shows a secondary place of articulation becoming the primary place. This is parallel to the change of a palatalized labial to a coronal found in a variety of languages (Andersen 1973, Thomason 1986).

Since p never alternates with k^w , Lexicon Optimization quickly formed a new phoneme $/p/$ to correspond to output p , and faithfulness could again prevail.

(24) $/p/ \rightarrow p$ All faithfulness constraints met.

In the dialect ancestral to the Goidelic languages, IDENT(labial) was demoted, and the surface form was dorsal.

(25)

$/k^w/$	IDENT(dorsal)	$*COMPSEG$	IDENT(labial)
k^w		* !	
p	* !		
$\text{☞ } k$			*

Since there were no alternations of k^w and k , surface k from $/k^w/$ merged with original $/k/$, leaving only a single phoneme $/k/$ and one (relevant) allophone k . Once again, Lexicon Optimization allowed faithfulness to regain its position.

(26) $/k/ \rightarrow k$ All faithfulness constraints met.

1.3.3 Re-solving problems: Modern English

Sometimes promoting phonological constraints and rebuilding inputs to be faithful to new outputs is not sufficient to remove marked phonological patterns. If a language borrows words from another language, new phonological patterns may emerge; in some cases, these phonological patterns are ones that had earlier been eliminated, and may be treated differently the second time around. An example comes from English, where initial kn - clusters were simplified to n - between Middle and Modern English, but have resurfaced in recent loan-words.

Middle English permitted kn - as an onset cluster; Modern English does not, having simplified the cluster to n -.

(27) $k > \emptyset / _ n$

	Middle English	Modern English	Orthog.
a.	knɪxt	naɪt	<knight>
b.	knou	noʊ	<know>
c.	kna:və	neɪv	<knaves>

In Modern English, the input forms of these words assuredly begin with /n/: there are no alternations or other circumstances that would lead speakers to posit, say, /knoʊ/ for ⟨*know*⟩.⁷ It is reasonable to assume that at some point in the history of English the output forms *know* and *now* occurred side by side, but both with the input form /knoʊ/, since even those speakers who usually said *now* would have heard *know* from other speakers, and might have used it themselves in certain contexts, e.g. in slow, careful speech.

Let us consider the constraints at work. First, there is presumably a constraint *kn that prohibits the sequence. (It is part of a larger constraint on permissible onset clusters, which I shall go into in chapter 5.) The relevant faithfulness constraints, all undominated, are DEP, MAX, and IDENT(nasal).

In Middle English, the faithfulness constraints all outranked *kn, meaning that nothing could be done to improve it.

(28)

/knoʊ/	DEP	MAX	IDENT(nasal)	*kn
kənoʊ	* !			
noʊ		* !		
kroʊ			* !	
☞ knoʊ				*

But at some point, speakers promoted the phonological constraint *kn, deciding that *kn-* was an unacceptable onset cluster. Once *kn was promoted, it was necessary to demote one of the faithfulness constraints in order for a candidate to be judged optimal: if all four constraints in (28) were undominated, all candidates would violate an undominated constraint, and no candidate could surface. In principle any of the faithfulness constraints in the tableau could have been demoted; by chance it was MAX.

⁷ Some might cite *acknowledge* as evidence that the root still has underlying /kn-/, but I doubt that *know* and *acknowledge* are actually synchronically derivable from the same morphological root.

(29)

/knoʊ/	DEP	IDENT(nasal)	*kn	MAX
kənoʊ	* !			
☞ noʊ				*
kroʊ		* !		
knoʊ			* !	

Later still, the older variant with *kn-* disappeared completely, and the input form of *now* became /noʊ/, since speakers had no reason to posit anything else. This allowed speakers to reanalyze the constraint ranking when new words with *kn-* entered the language, since words like ⟨*know*⟩ /noʊ/ would not be affected. Consider recent loan words into Modern English in which the source language has initial *kn-*. Here, many speakers pronounce the English word with an epenthetic ə.

(30)

English orthography	English pronunciation	Source	Gloss
a. ⟨knish⟩	kənɪʃ	Yiddish knif	‘savory pastry’
b. ⟨Knesset⟩	kənɛsət	Hebrew kneset	‘parliament’
c. ⟨Knopf⟩	kənaf	German knopf	(proper name)

These words probably still have underlying /kn-/ in English, as they all have learned alternative pronunciations without the epenthetic vowel. If, for example, the English word *kənɪʃ* has the input form /knɪʃ/, then the grammar of English has been reanalyzed: *kn is still undominated, but it is DEP that has been demoted in order for a surface form to be realizable.

(31)

/knɪʃ/	MAX	IDENT(nasal)	*kn	DEP
☞ kənɪʃ				*
nɪʃ	* !			
krɪʃ		* !		
knɪʃ			* !	

As mentioned above, Lexicon Optimization means that a new input form is created if the new output form shows no alternations requiring the old input form to be maintained; constraints may then be reranked when new forms enter the language through sound changes or loan words. So, as we see in words like ⟨*knish*⟩, in Modern English, *kn still outranks a faithful-

ness constraint, namely DEP.

1.3.4 A previous analysis of constraint reranking

We have now seen a complete analysis of historical sound change within OT. But a previous OT analysis of sound change has focused on the fact that languages often show intermediate stages, when a certain sound change is incomplete, and forms that have undergone the change are found side by side with forms that have not undergone the change. Bermúdez-Otero (1996), building on work done by Y. Y. Cho, presents such an analysis, which I sketch out below. I contend that although the intention of Bermúdez-Otero's analysis is valid, the analysis itself will not work, for both sociolinguistic and methodological reasons.

Under Bermúdez-Otero's analysis, two constraints K and L may shift from being ranked $K \gg L$ to being unranked. According to Anttila (1995), the unranking of constraints results in free variation. Bermúdez-Otero calls this the Free-Variationist Model of Sound Change. In the example of coda devoicing in German, in an intermediate stage between OHG and MHG, IDENT(voice) and LICENSELARYNGEAL become unranked with respect to each other; the outcome is that *runt* and *rund* tie, resulting in free variation between them.

(32) Intermediate stage: IDENT(voice) and LICENSELAR unranked

/rund/	IDENT(voice)	LICLAR
☞ .rund.		*
☞ .runt.	*	

Later, according to this analysis, the two constraints in question become ranked again, either in the original order, in which case the newer variant is eliminated, or in the opposite order, in which case the newer variant takes over. This second possibility is what happened in Middle High German, as we saw in (20), repeated here as (33).

(33) LICENSELARYNGEAL \gg IDENT(voice) in Middle High German

/rund/	LICLAR	IDENT(voice)
.rund.	* !	
☞ .runt.		*

Although I agree that it is likely that there was an intermediate stage in

which *rund* and *runt* were found more or less side by side, I believe that the analysis of free variation illustrated in (32) will simply not work: it makes the sociolinguistically undesirable prediction that both surface forms are equally harmonic in the grammar of any single given speaker, and in addition, it runs counter to the usual treatment of unranked constraints in OT. This approach to historical change based on the reranking of two constraints will also not capture phonological conspiracies as directly as the Promotion of the Unmarked will.

The analysis of free variation illustrated in (32) implies that both variants (*rund* and *runt*) are equally harmonic and thus simultaneously available to each speaker of the language at all times. In my opinion, this is intuitively highly unlikely. It is far more plausible that at the time when *rund* and *runt* were found side by side, there were geographic, stylistic, and/or generational implications to each form. Perhaps they said *runt* in the city and *rund* in the surrounding farms. Perhaps they said *runt* when speaking in a casual conversational style but *rund* in slow, careful speech. Perhaps younger people said *runt* and older people said *rund*. But it is unlikely that any individual speaker went around saying *runt* half the time and *rund* half the time, with no sociolinguistic ramifications, as the tableau in (32) implies.

A further argument against this analysis of free variation is methodological. The usual assumption in OT is that undominated constraints are never violated by surface forms: if both IDENT(voice) and LICENSE LARYNGEAL are undominated in (32), then neither candidate (rather than both) should be optimal. But even if these constraints are dominated, it is general practice in OT to say that when two candidates tie on a set of constraints, the tie is broken by a lower ranking constraint. This might not be easily demonstrable in the case of *runt* ~ *rund*, but it is probably true often enough to invalidate this analysis of free variation. I illustrate this point using a hypothetical example.

McCarthy & Prince (1994) argue that unmarked characteristics can emerge in certain circumstances, even when they are usually suppressed. For example, a language that freely permits closed syllables in roots may prohibit closed syllables in reduplication. In the hypothetical case of language L, a root *sig* reduplicates as *si-sig* rather than *sig-sig*, in order to minimize closed syllables. However, the root itself is allowed to have a closed syllable, because MAX-IO outranks NOCODA.

(34)

/RED-sig/	MAX-IO	NOCODA	MAX-BR
.sig.sig.		**!	
☞ .si.sig.		*	*
.si.si.	* !		

Now, say **L** undergoes a sound change whereby the cluster *kt* is simplified to *t* in intervocalic position.

(35)

	Old High L	Modern L	Gloss
a.	sak-u	sak-u	‘I read’
	sa-sak-u	sa-sak-u	‘I read continuously’
b.	sak-ap	sak-ap	‘she reads’
	sa-sak-ap	sa-sak-ap	‘she reads continuously’
c.	sak-tum	sa-tum	‘we read’
	sa-sak-tum	sa-sa-tum	‘we read continuously’

Say the two constraints in question are *kt (simply prohibiting that cluster) and MAX-IO. In Old High **L**, the ranking is MAX-IO ≫ *kt, and in Modern **L** the ranking is *kt ≫ MAX-IO. The facts of reduplication show that the ranking MAX-IO ≫ NOCODA ≫ MAX-BR is in effect in both stages.

(36) Old High **L**

/RED-sak-tum/	MAX-IO	*kt	NOCODA	MAX-BR
.sak.sak.tum.		*	***!	
☞ .sa.sak.tum.		*	**	*
.sa.sa.tum.	* !		*	
.sa.sa.tu.	*!*			

(37) Modern **L**

/RED-sak-tum/	*kt	MAX-IO	NOCODA	MAX-BR
.sak.sak.tum.	* !		***	
.sa.sak.tum.	* !		**	*
☞ .sa.sa.tum.		*	*	
.sa.sa.tu.		**!		

Under the Free Variationist Model of Sound Change, there is predicted to be an intermediate stage where *sa-saktum* and *sa-satum* are found side by side. Leaving aside the sociolinguistic questions raised above, there is an

important methodological flaw with the previous OT approach to sound change. Under that analysis, MAX-IO and *kt should be unranked for a while before becoming reranked. However, free variation will not be the result of unranking: low-ranking NOCODA will break the tie, meaning that *sa-satum* is always preferred, and the variant *sa-saktum* can never surface.

(38) Intermediate **L**

/RED-sak-tum/	MAX-IO	*kt	NOCODA	MAX-BR
.sak.sak.tum.		*	**!*	
.sa.sak.tum.		*	**!	*
☞ .sa.sa.tum.	*		*	
.sa.sa.tu.	**!			

The intuition that variants occur side by side when a sound change is in progress is probably correct; however, the analysis of free variation as a result of unranked constraints has undesirable sociolinguistic and methodological implications. A better approach to variation is to posit multiple grammars with varying constraint rankings.

By multiple grammars I do NOT mean here cophologies in the sense of Itô & Mester (1995) and Inkelas, Orgun & Zoll (1996). Cophonologies in that sense refer to variant constraint rankings within a single grammar, i.e. the grammar of any single speaker. By multiple grammars I mean that speakers may have different grammars from each other (with correlations of age, social status, geographical location, etc.), or even that a single speaker may have different grammars in his competency (with correlations of speaking style).

Under this analysis, the original phonology of Old High German had the IDENT(voice) ≫ LICENSELARYNGEAL ranking seen in (23), but at some intermediate point a grammar with the opposite ranking arose among some speakers, by means of the Promotion of the Unmarked, specifically LICENSELARYNGEAL. For a while, then, there was an intermediate stage when the two grammars occurred side by side. In some situations (formal speech, older speakers, etc.) the grammar with the original IDENT(voice) ≫ LICENSELARYNGEAL ranking was used. In other situations (casual speech, younger speakers, etc.) the grammar with the innovatory LICENSELARYNGEAL ≫ IDENT(voice) ranking was used. By Middle High German, the newer grammar had won out.

(39) Reranking of IDENT(voice) and LICENSELARYNGEAL

- a. Old High German
IDENT(voice) \gg LICENSELARYNGEAL
- b. Intermediate stage
Grammar A: IDENT(voice) \gg LICENSELARYNGEAL
Grammar B: LICENSELARYNGEAL \gg IDENT(voice)
- c. Middle High German
LICENSELARYNGEAL \gg IDENT(voice)

Likewise, in the hypothetical case of **L**, an intermediate stage has two grammars, one with the older ranking and one with the newer ranking.

(40) Reranking of MAX-IO and *kt

- a. Old High **L**
MAX-IO \gg *kt
- b. Intermediate stage
Grammar A: MAX-IO \gg *kt
Grammar B: *kt \gg MAX-IO
- c. Modern **L**
*kt \gg MAX-IO

This analysis avoids both of the problems of the previous analysis: positing separate grammars allows us to predict sociolinguistic parameters for the variants, and does not raise the methodological problems that positing unranked constraints does.

1.4 Paradigm leveling and output–output correspondences

In the previous section we discussed input–output correspondences in both synchronic and diachronic situations. In addition to these input–output correspondences, there are also correspondence relationships between related output forms, indicated by the horizontal arrow in the schema in (1). Sometimes, the language’s inclination for a set of related forms to resemble each other outweighs the phonological constraints that play an independent role in the language. In this section, I discuss output–output correspondences in both synchronic and diachronic terms. As we shall see, output–output correspondences are an effective approach to paradigm leveling.

Some clear examples of output–output correspondences are found in

facts of reduplication (McCarthy & Prince 1995), where it is sometimes found that a phonological process either overapplies (i.e. applies in an environment where it is not phonologically expected) or underapplies (i.e. fails to apply in an environment where it is expected). An example of overapplication of a phonological process in a reduplication environment is *h*-deletion in Javanese (analysis from McCarthy & Prince 1995, data from Horne 1961 and Dudas 1976). Generally, Javanese permits *h* in coda position, but not intervocally.

(41) Distribution of *h* in Javanese

	Root	‘my’	Dem.	Gloss
a.	aneh	aneh-ku	ane-e	‘strange’
b.	arah	arah-ku	ara-e	‘direction’

In reduplication, however, we see *h* loss applying to the reduplicant as well as the base, even though the *h* in the reduplicant is not intervocalic.

(42) Overapplication of *h* loss

	Root	Reduplicated	Redup. + dem.	Gloss
a.	bəḏah	bəḏah-bəḏah	bəḏa-bəḏa-e	‘broken’
b.	ḏajoh	ḏajoh-ḏajoh	ḏajo-ḏajo-e	‘guest’

A derivational account would require rule ordering: *h* loss occurs before reduplication.

(43) UR	/bəḏah+RED/	/bəḏah+RED+e/
<i>h</i> -loss	—	bəḏa-e
Redup.	bəḏah-bəḏah	bəḏa-bəḏa-e
SR	bəḏah-bəḏah	bəḏa-bəḏa-e

Correspondence Theory allows us to explain the phenomenon without stipulating rule ordering. MAX-IO requires that every element of the input have a correspondent in the output, and MAX-BR requires that every element of the base have a correspondent in the reduplicant. In addition, Javanese has a phonological constraint *VhV, prohibiting *h* between vowels.

Our intuition is that the reduplicant is trying to look as much like the base as possible. By ranking MAX-BR high, this intuition can be formal-

ized. There are two ways that BR identity could be achieved: either by including the *h* in both parts (a hypothetical **bāḍah-bāḍah-e*), or by omitting the *h* from both parts (the actual *bāḍa-bāḍa-e*). In this case, BR identity is achieved by overapplying the phonological constraint, which means that **VhV* must rank above MAX-IO. Thus we arrive at the intuition that it is better to violate faithfulness between the input and the output by losing the *h* than it is to have an intervocalic *h*.

(44)

/bāḍah+RED+e/	MAX-BR	*VhV	MAX-IO
bāḍah-bāḍah-e		*!	
bāḍah-bāḍa-e	*!		
☐ bāḍa-bāḍa-e			*

Output–output correspondences turn out to be relevant in discussing historical change as well, specifically the role of paradigm leveling in the historical development of a language. In traditional historical linguistics, paradigm leveling has been explained as due to analogy. Analogy is stated as an algebraic proportion, and results in the leveling of a paradigm or the spread of a productive pattern. For example, in English, the older plural of *cow* was *kine*, but this has been replaced by *cows*. Similarly, the past of *climb* was once *clomb*, but this has been replaced by *climbed*. Both replacements can be stated in terms of analogy.

(45) Analogy in English

- a. dog : dogs :: cow : X X = cows
 b. hum : hummed :: climb : X X = climbed

Generative approaches to historical change have frequently either ignored analogy or relegated it to a minor part of the discussion, dismissing it as “rule loss” or “rule simplification,” which does not take strong paradigmatic pressure into consideration (see for example Kiparsky 1988, 1995).

However, under an OT approach to historical change, output–output correspondences can be as important as input–output correspondences, thus allowing us to account for paradigm leveling directly in the theory. An example can be found in Sanskrit.

In Sanskrit (Whitney 1889), the Indo-European (IE) labiovelar stop *k^w* became *c* (a palatal stop or affricate) before front vowels and *k* before back vowels and consonants. The original distribution was largely obfus-

cated by the later merger of *e* and *o* into the single sound *a*.

(46)

Indo-European	Sanskrit	Gloss
*k ^w e	ca	‘and’
*k ^w oteros	kataras	‘which’

In the middle voice of thematic verbs in the present tense, Sanskrit has the ending *-ate* in the 3 sg. and *-ante* in the 3 pl. Comparative evidence allows us to reconstruct the endings **-etoi* and **-ontoi* (cf. Greek *-etai* and *-ontai*) in the IE dialect ancestral to Sanskrit.

(47)

Indo-European	Sanskrit	Gloss
*bher-etoi	bhar-ate	‘carry’ (3 sg. middle)
*bher-ontoi	bhar-ante	(3 pl. middle)

In verb roots that ended with *k^w* in IE, one would expect to find the same distribution of *c* and *k* described in (46); however, we actually find *c* in both forms.

(48)

IE	Expected Skt.	Attested Skt.	Gloss
*sek ^w -etoi	sacate	sacate	‘follow’ (3 sg.)
*sek ^w -ontoi	*sakante	sacante	(3 pl.)

Traditional historical linguistics has explained the replacement of **sakante* with *sacante* in terms of an analogy in which forms that show no consonant alternation have influenced verbs that did.

(49) Four-part analogy

3 sg. bharate : 3 pl. bharante :: 3 sg. sacate : X X = sacante

We do not know if the replacement of *k* with *c* in the 3 pl. happened before or after *e* and *o* became *a*. There are two possible timelines (I use > to indicate a historical phonological change and ⇒ to indicate an analogical replacement).

(50)

Stage I	Stage II	Stage III	Stage IV
a. sek ^w etoi	> secetoi	> sacate	
sek ^w ontoi	> sekontoi	> sakante	⇒ sacante

- b. sek^wetoi > secetoi > sacate
 sek^wontoi > sekontoi ⇒ secontoi > sacante

It is perhaps more likely that the analogical replacement would happen after the environment for the *k* ~ *c* alternation was lost, so that (50a) is the correct timeline. It is not inconceivable, however, that (50b) is correct.

The notion of output–output faithfulness can be used to explain paradigm leveling in OT terms.⁸ I assume for the moment that (50a) is correct. At stage III, the allomorphy must be represented lexically, as it cannot be derived phonologically. Probably, the lexical listing of the root meaning ‘follow’ at this stage was /sak-/ , but with an indication that certain forms, including the 3 sg., are built on a variant /sac-/. Further, there are correspondence relationships between any two output forms of a paradigm. For the specific case at hand, the plural has been altered to conform to the singular, so I posit a constraint IDENT-SINGPL(Place) that demands identity of the Place features between singular and plural.

(51) **IDENT-SINGPL(Place)**

If an element of the singular output has a specific Place feature, then its correspondent in the plural output has the identical Place feature.

IDENT-IO(Place) places the same restriction on elements between the input and output. At some point between Stage III and Stage IV in the timeline of (50a), IDENT-SINGPL(Place) came to dominate IDENT-IO(Place), meaning that the Place-feature marking of a plural could change for the sake of uniformity with the singular.

(52)

P:/sakante/	IDENT-SP(Place)	IDENT-IO(Place)
sakante	* !	
☞ sacante		*

S:sacate

If, on the other hand, the correct timeline is that in (50b), then the analogy happened at Stage II, when the distribution of *k* and *c* was still predictable.

⁸ The use of output–output faithfulness to explain leveling within a verbal paradigm is an obvious extension of its use in Benua (1995), where output–output faithfulness accounts for irregular phonology in truncated forms. Steriade (1996) also accounts for paradigm leveling by allowing the grammar to compare related output forms, though she uses different terminology from that of Correspondence Theory.

The input forms were /seketoi/ in the singular and /sekontoi/ in the plural. The singular output *secetoi* was derived by ranking PAL (53) above IDENT-IO(Place).

(53) **PAL**

A consonant is [coronal] before a front vowel.

(54)

/seketoi/	PAL	IDENT-IO(Place)
seketoi	* !	
☞ secetoi		*

At first in Stage II, IDENT-IO(Place) outranked IDENT-SP(Place), meaning that there was no overapplication of palatalization in *sekontoi*.

(55)

P:/sekontoi/	PAL	IDENT-IO(Place)	IDENT-SP(Place)
☞ sekontoi			*
secontoi		* !	

S:secetoi

But later, the impulse to comply with IDENT-SP(Place) became too great, and it was promoted above IDENT-IO(Place). In this case, it is actually a faithfulness constraint that is promoted, because paradigm uniformity (dictated by IDENT-SP(Place)) is less marked than allomorphy (required by IDENT-IO(Place)); this is still an example of the Promotion of the Unmarked, as noted in § 1.3.1.

(56)

P:/sekontoi/	PAL	IDENT-SP(Place)	IDENT-IO(Place)
sekontoi		* !	
☞ secontoi			*

S:secetoi

Paradigm leveling may thus be viewed as a result of faithfulness between related output forms, e.g. singular and plural verb forms. The intuition that related forms of a paradigm tend to be uniform, an intuition captured by four-part analogy, can be formalized in OT terms by means of output–output faithfulness conditions, such as IDENT-SP(cor) in Sanskrit.

1.5 Assumptions about foot and syllable structure

Throughout this dissertation, I make certain assumptions about the nature of syllables and feet, which I shall briefly lay out here. For syllables, I fol-

low Prince (1983), Hyman (1985), Zec (1988), Hayes (1989), Itô (1989), McCarthy & Prince (1993a), and others in assuming two types of syllables, light and heavy, and in defining the difference on the basis of moras: light syllables have one mora, while heavy syllables have two. I further assume that onset consonants are linked directly to the syllable node (more on this in chapter 5).

For feet, I follow Hayes (1985, 1987, 1995), McCarthy & Prince (1993a), and others in analyzing feet as being binary with either left prominence (trochees) or right prominence (iamb). Feet may be binary at either the syllabic level or the moraic level, but Hayes (1995) points out that the distinction is crucial only for trochees. Thus there are three types of feet: moraic trochees, syllabic trochees, and iambs. Feet that are not binary (i.e. monomoraic or monosyllabic) are called degenerate feet: many languages prohibit degenerate feet absolutely, while others tolerate them in limited environments. The modern Goidelic languages fall into this latter category.

1.6 Sources

The phonological study of endangered languages like Irish and Scots Gaelic, not to mention recently extinct languages like Manx, presents special problems to the linguist. Linguists working with healthy languages that have large numbers of native speakers, like English and Mandarin, have no difficulty gathering data and testing their hypotheses, and linguists working with long-dead languages like Latin and Sanskrit are not expected to discuss the finer points of phonetic realization.

But languages like those under discussion here are somewhere in between. Dozens of detailed studies of Irish and Scots Gaelic dialects have been published since the turn of the twentieth century, some of them based on the close transcriptions of fieldworkers that had done their research as much as twenty or thirty years previously. The body of literature that I consulted is quite formidable. Descriptions of Ulster Irish include Quiggin (1906), Sommerfelt (1922, 1929, 1965), Ó Searcaigh (1925), Holmer (1940, 1942), Wagner (1959), Stockman & Wagner (1965), E. Evans (1969), Hamilton (1974), Lucas (1979), and Hughes (1986). Connacht Irish is described in de Bhaldraithe (1945, 1953), Lavin (1957), de Búrca (1958), Mhac an Fhailigh (1968), Dillon (1973), and Stockman (1974). Munster Irish is described by Sommerfelt (1927), Sjoestedt (-Jonval) (1931, 1938), Holmer (1962a), Ó Cuív (1944), R. B. Breatnach (1947,

1961), Ó Briain & Ó Cuív (1947), and Dillon & Ó Cróinín (1961)⁹. Ó Máille (1974) and Ó hÓgáin (1984) are word-lists from specific dialects of Irish. Gaelic dialects are described by Robertson (1906), Borgström (1937, 1940, 1941), Holmer (1938, 1957, 1962b), Oftedal (1956), Dilworth (1958), Mac Gill-Fhinnein (1966),¹⁰ Ternes (1973), Watson (1974, 1983, 1986), Dorian (1978), and Ó Murchú (1989). Manx was also described before its death in the early 1970s, in work such as Jackson (1955) and Broderick (1984, 1986). Other important works on the modern Goidelic languages are the essays in MacAulay (1992a), Ball & Fife (1993), and McCone et al. (1994). O'Rahilly (1932) is an important survey of the historical development of the modern Goidelic languages. Wagner (1958–69) is a linguistic atlas and dialect survey of Irish and Manx—a very valuable source of lexemes. Ó Siadhail & Wigger (1975) and Ó Siadhail (1989) discuss the phonology of Modern Irish descriptively, but do not focus on any one dialect. Ó Dochartaigh (1987) is a statistical analysis of linguistic tendencies in Ulster Irish. Ní Chiosáin (1991) is a generative study of the phonology of the Connemara dialect.

In many cases, the descriptions of dialects were based on interviews with a handful of elderly speakers (in some cases, even only one speaker) who may have imperfectly remembered the language spoken around them in their youth. Nevertheless, even these studies are valuable tools that help us get an idea of what the spoken dialects were like at the end of the nineteenth century and the beginning of the twentieth century. Unfortunately it would be very difficult, if not impossible, for me in the mid-1990s to verify the accuracy of these descriptive studies or to obtain additional data to test my own ideas. Instead, I did “fieldwork” of a different sort—I combed through the published descriptions mentioned above, finding various facts about stress placement, vowel shortening, epenthesis, and syllabification that could be brought to bear on this dissertation. For this purpose, I used not only the works mentioned above, but also a wide variety of published articles and unpublished papers, including Ó Conchubhair (1948), de hÓir (1969), Blankenhorn (1981), Ó Sé (1984, 1989), Stockman (1986), Ní Chiosáin (1990, 1994, 1995, to appear), Doherty (1991), Gussmann (1995), and Bosch & de Jong (1997).

I did spend two weeks in the summer of 1995 at an Irish-language

⁹ Actually, a textbook for learners, but also a good description of the West Kerry (Corkaguiney) dialect.

¹⁰ Another textbook, but also a description of the South Uist dialect.

school in Glencolmcille, County Donegal, where as part of the language course we were taught what speakers perceive to be the phonemes of the Ulster dialect, and where I was able to make some observations about the phonology of the dialect, but my time there was not (and was not intended to be) fieldwork. I did not interview native speakers and did not make tape recordings.

I hope to go back to Ireland someday (and maybe to Scotland as well) to do fieldwork on the surviving dialects, perhaps especially to see to what extent written standard Irish and Scots Gaelic have affected the local dialects. While I was in Ireland I got the impression (which may or may not be accurate) that there are more people who can converse fluently in Irish but whose native language is English than there are true native speakers. I would therefore also like to examine what differences there may be between the Irish of native speakers and that of fluent nonnative speakers. The influence of the latter upon the future development of Irish may be quite significant; in fact, we should not be surprised to find English substrate effects in the Irish of future generations of native speakers. This would be rather ironic since Hiberno-English itself has many Irish substrate effects, even among those who speak no Irish.

1.7 Transcription

There is precious little consistency of phonetic transcription from one descriptive study to the next, and what consistency there is often diverges greatly from what would be recognizable to modern phonologists and phoneticians. For example, the vowel θ is generally transcribed ϱ by the early researchers; likewise \varkappa is written ϱ :. There is greatest variation in the case of u , for which I have encountered λ , λ , an inverted capital Y , i , and occasionally even u .

Throughout this dissertation (even in direct quotes), I have normalized transcriptions of Goidelic languages to a system that closely approaches the standards of the IPA. The ways in which I have diverged most widely from IPA standards are these: (i) I indicate stress with an acute accent over the stressed vowel (\acute{a} , \acute{e} , etc.); (ii) I do not distinguish front a and back a , instead using noncontrastively “a” in roman and “*a*” in italic type); (iii) I use R , L , N to indicate “fortis” sonorants; and (iv) I indicate “palatalization” by means of the prime (t' , s' , etc.), a practice long established in Goidelic studies. I maintain this tradition not only out of habit but also because the realization of “palatalization” varies greatly across dia-

lects (not to mention across places of articulation) and is not in every instance *phonetic* palatalization, as transcriptions like t' , s' , etc., might imply.

I have generally not used Irish (or Gaelic or Manx) orthography, partly because I feared it might confuse more people than it helped. (For instance, in the orthography, the acute accent over a vowel indicates that the vowel is long, not necessarily stressed.) When on occasion I have indicated the orthography of a word, it is always enclosed in angled brackets thus: $\langle Broccán \rangle$. I have tried to use square brackets [] only to indicate the edges of a prosodic word, and not simply to indicate the surface realization of a sound or word, which instead is represented with *italics* in the text or in roman type in tables.

1.8 Summary

In this chapter we have seen how Optimality Theory can be used to explain both synchronic and diachronic linguistic facts in a manner that allows us to formalize our intuitions about the motivation for various changes. Whereas a derivational approach does not very successfully capture generalizations from surface forms, OT uses the high rank of certain constraints to capture these generalizations directly in the analysis.

The Promotion of the Unmarked explains both sound change and analogical change, as constraints both against marked phonological patterns and against allomorphy are promoted, resulting in the predominance of an unmarked pattern. Once a phonological constraint has been promoted, Lexicon Optimization will create a new input if no alternations requiring the old input are present in the system. When a sound change is in progress, variant forms are expected to be found side by side synchronically: we have seen that variation is preferably explained with separate grammars rather than by the unranking of constraints, on both sociolinguistic and methodological grounds. Finally, we have seen that paradigm leveling, traditionally explained by analogy, can be analyzed as the result of the high rank of constraints on the relationship between related output forms.

1.9 Overview of the dissertation

In the remainder of this dissertation, I shall apply the tools introduced here to the Goidelic languages and build an analysis of the prosodic structure of those languages. Chapter 2 provides a descriptive introduction to the Goidelic languages. I discuss their place in the Indo-European language fam-

ily, and the dialects of the modern languages. I examine the sound inventories of each language, describe the initial consonant mutations, and take a preliminary look at syllable structure.

In chapters 3 and 4 I focus on stress patterns and the roles of the foot and colon in prosodic phonology. In particular, I consider the Weight-to-Stress Principle (Prince 1990) and its consequences. First I show how Optimality Theory accounts for weight-to-stress effects in two non-Goidelic languages. Then I turn to Goidelic, examining how the Weight-to-Stress principle has affected the development of Old Irish from Proto-Insular Celtic, and how Old Irish evolved into Middle and Early Modern Irish, and thence to the modern Goidelic languages. I argue that a prosodic constituent called the colon must be included in the prosodic hierarchy between the prosodic word and the foot, presenting evidence first from some non-Goidelic languages before looking in more detail at the stress pattern of Munster Irish, East Mayo Irish, and Manx. I show that the facts of stress placement in these dialects can be most successfully accounted for with reference to the colon.

In chapter 5 I discuss issues in syllable structure, and present evidence for the prosodic hierarchy that is unrelated to stress. I begin with ambisyllabicity, arguing that it is a pervasive characteristic of Irish that stressed short vowels are in close contact with a consonant within the same foot in Irish. Next, I look at the syllabification of rising-sonority consonant clusters, showing that shallower rises in sonority are permitted only at higher levels on the prosodic hierarchy. Finally, I turn to the issue of epenthesis in Irish and Scots Gaelic into clusters of falling sonority, and show that these facts support the analysis of the prosodic hierarchy begun in chapter 3.

Chapter 6 concludes the dissertation with a summary of the main points of the previous chapters, followed by an overview of the history of the prosodic structure of the Goidelic languages and directions for further research.

CHAPTER TWO INTRODUCTION TO THE GOIDELIC LANGUAGES

2.1 The position of Goidelic in Indo-European

The Celtic branch of the Indo-European language family is often regarded as having a major sub-branch called Insular Celtic. Excluded from Insular Celtic are the Celtic languages found inscriptionally on the European Continent, such as Gaulish, Celtiberian,¹ and Lepontic.² Insular Celtic is then further subdivided into two branches: Brittonic (or Brythonic; including Welsh, Cornish and Breton) and Goidelic.³ Goidelic inscriptions that may date as far back as the fourth century A.D. (Thurneysen 1946, 10) have been found in Britain and Ireland, but the first literary form of Goidelic is Old Irish, which dates back to the seventh or eighth century (McCone 1994, 63). Middle Irish covers the period from the tenth century to the early thirteenth (L. Breatnach 1994, 222), and Early (or Classical) Modern Irish refers to the language used from then until the middle of the seventeenth century (McManus 1994, 335).

According to Jackson (1951), although there were Goidelic speakers in Scotland and the Isle of Man by the fifth century A.D., Irish, Scots Gaelic, and Manx did not really begin to diverge from each other into separate languages until the late Middle Irish period or the very beginning of the Early Modern Irish (EMI) period. The languages never diverged from each other very greatly, and adjacent dialects were probably always mutually intelligible. As Ó Siadhail (1989, 2) points out, “A few centuries ago the Irish speaker might have traveled from Kerry [in the southwest] to

¹ Also known as Hispano-Celtic, e.g. by Eska and Evans (1993).

² The Celtic languages of the Continent are often grouped together as Continental Celtic, but as Fife (1993, 5) points out, this is just a convenient term for non-Insular languages. Not enough is known about the “Continental Celtic” languages to determine if they all descend from a common ancestor later than Proto-Celtic.

³ According to another theory, Goidelic separated early from the rest of Celtic, and Gaulish and Brittonic are closely related members of a sub-branch called Gallo-Brittonic or “P Celtic.” Goidelic and Celtiberian are referred to as “Q Celtic.” See MacAulay (1992b), Schmidt (1993), and references therein for details.

Schrijver (1995, 463 ff.) has argued persuasively that the features Brittonic has in common with Goidelic are older than the features that Brittonic has in common with Gaulish, showing that Insular Celtic was indeed a constituent branch of Celtic. Other features spread later from Gaulish to Brittonic (but not Goidelic) when Gaul and Britain (but not Ireland) were under Roman occupation.

Antrim [in the northeast] (and on to Scotland) and only noticed dialectal changes gradually shading into each other.”

A family tree showing the position of Goidelic in Indo-European is shown in figure 1.

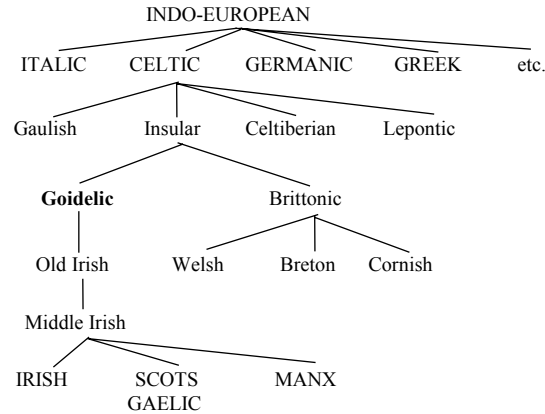


Figure 1. Goidelic in Indo-European

2.2 Dialects of Irish and Scots Gaelic

Modern Irish is divided into three major dialect groups: Munster, Connaught, and Ulster, named for the three historical provinces where they are spoken. The fourth province of Ireland, Leinster, is now entirely English-speaking. In addition, a committee set up by the Institiúid Teangeolaíochta Éireann (Linguistics Institute of Ireland) has established a “standardized” pronunciation of Irish, known as the *Lárchanúint* (*la:rxanu:n't* ‘central dialect’: Ó Baoill 1990) which is something of a compromise among the dialects, and closely follows the standard orthography. *Foclóir Póca* (Ó Liatháin & Nic Mhaoláin 1986, henceforth *FP*) lists the *Lárchanúint* pronunciation for each headword. I should emphasize that it is not a standard accepted by native speakers, but rather a suggestion made by a committee that hopes it will become standard. I will be citing the *Lárchanúint* only when making generalizations about Irish that hold for all dialects.

Scots Gaelic⁴ has many local varieties, of which the dialects most thoroughly studied are Argyll, Arran, and Kintyre in the southwest; Perth in the southeast; Ross, Skye, and Sutherland in the northeast; and Lewis

and South Hebridean⁵ in the northwest. There are also Gaelic-speaking communities on Cape Breton Island in Nova Scotia. Unless otherwise noted, Gaelic examples in this dissertation will be in the South Hebridean dialect.

Two dialects of Manx, Northside and Southside, were identified on the Isle of Man before the language perished. The last native speaker of Manx is said to have been Mr. Ned Maddrell, who died on December 27, 1974 (Broderick 1986, N. Williams 1994).

The geographical locations of the modern Goidelic languages are shown on the map in figure 2. The points on this map show the locations of the dialects described by the various early descriptive sources mentioned in § 1.1.1 and listed in the references. I do not refer to all of these places in the text of this dissertation.

There is some disagreement among generative linguists working on Irish whether the various dialects should all be assigned the same underlying representation for any particular form. Ó Siadhail (1989) follows this practice, but I think it requires overly abstract levels of analysis. For example, consider the two productive verbal-noun (v.n.) endings, which in EMI were *aγ* and *u:*.

- (1) Verbal noun endings in EMI
 - a. *mól-aγ* ‘praise’ (v.n.)
 - b. *b’áN-u:* ‘bless’ (v.n.)

In modern Munster, these endings are still distinct as *a* and *u:*.

- (2) Verbal noun endings in Munster
 - a. *mól-a* ‘praise’ (v.n.)
 - b. *b’an-ú:* ‘bless’ (v.n.)

But in Ulster, the two endings have merged into *u* as a result of phonological changes.

- (3) Verbal noun endings in Ulster
 - a. *mól-u* ‘praise’ (v.n.)
 - b. *b’áN-u* ‘bless’ (v.n.)

⁴ Henceforth called simply Gaelic.

⁵ A cover term for the dialect spoken in Barra, Benbecula, Harris, North Uist, and South Uist.



- | | | |
|------------------|--------------------|-----------------|
| 1. Achill | 10. Glencolmcille | 18. Rosmuck |
| 2. Applecross | 11. Iveragh | 19. South Uist |
| 3. Argyll | 12. Kintyre | 20. Tangaveane |
| 4. Arran | 13. Leurbost | 21. Teelin |
| 5. Ballyvourney | 14. Meenawannia | 22. Torr |
| 6. Cois Fhairrge | 15. Rathlin Island | 23. Tory Island |
| 7. Corkaguiney | 16. Ring | 24. Tourmakeady |
| 8. Durrrow | 17. Ros Goill | 25. Urris |
| 9. Erris | | |

Figure 2. Locations of the Modern Goidelic Languages

A child learning Ulster Irish would have no reason to assign two different underlying representations for the endings in these forms. Under Ó Siadhail's analysis, not only do the endings have separate underlying representations in Ulster as well as Munster, but the ending of *mólā* ~ *mólu* must be assigned /əɣ/ to keep it distinct from words that have ə in both dialects, e.g. Munster *kó:tā* ~ Ulster *kó:tā* 'coat'. This analysis is just too abstract to be plausible as a model to be learned by a speaker. Even the fact that the two forms have different genitives (*mólā* but *b'áNāhā* in Ulster) would not compel the learner to establish underlying /mEləɣ/⁶ for *mólu* and /b'áNu:/ for *b'áNu*. Rather, the learner would simply postulate that some verbal nouns in -u have genitives in -tā and others have genitives in -āhā. Indeed, Quiggin points out (1906, 22) that there has been "hopeless confusion of the two conjugations" in Ulster Irish.

I believe, therefore, that Munster and Ulster (as well as Connacht) have separate underlying representations, as well as separate phonemic and surface sound inventories. The various sound inventories of the Goidelic languages will be examined in the next section.

2.3 Sound inventories

2.3.1 Old Irish

The consonant inventory of Old Irish is as shown in (4) (Thurneysen 1946, Quin 1975). *N N' L L' R R'* represent fortis sonorants whose precise articulation is unknown, but which were probably longer, tenser, and generally more strongly articulated than their lenis counterparts *n n' l l' r r'*. I assume that the phonological difference between the fortis and lenis sonorants is that the former are marked with some feature (perhaps [+tense]) and the latter are unmarked (or [-tense]).

(4) Consonants of Old Irish

	Plain			Palatalized		
Vcls. stops	p	t	k	p'	t'	k'
Vcd. stops	b	d	g	b'	d'	g'
Vcls. frics.	f	θ s	x h	f'	θ' s'	x' h'
Vcd. frics.	v v̄	ð	ɣ	v' v̄'	ð'	ɣ'
Nasals	m	N n	ŋ	m'	N' n'	ŋ'
Liquids		L l R r			L' l' R' r'	

⁶ See § 2.3.2 below for the phoneme /E/.

The inventory of Old Irish vowels is as shown in (5).

(5) Vowels of Old Irish

Short		Long	
i	u	i:	u:
e	o	e:	o:
a		a:	

The distribution of short vowels in unstressed syllables requires comment. All short vowels may appear in unstressed final open syllables, after both plain and palatalized consonants. The front vowels *e* and *i* are often spelled ⟨*ae*⟩ and ⟨*ai*⟩ after plain consonants, which might indicate a retracted pronunciation here, perhaps something like *ɛ* and *ɪ* (J. Jasanoff, p.c.). All ten possibilities are shown in the examples in (6).

(6) Unstressed vowels in absolute final position

már <u>v</u> a	‘kill’ (1 sg. subj.)	L’ <u>é</u> :g’ <u>a</u>	‘leave’ (1 sg. subj.)
már <u>v</u> e	‘kill’ (2 sg. subj.)	L’ <u>é</u> :g’ <u>e</u>	‘leave’ (2 sg. subj.)
már <u>v</u> i	‘kill’ (2 sg. indic.)	L’ <u>é</u> :g’ <u>i</u>	‘leave’ (2 sg. indic.)
sú:l <u>o</u>	‘eye’ (gen.)	dóR’s’ <u>o</u>	‘door’ (gen.)
már <u>v</u> u	‘kill’ (1 sg. indic.)	L’ <u>é</u> :g’ <u>u</u>	‘leave’ (1 sg. indic.)

In unstressed closed syllables, the quality of a short vowel is almost entirely predictable by the palatalization or nonpalatalization of the surrounding consonants. Between two plain (i.e. nonpalatalized) consonants, the vowel is *a*, as in *d’i:γal* ‘vengeance’ (nom.). Between a plain and a palatalized consonant the vowel is *e*, as in *d’l’iγ’ēδ* ‘law’ (nom./acc.). Before a palatalized consonant the vowel is *i*, as in *d’l’iγ’i* ‘vengeance’ (acc./dat.), and *d’l’iγ’iδ* ‘law’ (gen.). Again, after a plain consonant the spelling is often ⟨*ai*⟩, which may indicate a retracted pronunciation like *i*. The chief exceptions to this pattern are that *u* frequently appears when the following syllable contained an *u*: in PIC (e.g. *d’l’iγ’uδ* ‘law’ (dat.) < PIC **dligedu*:), and that *o* or *u* frequently appears after a plain labial (e.g. *L’évor* ‘book’; *dóvun* ‘world’).

By Middle Irish, unstressed *o* had become *a*, as had unstressed *e* after a plain consonant; the other unstressed vowels retained their identities

until the EMI period, when all unstressed short vowels became *ə*.⁷ An exception seems to be *ax*: this has remained *ax* (rather than *əx*) in unstressed position in Ulster, Manx, and some dialects of Gaelic. In Munster, *ax* attracts stress when not adjacent to a long vowel: see § 3.4.2.1 for details.

The inventory of Old Irish diphthongs is shown in (7).

(7) Diphthongs of Old Irish

Long (bimoraic)					Short (monomoraic)	
ai	ia	ui	au		iu	äu
oi	ua	iu	eu	ou	ëu	

During the Old Irish period, the number of diphthongs was beginning to decrease. By the time of Middle Irish, *ai* and *oi* had merged into a single sound,⁸ and *au* and *ou* had first merged together, and then became *o*:. By the beginning of the EMI period, *ui* had become *i*:, *iu* had become *u*:, *eu* had become *o*:, *iu* had become *u*, *ëu* had become *e*, and *äu* had become *a*. In fact, by EMI, the only remaining diphthongs were *ia* and *ua*.

2.3.2 Modern Irish (Lárchanúint)

The consonant inventory of the Lárchanúint of Modern Irish (*FP*, xiii–xv) is shown in the chart in (8).

(8) Consonants of the Lárchanúint

	Plain			Palatalized		
Voiceless stops	p	t	k	p’	t’	k’
Voiced stops	b	d	g	b’	d’	g’
Voiceless fricatives	f	s	x h	f’	s’	x’
Voiced frics./Glides	v		γ	v’		j
Nasals	m	n	ŋ	m’	n’	ŋ’
Liquids		l r			l’ r’	

In addition to the phonemes given above, *d’z’*, *w*, *z*, and *z’* are found in relatively uncommon, unassimilated loan-words from English (*d’z’ab* ‘job’, *wigwam* ‘wigwam’, *zu*: ‘zoo’, *z’il’əfo:n* ‘xylophone’: Ó Liatháin & Nic Mhaoláin 1986, xv). *FP* transcribes *j* as *γ’* but indicates that it is a glide, not a fricative (although the fricative *γ’* is found before consonants).

⁷ Though to this day in Irish, *ə* before a palatalized consonant sounds like *i*.

⁸ Its exact character is uncertain; by EMI it had become *uu*:.

Palatalized consonants are traditionally called “slender”; plain consonants are traditionally called “broad”. Plain consonants are usually velarized, especially noticeably before front vowels. Plain labials are labio-velarized before a front vowel, thus /bi:/ ‘yellow’ is pronounced roughly *bʷi:*. The realization of the palatalized consonants varies somewhat from dialect to dialect; for example, *tʰ* is an affricate *tʃ* in Ulster, a palatalized *tʰ* in Connacht, and an apical postalveolar *ʈ* in Munster. Palatalized *sʰ* is pronounced *ʃ* in all dialects. See Sutton (1992–93) and references therein for the phonetic realization of plain and palatalized consonants.

The long vowels and diphthongs of the Lárchanúint are as given in (9).

(9) Long vowels and diphthongs of the Lárchanúint

Long vowels		Diphthongs	
i:	u:	ai	iə
e:	o:	au	uə
a:			

FP (xiii) indicates five stressed short vowel phonemes *i e a o u*, plus the unstressable *ə*, but as both Ó Siadhail (1989, 35 ff.) and Ní Chiosáin (1991, 11; 1994) observe, the [back] feature of short vowels is predictable, depending on the palatalized ([–back]) or plain ([+back]) quality of the surrounding consonants. The feature [round] is not really salient for short vowels; the [+back] allophones are somewhat more rounded than their [–back] counterparts, but rounding is never very strong in Irish. The stressed short vowel inventory is therefore as given in (10).

(10) Stressed short vowels of the Lárchanúint⁹

I	[+high, –low]
E	[–high, –low]
a	[–high, +low]

The allophones of /I/ are *i* and *u*, and those of /E/ are *e* and *o*. The difference between the front and back allophones of /a/ is not always indicated in broad transcription, nor shall I mark it here.

The only unstressed vowel is *ə* (pronounced *i* when adjacent to a

⁹ Ó Siadhail (1989) transcribes /I/ and /E/ as /u/ and /ə/, a practice I find misleading.

palatalized consonant), so in unstressed position the distinction among /I/, /E/, and /a/ is apparently lost. Somewhat arbitrarily, I will use /I/ for the underlying unstressed vowel before palatalized consonants, /a/ elsewhere.¹⁰

2.3.3 The spoken dialects of Irish

For the most part, the three major dialects of Irish have the same phonemic inventory as the Lárchanúint standard, but it would be well to discuss some of the most important differences.

The phonemic inventory of Munster (Sommerfelt 1927, Sjoestedt 1931, Sjoestedt-Jonval 1938, Ó Cuív 1944, R. B. Breatnach 1947, Dillon & Ó Cróinín 1961, Holmer 1962a, Ua Súilleabháin 1994) differs from that of the Lárchanúint as follows. The varieties of Munster described by Sommerfelt (1927), Sjoestedt (1931), Ó Briain & Ó Cuív (1947), and R. B. Breatnach (1947, 1961) are reported to have a distinct phoneme /hʰ/; but those described by Ó Cuív (1944) and Holmer (1962a) are not said to have this sound. Among the vowels, Munster has the additional diphthongs /əi/, /ou/ (or /əu/), and /ia/. Unstressed /a/ surfaces as *a*, rather than *ə*, when the following syllable is stressed and contains a long high vowel: /kaʰi:nʰ/ *kaʰi:nʰ* ‘girl’; /kʰartu:/ *kʰartú:* ‘correct’ (v.n.).

Connacht (de Bhaldraithe 1945, 1953, de Búrca 1958, Mhac an Fhailigh 1968, Stockman 1974, Ní Chiosáin 1991, Ó hUiginn 1994) differs from the Lárchanúint in that the glide *w* is found for /v/, at least in syllable-initial position. Only Ní Chiosáin (1991) reports the existence of a distinct /hʰ/; no other authors describing Connacht report it. Some varieties of Connacht have maintained some or all of the Old Irish tense sonorants /N L Nʰ Lʰ/ (but not /R Rʰ/). In the variety spoken in Cois Fhairrge, underlying short /a/ is realized as long front *a:* or *æ:* while underlying long /a:/ is realized as a back *a:*.

In Ulster (Quiggin 1906, Sommerfelt 1922, 1929, 1965, Ó Searcaigh 1925, Holmer 1940, 1942, Wagner 1959, Stockman & Wagner 1965, E. Evans 1969, Hamilton 1974, Lucas 1979, Hughes 1986, 1994) *w* is found for /v/ in all positions; and the descriptive grammars say that Ulster has all four *n*’s /N n Nʰ nʰ/ and all four *l*’s /L l Lʰ lʰ/. However, when I was in Glencolmcille, County Donegal, in 1995 I observed (in fact, I was TAUGHT) that *nʰ* and *l* had been lost in favor of *n* and *L* respectively. Lucas (1979)

¹⁰ See the discussion of Munster and East Mayo in chapter 3 for /E/ as an unstressed vowel.

reports that *n* and *l* have merged with *N* and *L* in the dialect of Ros Goill. Among the vowels, three additional long vowels /u:/, /ɜ:/, and /ɔ:/ are found, but Quiggin (1906) and Hughes (1986) observe that /u:/ and /ɜ:/ are being replaced with /i:/ and /e:/ respectively. /E/ has three [+back] allophones: *o* adjacent to labials, *ə* before a voiced stop, a nasal or /L/, and *ɔ* elsewhere. /l/ has two [+back] allophones: *u* before word-final /w/ and /h/, *ə* elsewhere.

2.3.4 Gaelic

The consonant inventory of Gaelic (Robertson 1906, Borgström 1937, 1940, 1941, Holmer 1938, 1957, 1962b, Oftedal 1956, Dilworth 1958, Mac Gill-Fhinnein 1966, Ternes 1973, Watson 1974, 1983, 1986, 1994, Dorian 1978, Ó Murchú 1989, Gillies 1993) is shown in (11).

(11) Consonants of Gaelic

	Plain			Palatalized	
	p ^h	t ^h	k ^h	t ^h	k ^h
Voiceless aspirated stops	p ^h	t ^h	k ^h	t ^h	k ^h
Voiceless unaspirated stops	p	t	k	t'	k'
Voiceless fricatives	f	s	x h	s'	x'
Voiced fricatives	v		ɣ		ɣ'
Glide					j
Nasals	m	N n	ŋ	N'	ŋ'
Liquids		L l R r		L' r'	

The biggest differences between the Irish systems and that of Gaelic are (i) the replacement of the voiceless : voiced distinction in stops with an aspirated : unaspirated distinction, (ii) the loss of distinctive palatalization in the labials, and (iii) the separation of *ɣ'* and *j* into separate phonemes. The vowels of Gaelic are as shown in (12).

(12) Vowels of Gaelic

Short vowels			Long vowels		
i	u	u	i:	u:	u:
e	ə	ɜ	e:	ɜ:	o:
ɛ	a	ɔ	ɛ:	a:	ɔ:

It is not clear to what extent the short vowels are all phonemically distinct. As in Irish, there is a tendency for back vowels to occur adjacent to non-

palatalized consonants and front vowels to palatalized ones, but the loss of distinctive palatalization among the labials, /h/, /n/, /l/, and /R/ has complicated the picture. The description of diphthongs in Gaelic depends heavily on the analysis of syllable structure; see § 5.1.2.

2.3.5 Manx

The consonant inventory of Manx at the time of its extinction (Jackson 1955, Broderick 1986, 1993, N. Williams 1994) is given in (13).

(13) Consonants of Manx

	Plain			Palatalized	
	p	t	k	t'	k'
Voiceless stops	p	t	k	t'	k'
Voiced stops	b	d	g	d'	g'
Voiceless fricatives	f	s	x h	s'	x'
Voiced fricatives	v	ð z	ɣ	z'	
Glides	w				j
Nasals	m	n	ŋ	n'	ŋ'
Liquids		l r		l' r'	

Manx shares with Gaelic the absence of palatalized labials. Unlike Irish and Gaelic, Manx has a distinction between /w/ and /v/. A late lenition of intervocalic obstruents has introduced the sounds *ð z z'*, but these may not be phonemes.

The vowels of Manx are shown in (14).

(14) Vowels of Manx

Short vowels		Long vowels	
i	u	i:	u:
e	ə	e:	o:
	a		a:

The same problem of determining the phonemic status of the short vowels in Gaelic mentioned above is present in Manx; Manx also has the same problems as Gaelic in defining the diphthongs.

2.3.6 A note on nasalized vowels

According to the descriptive grammars, in Connacht and Ulster, all vowels can be nasalized when adjacent to nasal consonants, including Old Irish

and EMI \tilde{v} ; this nasalization is maintained however even when the consonant is denasalized. For example, in a leniting environment after the definite article (see (22) below), an initial s becomes t , but the cluster sN becomes tr since tN is disallowed in these dialects. The vowel that is nasalized after the sN then remains nasalized even when the cluster becomes tr . Examples from Cois Fhairrge (Connacht) are given in (15).

(15) Nasalized vowels in Connacht (de Bhaldraithe 1945, 46)			
	Connacht	EMI	Gloss
a.	Lā:w	La:ṽ	‘hand’
b.	sāuru:	sāvray	‘summer’
c.	k’r’ād	k’n’ad	‘gasp’
d.	trū:hā:n	tnu:ha:n	‘expect’ (v.n.)
	Indefinite	Definite	
e.	sNā:həd’ ‘needle’	ə trā:həd’ ‘the needle’	
f.	s’N’āxtə ‘snow’	ə t’r’āxtə ‘the snow’ (gen.)	

Quiggin (1906) states that these nasalized vowels are falling out of use among the “young people” in Ulster; they may perhaps be no longer common in Connacht either. Ó Dochartaigh (1992, 88) says that if nasalization is distinctive in any Irish dialects, it is so only among older speakers.

In at least some dialects of Gaelic, the nasal and oral vowels contrast even adjacent to nasal consonants, and may be phonemically distinct in all dialects.

(16) Nasal and oral vowels in Applecross Gaelic (Ternes 1973, 125)				
	mūxk	‘pig’	mur	‘sea’
	mā:har	‘mother’	marav	‘dead’

See van der Hulst and Smith (1982a) for a discussion of nasalized vowels and nasal spreading in Applecross Gaelic. Even though nasalization is apparently phonemic in Gaelic, authors often leave it unmarked in broad transcription. I shall indicate it only when the author I am quoting does.

2.4 Initial consonant mutations

All of the Insular Celtic languages are characterized by a series of initial consonant mutations. Historically, these originate in phonological proc-

esses that occurred across a word boundary; for example, if a vowel was followed by a voiced stop, the voiced stop would become a voiced fricative. This process, called lenition, happened both within words and across word boundaries. Examples from reconstructed Proto-Insular Celtic are given in (17).¹¹

(17) Lenition in Proto-Insular Celtic				
(a.)	/sinda:/	‘the (fem.)’	+ /ble:dani:/	‘year’
	sinda: vle:ðani:	‘the year’		
(b.)	/eho/	‘his’	+ /markos/	‘horse’
	eho ṽarkos	‘his horse’		

There was no lenition after forms that did not end in a vowel.

(18) No lenition				
(a.)	/sindos/	‘the (masc.)’	+ /bitus/	‘world’
	sindos bitus	‘the world’		
(b.)	/eha:s/	‘her’	+ /markos/	‘horse’
	eha:s markos	‘her horse’		

By the time Old Irish and Old Welsh are attested, most PIC (unstressed) final syllables had been lost, and the question of whether a voiced stop would be lenited to a fricative (and likewise for the other initial consonants) had become part of the morphosyntax of the languages: the initial consonant of a feminine noun is lenited after the definite article, but the initial consonant of a masculine noun is not. Likewise there is lenition after ‘his’ but not after ‘her’. (The lenition of the word-internal d in ‘year’ had been phonologized; that is, /ð/ simply became a separate phoneme from /d/. The postvocalic PIC t in *bitus* ‘world’ also underwent lenition, to d in Brittonic and to θ in Goidelic; in Brittonic, the k in *markos* ‘horse’ spirantized to x after r .) The Old Irish and Middle Welsh¹² equivalents of (17–18) above are given in (19).

¹¹ The reconstructions in (17)–(18) are my own, but are generally uncontroversial. However, not all researchers would agree with my analysis of lenition; many believe that lenition arose separately in Goidelic and Brittonic. Nevertheless, I think the facts support a theory that says lenition began in Proto-Insular Celtic with the sonorants and voiced stops (m patterning with the latter rather than the former), and was extended to the voiceless stops separately in Goidelic and Brittonic.

¹² Old Welsh is scantily attested, so I quote forms from Middle Welsh (D. S. Evans 1976).

) above are given in (19).

(19) Lenition and absence of it in Old Irish and Modern Welsh

(a.) Feminine nouns: lenition after definite article

O.Ir.	/iN/ 'the' + /b'iaðin/ 'year'	iN v'l'iaðin'	'the year'
MW	/ə/ 'the' + /bluiðin/ 'year'	ə vlu:ðin	'the year'

(b.) Masculine nouns: no lenition after definite article

O.Ir.	/iN/ 'the' + /b'iθ/ 'world'	iN b'iθ	'the world'
MW	/ə/ 'the' + /bɪ:d/ 'world'	ə bɪ:d	'the world'

(c.) Lenition after 'his'

O.Ir.	/a/ 'his' + /mark/ 'horse'	a v̄ark	'his horse'
MW	/ɦ/ 'his' + /marx/ 'horse'	ɦ varx	'his horse'

(d.) No lenition after 'her'

O.Ir.	/a/ 'her' + /mark/ 'horse'	a mark	'her horse'
MW	/ɦ/ 'her' + /marx/ 'horse'	ɦ marx	'her horse'

Lenition has thus become phonologically unpredictable in the attested Insular Celtic languages. It serves an entirely morphosyntactic function: for example, to distinguish feminine nouns from masculine nouns after the definite article, or to distinguish the homophonous words for 'his' and 'her'. Other final sounds in PIC resulted in other mutations in the attested languages: final *n* in PIC led to the mutation called nasalization in both Brittonic and Goidelic, and final *s* in PIC led to the mutation called spirantization in Brittonic and to the prefixation of *h* to vowels in both Brittonic and Goidelic.

2.4.1 Old Irish

The mutations in Old Irish are as shown in the table in (20). Under lenition, stops (including *m*) turn into fricatives, *f* is deleted, *s* becomes *h*, and the fortis ([+tense]) sonorants become lenis ([−tense]). Under nasalization, voiceless stops and *f* become voiced, voiced stops become prenasalized, and *s*, *m*, and the fortis sonorants are unaffected. Homorganic clusters are never lenited; this is most obvious after the definite article *iN*, where *t*(') and *d*(') do not undergo lenition.

(20) The mutations of Old Irish

Basic	Lenition	Nasalization
p(')	f(')	b(')
t(')	θ(')	d(')
k(')	x(')	g(')
b(')	v(')	m(')b(')
m(')	v̄(')	m(')
d(')	ð(')	N(')d(')
g(')	ɣ(')	ŋ(')g(')
f(')	Ø	v(')
s(')	h(') ¹³	s(')
N(')	n(')	N(')
L(')	l(')	L(')
R(')	r(')	R(')

Vowel-initial stems are unaffected by lenition; under nasalization *N* is prefixed to back vowels and *N'* to front vowels. After a particle that causes no mutation to consonants, a vowel-initial stem has *h*(') prefixed if the particle itself ends in a vowel.

2.4.2 Modern Irish

The mutations work basically the same in Modern Irish (examples cited in Lárchanúint pronunciation) as in Old Irish, with the following exceptions: *t*(') lenites to *h*('), *m*(') lenites to *v*('), *d* lenites to *ɣ*, *d'* and *g'* lenite to *j*, the prenasalized voiced stops *m*(')*b*(') *N*(')*d*(') *ŋ*(')*g*(') have become pure nasals *m*(') *n*(') *ŋ*('), and the fortis sonorants stay fortis under lenition (in the dialects that maintain the fortis : lenis distinction). In dialects that do not retain *h'*, *s'* and *t'* lenite to *h* before front vowels and to *x'* before back vowels.¹⁴ *s*(') does not lenite before voiceless stops or *m*(').¹⁵ Thus there are two ways in which *m* patterns with the oral stops rather than with the sonorants: (i) it lenites to a fricative rather than a lenis sonorant, and (ii) it blocks the lenition of *s*, which the sonorants do not (e.g. *sna:v* 'swim')

¹³ A small number of words beginning with *s'* lenite to *f'* instead of *h'*; historically they had initial **sw*-.

¹⁴ It is possible that these dialects retain the phoneme /*h*'/, but that its allophones are identical to those of /*h*/ and /*x*'/.

¹⁵ Except, according to Ó Siadhail (1989,113), "in at least some Munster dialects." He cites *hmut* 'stump' (len.) from Dunquin, Co. Kerry.

(impv.) vs. *hna:v* ‘swim’ (past)).

In work on Modern Irish, lenition has also been known as aspiration or by its Irish name, (*séimhiú*) *s'e:v'u:*, and nasalization as eclipsis or (*urú*) *uru:*. The sounds *x()* *γ* *j* *η()* occur in initial position only when derived by a mutation, although in some words the mutated form has been lexicalized, e.g. *x'al* (a verbal particle), *xi:x'ə* ‘ever’, *γa:* ‘two’. The sounds *v* (*w* in Connacht and Ulster) and *v'* occur in initial position only in loan-words (e.g. *vo:tə* ‘vote’, *v'ail'i:n'* ‘violin’) and in words with lexicalized mutation (e.g. *vur* ‘your (pl.)’, *v'eh* ‘being’). The mutations have been analyzed theoretically by Ní Chiosáin (1991, 13 ff.) and Swingle (1993). A chart of the initial consonant mutations is shown in (21).

(21) Modern Irish consonant mutations

Basic	Lenition	Nasalization
p()	f()	b()
t	h	d
t'	h' ~ h/x'	d'
k()	x()	g()
b()	v()	m()
m()	v()	m()
d	γ	n
d'	j	n'
g	γ	ŋ
g'	j	ŋ'
f()	∅	v()
s	h	s
s'	h' ~ h/x'	s'

After the definite article *ən*, *d()* and *t()* do not lenite, and *s()* becomes *t()* where lenition is expected. Vowel-initial stems get *t()* attached after *ən* where no lenition is expected.

(22) Mutation after *ən* ‘the’

	No mutation expected (nominative)	Lenition expected (genitive)	Gloss
C-	<i>ən pa:s't'ə</i>	<i>ən fa:s't'ə</i>	‘the child’
V-	<i>ən t-is'k'ə</i>	<i>ən is'k'ə</i>	‘the water’
	<i>ən t'-o:ləs</i>	<i>ən' o:ləs'</i>	‘the knowledge’
s-	<i>ən soləs</i>	<i>ən toləs'</i>	‘the light’
t-	<i>ən tarəv</i>	<i>ən tar'əv'</i>	‘the bull’
d-	<i>ən d'er'ə</i>	<i>ən d'er'i:</i>	‘the end’

Whether *t* or *t'* is prefixed to a vowel-initial word depends on whether the word began with a back or front vowel in Old Irish. In the V-initial examples in (22), ‘water’ began with a back vowel in Old Irish *us'k'e*, so plain *t* is prefixed to the Modern Irish *t-is'k'ə*. On the other hand, ‘knowledge’ began with a front vowel in Old Irish *eulas*, so palatalized *t'* is prefixed to the Modern Irish *t'-o:ləs*. Notice that the article is palatalized to *ən'* before *o:ləs* as well. Synchronically in Modern Irish, V-initial words have to be marked as to whether they take plain or palatalized consonant prefixes. See Ní Chiosáin (1991, 1995) for analyses.

Vowel-final particles that do not mutate consonants (e.g. *xo* ‘as’: cf. *b'eg* ‘small’ with *xo b'eg* ‘as small’) attach *h* to vowel-initial words: *a:rd* ‘tall’, *xo ha:rd* ‘as tall’.

2.4.3 Gaelic

Lenition in Gaelic is basically the same as lenition in Irish, but the fortis: lenis distinction in sonorants is generally preserved. Also, since the voiced: voiceless distinction in stops has been replaced by an unaspirated: aspirated distinction, it is important to mention that unaspirated stops are lenited to voiced fricatives, and aspirated stops are lenited to voiceless fricatives.¹⁶

(23) Lenition in Gaelic

Basic	Lenition
p ^h	f
t() ^h	h

¹⁶ This might be taken as evidence that the underlying phonation distinction for stops really is one of voicing, but see below for why that idea is untenable.

k(ʰ)	x(ʰ)
p	v
m	v
t(ʰ)	ɣ(ʰ)
k(ʰ)	ɣ(ʰ)
f	∅
s(ʰ)	h ¹⁷
N(ʰ)	n
L	L
L'	l'
R	r

The Old Irish mutation known as nasalization is no longer part of Gaelic grammar, but Gaelic does have a phonological process whereby the final nasal of a proclitic affects a following stop. I refer to this process as “neo-nasalization.” In some dialects, including the South Hebridean dialect, stops after nasals (which are always homorganic) have become partially or completely voiced; in the case of the aspirated stops, in many of these dialects the aspiration remains, which is why, at least for those dialects, the underlying phonation contrast for stops must be one of aspiration rather than voicing. The nasal may be greatly reduced or even deleted.

(24) Neo-nasalization in South Hebridean Gaelic

Underlying	Surface
m + p ^h	^m b ~ ^m b ^h
N + t(ʰ)	^N d(ʰ) ~ ^N d(ʰ) ^h
ŋ + k(ʰ)	^ŋ g(ʰ) ~ ^ŋ g(ʰ) ^h
m + p	^m b
N + t(ʰ)	^N d(ʰ)
ŋ + k(ʰ)	^ŋ g(ʰ)

In the dialect of Lewis, the nasal is predominant, and the stop may be greatly reduced or even eliminated. Borgstrøm (1940, 22) reports that the velum is raised a moment before the occlusion is released, resulting in a slight oral off-glide in forms like ə *m^baul* ‘the limb’, which is from /ə^m paul/. This contrasts with forms like ə *maxk* ‘the son’, from /ə^m maxk/, where the consonant is nasal throughout.

¹⁷ The lenition of sL- sN- str- (< /st-/) is l- n- r- (not hl- hn- hr-, as in Irish).

Only stops are affected by neo-nasalization; other sounds are unchanged. As neo-nasalization is always predictable from context, and since it has no effect on the prosodic structure of Gaelic, I shall be transcribing such groups simply as ə^m p^heuN ‘the head’, ə^m paul ‘the limb’, etc.

2.4.4 Manx

Lenition in Manx is only slightly different from that in Irish and Gaelic, as shown in the chart in (25).

(25) Lenition in Manx

Basic	Lenition
p	f
t	h
t'	h/x'
k(ʰ)	x(ʰ)
b	v
bw	w
m	v
mw	w
d	ɣ
d'	j
g	ɣ
g'	j
f	∅
fw	hw
s	h
s'	h/x'

Nasalization was not a regular feature of Manx grammar when the language died, but Broderick (1986, 66) reports that a few fossilized traces of it are found, e.g. *nən do:s* ‘in their silence’, cf. *to:s* ‘silence’, with the *t ~ d* alternation found under nasalization in Irish (see (21)).

2.5 Syllable structure

2.5.1 Irish

Syllable onsets in Irish may consist of single consonants, or clusters of obstruent plus sonorant. (Under nasalization, nasal plus liquid is also al-

lowed.) Voiceless stops may also be preceded by a sibilant. Clusters generally agree in palatalization, although plain *s* rather than palatalized *s'* precedes the palatalized labials *p'* and *m'*. *n n'* may follow only velars, *t t'*, *s s'*, or *h*, except in the word *mna*: 'woman's; women', and in forms derived from this word. Onset consonants are not obligatory in Irish, as vowel-initial words are permitted (e.g. *is'k'ə* 'water', *o:ləs* 'information').

(26) Onset clusters in Irish (^L = only under lenition; ^N = only under nasalization)

pl	p'l'	pr	p'r'	bl	b'l'	br	b'r'
fl	f'l'	fr	f'r'	vl ^L	v'l ^L	vr ^L	v'r ^L
ml ^N	m'l ^N	mr ^N	m'r ^N				
tl	t'l'	tr	t'r'	dl	d'l'	dr	d'r'
nl ^N	n'l ^N	nr ^N	n'r ^N				
sl	s'l'	sr		hl ^L	h'l ^L	hr ^L	h'r ^L
kl	k'l'	kr	k'r'	gl	g'l'	gr	g'r'
xl ^L	x'l ^L	xr ^L	x'r ^L	ɣl ^L	ɣ'l ^L	ɣr ^L	ɣ'r ^L
ɲl ^N	ɲ'l ^N	ɲr ^N	ɲ'r ^N				
sp	sp'	spr	sp'r'	st	s't'	str	s't'r'
sk	s'k'	skl	s'k'l'	skr	s'k'r'		
kn	k'n'	gn	g'n'	xn ^L	x'n ^L	ɣn ^L	ɣ'n ^L
ɲn ^N	ɲ'n ^N	tn	t'n'	sn	s'n'	hn ^L	hn'
sm	sm'						

Comments on the above table:

- Certain other onset clusters are possible in rapid speech, when unstressed vowels are deleted; examples from Munster include *fnaxt* for *fənaxt* 'wait' (v.n.) (Holmer 1962a, 46) and *gva:l'* for *gəva:l'* 'take' (v.n.) (Dillon & Ó Cróinín 1961, 227).
- *s'r'* is disallowed in Modern Irish: historical examples (e.g. O.Ir. *s'R'ev* 'stream') now have *sr* (Lárchanúint *srav*).
- In the clusters *hl()*, *hr()*, and *hn()*, the sonorants are devoiced; this does NOT mean, however, that Irish has voiceless sonorant phonemes, as Maddieson (1984) and Ladefoged & Maddieson (1996) imply.
- Following Ó Siadhail & Wigger (1975), Ó Siadhail (1989), Ní Chiosáin (1990 et seq.), and others, I write *sp st sk xt* where R. B. Breatnach (1947, 1961), Ó Cuív (1944), Ó Briain & Ó Cuív (1947), and others write *sb sd sg xd*. Both R. B. Breatnach (1947) and Ó Cuív

(1944) state that the stops in question are fully voiceless (like *p t k*) and unaspirated (like *b d g*); the choice of representation is therefore somewhat arbitrary.

- In Connacht and Ulster, as well as Gaelic and Manx, only *s()* *h* are allowed to precede a nasal at the beginning of a syllable. After other consonants, *n()* have become *r()* (e.g. Ulster *kra:w* vs. Munster *kna:v* 'bone').

Syllable codas may consist of a single consonant, or of a cluster of nasal plus homorganic voiceless stop, or liquid plus obstruent, provided the obstruent is either a voiceless stop or *d()*. Also permitted are clusters of sibilant plus voiceless stop, as well as *xt*. As with the onset clusters, coda clusters generally agree in palatalization, but *r* is not palatalized before *t'*, nor is *x* palatalized before *t'*.

(27) Coda clusters in Irish

rp	r'p'	rt	rt'	rk	r'k'	rd	rd'
lp	l'p'	lt	lt'	lk	l'k'	ld	ld'
mp	m'p'	nt	n't'	ɲk	ɲ'k'	rn	rn'
sp	s'p'	st	s't'	sk	s'k'	xt	xt'

Other clusters exist underlyingly, but are broken up by an epenthetic vowel, as will be discussed in chapter 5.

2.5.2 Gaelic

The onset clusters permitted in Gaelic are listed in (29).

(29) Onset clusters in Gaelic

pl	p ^h l	p'l'	p ^h l'	pr	p ^h r	pr'	p ^h r'
fl	f ^h l'	fr	fr'	vl ^L	v ^h l ^L	vr ^L	v ^h r ^L
tl	t ^h l	t'l'	t ^h l'	tr	t ^h r	t'r'	t ^h r'
sL	s'L'	/sr/ → str ¹⁸					
kl	k ^h l	k'l'	k ^h l'	kr	k ^h r	k'r'	k ^h r'
xl ^L	x ^h l ^L	xr ^L	x ^h r ^L	ɣl ^L	ɣ ^h l ^L	ɣr ^L	ɣ ^h r ^L
sp	spr	st	s't'	str ¹⁸			
sk	sk'	skl	sk'l'	sk'r'			
sN	s'N'	sm					

¹⁸ *str* from underlying /sr/ is lenited to *r*-: *strɔ:n* 'nose' : *mə rɔ:n* 'my nose'. Underlying /str/ is not affected by lenition: *strax'k'* 'pride' : *mə strax'k'* 'my pride'.

In many dialects of Gaelic, the aspirated stops are preaspirated when they follow a stressed vowel, regardless of whether they are followed by another vowel or not. When a sonorant intervenes between the stressed vowel and the aspirated stop, preaspiration of the stop is realized as devoicing of the liquid. In the case of $k^{(h)}$, the preaspiration has become a fully segmental $x^{()}$; likewise between r and $t^{(h)}$ the preaspiration has become a fully segmental s . Examples of preaspiration are shown in (30); in the orthography, $\langle p t c \rangle$ indicate aspirated stops.

(30) Preaspiration in Gaelic (examples from Mac Gill-Fhinnein 1966, 6 ff.)

a.	$t^h a^h p i$	$\langle t a p a i d h \rangle$	‘clever’
b.	$k^h a^h t$	$\langle c a t \rangle$	‘cat’
c.	$r a \text{̥} p$	$\langle o i d h e a r p \rangle$	‘attempt’
d.	$f a \text{̥} t$	$\langle f a l t \rangle$	‘hair’
e.	$m a x k$	$\langle m a c \rangle$	‘son’
f.	$a \text{̥} x k$	$\langle o l c \rangle$	‘bad’
g.	$k^h i \text{̥} x k'$	$\langle c i r c \rangle$	‘hen’ (dat.)
h.	$k^h a \text{̥} r s t$	$\langle c e a r t \rangle$	‘right’
i.	$k^h u \text{̥} r s t'$	$\langle c u a i r t \rangle$	‘visit’

The coda clusters of Gaelic are listed in (31).

(31) Gaelic coda clusters

$r p$	$r s t^{()}$	$r x^{()} k^{()}$	
$l p$	$l^{(')} t^{()}$	$l^{(')} x^{(')} k^{()}$	
$m p$	$N^{(')} t^{()}$	$\text{̥}^{(')} k^{()}$	
$s^{(')} p$	$s^{(')} t^{()}$	$s^{(')} k^{()}$	$x^{(')} k^{()}$

The Irish cluster xt has become xk in Gaelic, as in $p \text{̥} x k$ ‘poor’ (cf. Irish $b o x t$ ‘id.’). Gaelic, like Irish, epenthesizes other coda clusters; see chapter 5 for details.

2.5.3 Manx

The syllable structure of Manx is largely the same as that of Irish, with two notable exceptions.

First, the glide w appears as the second consonant of initial clusters, appearing after labials, velars, and h : $p w$, $b w$, $f w$, $m w$, $k w$, $g w$, $x w$, $h w$ are

attested (Broderick 1986, 23).

Second, as Broderick (1986, 28 ff.) points out, a nasal or lateral after a stressed vowel may acquire a homorganic voiced stop, a phenomenon known as preocclusion.

(32) Preocclusion in Manx

a.	$k'am \sim k'abm$	‘crooked’
b.	$be:n \sim be:dn \sim bedn$	‘white’
c.	$loŋ \sim loŋŋ$	‘ship’
d.	$s'u:l \sim s'u:dl$	‘walking’

For the most part, there seems to be free variation between forms with and without preocclusion, but Broderick (1986, 30) points out that some forms (e.g. $k i d n$ ‘sea’, $l e d n$ ‘full’) are only found with preocclusion. A long vowel may be shortened before preocclusion, as in (32b), but Broderick (1986, 33) shows that such syllables are still heavy, at least in Manx verse.

The phonemic inventories and syllabic structure of the modern Goidelic languages have not changed very greatly since Old Irish, although we have seen a certain amount of variation. Most notably, some dialects have lost or reduced the distinction between fortis and lenis sonorants; some dialects have lost distinctive palatalization for certain classes of sounds; and Gaelic stops are now distinguished by aspiration instead of voicing. All modern Goidelic languages retain lenition as a morphosyntactic process, but only the Irish dialects also retain morphosyntactic nasalization. In chapter 3, we see how the definition of a heavy syllable has changed between Old Irish and the modern languages, and what effects the Weight-to-Stress principle has had.

CHAPTER THREE
STRESS IN GOIDELIC AND THE ROLE OF
THE WEIGHT-TO-STRESS PRINCIPLE¹

In this chapter and the two that follow, I examine the evidence that the Goidelic languages bring for the prosodic constituency and its hierarchical arrangement. Here in chapter 3, I examine the stress pattern of the Goidelic languages and show that the Weight-to-Stress Principle (WSP) (Prince 1990) is absolutely essential to a discussion of stress in these languages. The WSP has an effect on the type of foot that is permitted in Goidelic, and on syllable weight, thus touching on the relevance of the foot, syllable, and mora levels of the hierarchy.

In § 3.1 I present the WSP and Grouping Harmony (a formula for determining the well-formedness of feet) and the consequences these have on syllable weight and stress placement, using evidence from two non-Goidelic languages, Fijian and Yana. In § 3.2 I give a general overview of the metrical structure of the Goidelic languages, discussing such issues as stress placement and what makes heavy and light syllables in Goidelic (and how this has changed between Old Irish and the modern languages). In § 3.3 I show how the Weight-to-Stress Principle has affected the prosodic development of the Goidelic languages from Proto-Insular Celtic to Early Modern Irish, and in § 3.4 I show how the WSP has continued to affect the prosodic structure of the modern languages.

3.1 Quantitative and accentual consequences of WSP and Grouping Harmony

The Weight-to-Stress Principle makes the cross-linguistic generalization that if a syllable is heavy, it tends to be stressed, and conversely, that if a syllable is unstressed, it tends to be light.

¹ Part of this chapter was presented at the Annual Meeting of the Linguistic Society of America in Chicago in January 1997. I should like to thank audience members for their insightful questions and comments. An early version of this chapter also appears as Green (1996a).

(1) **Weight-to-Stress Principle** (Prince 1990)

Primary statement

- a. If heavy, then stressed.

Contraposition

- b. If unstressed, then light.

There is no prediction in the opposite direction: the WSP does NOT say that stressed syllables tend to be heavy or that light syllables tend to be unstressed.

Two major effects may be expected to enforce compliance with the WSP: stressing of heavy syllables (especially noticeable in a position where the language otherwise disfavors stress), and the lightening of unstressed heavy syllables.

Grouping Harmony (Prince 1990) is a mechanism for predicting the best-formed feet. Hayes (1985) observes that in iambic systems, the stressed syllable tends to be quantitatively greater than the unstressed syllable, while in trochaic systems, the stressed and unstressed syllables tend to be the same size. Prince gives two statements to capture these generalizations ($|Z|$ indicates the size of Z, as measured in moras).

(2) Iambic Quantity

In a rhythmic unit (W S), $|S| > |W|$, preferably.

(3) Trochaic Quantity

In a rhythmic unit (S W), $|S| = |W|$, preferably.

The result of this observation is that iambic systems judge (L \acute{H}) feet to be better-formed than (L \acute{L}) and (\acute{H}) feet, while trochaic systems judge (\acute{L} L) and (\acute{H}) feet to be better-formed than (\acute{H} L) feet. Both systems strongly disfavor (\acute{L}) feet, which are binary at neither the syllabic nor the moraic level of analysis. Prince (1990) summarizes all these generalizations into a single grouping generalization.

(4) Grouping generalization

$LH \succ \{LL, H\} \succ HL \succ L$

(The symbol \succ means 'is better than'.)

In order to derive the generalization in (4), Prince (1990) devises the function known as Grouping Harmony.

(5) Grouping Harmony

Let G be a Rhythmic unit, at most binary on syllables or moras.

Let X be the first element of G .

Let $Y = G - X$ (in other words, $G = (X + Y)$).

Let $|Z|$ be the size of Z , measured in moras.

The harmony H of G is defined as the following function: $H(G) = |Y| \div |X|$.

The harmony H of each type of foot can now be calculated.

(6) Foot type ($X + Y$)	$ X $ = μ in X	$ Y $ = μ in Y	$ Y \div X $ = H
a. $L + H$	1	2	$2 \div 1 = 2$
b. $L + L, H (= \mu + \mu)$	1	1	$1 \div 1 = 1$
c. $H + L$	2	1	$1 \div 2 = 0.5$
d. L	1	0	$0 \div 1 = 0$

The greater the value of H , the better formed the foot.

A number of OT constraints have been proposed to derive the effects of Grouping Harmony. First of all, the bias against (L), which is not binary at either the syllabic or the moraic level, is attributed to FOOT BINARITY (usually abbreviated FTBIN). FTBIN may be stated in terms of either syllables or moras.

(7) **FTBIN** (cf. McCarthy & Prince 1993a, 43; Prince & Smolensky, 47)

(moraic): Feet are binary at the moraic level.

(syllabic): Feet are binary at the syllabic level.

Whether a language chooses the moraic or syllabic interpretation of FTBIN usually depends on whether the metrical structure is quantity sensitive or insensitive.

The leftheadedness of trochees and righthheadedness of iambs is the domain of FTFORM.

(8) **FTFORM**

(trochaic): Feet are ($S W$).

(iambic): Feet are ($W S$).

The iambic preference for ($L \acute{H}$) over ($L \acute{L}$) and (\acute{H}) is stated by IAMBIC QUANTITY (abbreviated IAMBQ), which corresponds to the statement in (2).

(9) **IAMBQ** (Hung 1994)

In a rhythmic unit ($W S$), $|S| > |W|$.

The trochaic preference for ($\acute{L} L$) and (\acute{H}) over ($\acute{H} L$) is stated by TROCHAIC QUANTITY (abbreviated TROQ), which corresponds to the statement in (3).

(10) **TROQ** (Prince 1990)

In a rhythmic unit ($S W$), $|S| = |W|$.

Finally, the WSP itself may be stated as a constraint.

(11) **WSP**

Heavy syllables are stressed.

Iambic Quantity and Trochaic Quantity as formulated imply that weight derives from stress; the contraposition of the WSP (1b) makes the same implication. And indeed, there are many instances where syllable weight is dependent on stress; an example is Fijian (§ 3.1.1). However, the primary statement of the WSP (1a) implies the opposite: that stress derives from weight, and again there are instances where the locus of stress is dependent on syllable weight. An example of this is Yana (§ 3.1.2).

3.1.1 Fijian

In Fijian (Hayes 1995, 145 ff.; data from Schütz 1985 and Dixon 1988), Grouping Harmony's prediction that ($\acute{L} L$) ($H = 1$) is a better trochee than ($\acute{H} L$) ($H = 0.5$) is borne out by the observation that penultimate heavy syllables are shortened before a light syllable. The change of ($\acute{H} L$) to (\acute{L}

L) is known as trochaic shortening.

(12) Trochaic shortening in Fijian

- a. /^mbuu-ⁿgu/ ^mbúⁿgu ‘my grandmother’
(cf. ^mbúu ‘grandmother’)
- b. /táa-y-a/ táya ‘chop’ (trans. 3 sg. object)
(cf. táa ‘chop’)
- c. /ⁿree-ta/ ⁿréta ‘pull’ (trans.)
(cf. ⁿrée ‘pull’)
- d. /ðaa-ta/ ðáta ‘hate, consider bad’ (trans.)
(cf. ðáa ‘bad’, ða-ðáa ‘lots of bad things’)
- e. /siiβi/ síβi ‘exceed’
(cf. siiβi-ta ‘exceed’ (trans.))
- f. /rai-ða/ ráiða ‘see it’
(cf. rái ‘see’)

ai indicates a bimoraic diphthong; *ǎi* indicates a monomoraic diphthong.

Trochaic shortening may be attributed in OT terms to the ranking of PARSE-σ and TROQ above MAX(μ).

(13) **PARSE-σ**

Syllables are parsed into feet.

(14)

/siiβi/	PARSE-σ	TROQ	MAX(μ)
(.síi.)βi.	* !		
(.síi.βi.)		* !	
☞ (.sí.βi.)			*

Because PARSE-σ is ranked high, syllables should be parsed as exhaustively as possible into feet, and because TROQ outranks MAX(μ), even trochees may be derived by vowel shortening. We shall see trochaic shortening in Ulster Irish in § 3.4.1.1.

3.1.2 Yana

In Yana, a language of northern California, stress is dependent on syllable weight. Sapir & Swadesh (1960, 4) state that word stress is variable to some degree, but that in general the leftmost heavy (CVV or CVC) syllable

of a word is stressed, and the initial syllable of a word is stressed when all syllables are light. Page numbers refer to Sapir (1910). The transcription is that of Sapir & Swadesh (1960); note that *c c' ʒ* refer to alveolar affricates (IPA *ts ts' dz*).

(15) Yana stress

- a. .déé.cid.ʔa.yau.na. ‘commencing’ p. 6
- b. .móo.mai.yau.na. ‘myth’ p. 6
- c. .ómʔ.ʒi.baʔ. ‘kill them all’ p. 7
- d. .ʒu.wál.k'ai.ma.riʔ.mi. ‘Rock Woman’ p. 7
- e. .k'u.náa.ma.riʔ.mi. ‘old woman’ p. 7
- f. .xa.ga.yám.c'i.wi. ‘Flint village’ p. 7
- g. .ni.ba.míi.ríw. ‘that all are going thereto’ p. 25
- h. .mé.c'i. ‘coyote’ p. 25
- i. .wó.wi. ‘house’ p. 25
- j. .xá.ga.p'a. ‘Flint boy’ p. 13
- k. .wá.ra.k'i. ‘frog’ p. 112

Yana thus shows the “Default to Same Side” stress pattern (Hayes 1995, Walker 1996). This pattern can be accounted for in OT terms by proposing that the constraint WSP outranks LEFTMOST.

(16) **LEFTMOST**

Align(PrWd, L; ó, L)

The leftmost syllable of a word is stressed.

(17)

/omʔʒibaʔ/	WSP	LEFTMOST
☞ .ómʔ.ʒi.baʔ.	*	
.omʔ.ʒi.baʔ.	**!	σ
.omʔ.ʒi.báʔ.	*	σ ! σ

/xagayamc'iwi/	WSP	LEFTMOST
.xá.ga.yam.c'i.wi.	* !	
☞ .xa.ga.yám.c'i.wi.		σσ

c.

/warak'í/	WSP	LEFTMOST
☞ .wá.ra.k'í.		
.wa.rá.k'í.		σ!

The high rank of WSP means that if a heavy syllable is present, it must be stressed, as in (17b). If more than one heavy syllable is present, as in (17a), LEFTMOST decides that it is the first heavy syllable that bears stress. If there are no heavy syllables, as in (17c), WSP is irrelevant, and LEFTMOST decides that stress is on the first syllable.

Although the basic statement of the WSP and its contraposition are logically identical, they make different implications: “If heavy, then stressed” implies that stress derives from weight, and “If unstressed, then light” implies that weight derives from stress. As we have seen, some languages make use of one implication, while others make use of the other.

Kager (1992) observes the avoidance of (L H) trochees in many languages and defines the following reparation strategies: SKIPPING (i.e. (L H) rather than (L H) stress) in Gooniyandi, Guugu Yimidhirr, and Yindjibarndi; SHORTENING of (L H) to (L L) in Latin and English; and LENGTHENING of (L H) to (H H) in Finnish. Skipping and shortening are directly attributable to the WSP and its contraposition. “If heavy, then stressed” means that (L H) has final stress. “If unstressed, then light” means the (L H) becomes (L L). Among the Goidelic dialects, skipping is employed in Munster, East Mayo, and Manx (for later instances of (L H)); shortening is employed in Ulster and, historically, in Gaelic and Manx (for earlier instances of (L H)). Lengthening of (L H) to (H H) is not found at all, nor is lengthening of (L) to (H) (no minimum word effects), which may be ascribed to the high rank of DEP(μ) in Modern Goidelic.

3.2 The metrical structure of the Goidelic languages

One of the most fundamental historical changes that has happened in the Goidelic languages is in the realm of syllable weight and minimum word size.

In Old Irish, as in most Indo-European languages, coda consonants contributed to weight. Thus, CVV and CVC syllables were heavy, while CV syllables were light. The evidence for this comes from two facts: the loss of a coda consonant produced compensatory lengthening of a preceding vowel (see § 3.3.2), and the minimum word was bimoraic (either CVV

or CVC), subminimal words being extended by vowel lengthening (see § 3.3.3).

In Modern Goidelic languages, however, coda consonants no longer contribute to weight, so that only CVV syllables are heavy, while CV and CVC syllables are light. This is shown by the fact that CVC syllables behave as light for purposes both of stress placement (Green 1996b) and of epenthesis (Ní Chiosáin to appear).²

The reinterpretation of CVC syllables as light meant that Old Irish CVC words that had conformed to the bimoraic minimum word size no longer did so: thus, while Old Irish *mak* ‘son’ is bimoraic, its Modern Irish descendant *mak* is not, nor are Scots Gaelic *maxk* and Manx *mak*. CV content words are rare in Modern Irish, because it inherited most words from Old Irish, which disallowed them. Most loan-words are from English and French, which also disallow CV content words. Nevertheless, there are a few such words in Modern Irish: *t'e* ‘hot’, *ba* ‘cows’, *ga* ‘spear’. Some dialects have more because they have lost certain final consonants: *ma* ‘good’ (< *mah*), *pu* ‘puff’ (< *puh*), *mo* ‘manner’ (< *moy*), etc. Thus, it may safely be said that in the modern Goidelic languages, the concept of the bimoraic minimum word plays no role.

It is difficult, perhaps impossible, to say at what point the reinterpretation of CVC as light took place. It is possible that CVC syllables in Old Irish were not heavy in every instance (cf. Hayes 1994). All that is known for sure is that CVC was a permissible word shape, while CV was not. Perhaps CVC was heavy only in monosyllabic words, or only in initial (stressed) syllables. Thus, while it is quite certain that *mák* ‘son’ had the structure [H], it cannot be determined what the structure of *márkax* ‘horseman’ was: [H H], [H L], or [L L] (or theoretically [L H], though this seems highly unlikely). Such a word is [L L] in all the modern languages, and probably has been since at least late Old Irish or early Middle Irish. The fortis sonorants *L(')* *N(')* *m(')* (see below) remained weight-bearing at the end of a phonological phrase in East Mayo Irish (see § 3.4.4).

The trochaic nature of the Goidelic languages is shown by the following words of three light syllables.

² But see § 3.4.2.2 for some heavy CVC syllables in East Mayo Irish.

- (18) [(\acute{L} L) L] in Goidelic
- | | | | |
|----|--------------|----------------|------------|
| a. | Old Irish | (.k'ė.Ni.)ɣ'e. | 'merchant' |
| b. | Modern Irish | (.má.rə.)gə. | 'market' |
| c. | Manx | (.fó.la.)xə. | 'hiding' |
| d. | Gaelic | (.á.N'a.)ləx. | 'ignorant' |

Words of the shape (H L) are also left-headed in all dialects.

- (19) [(\acute{H}) L] in Goidelic
- | | | | |
|----|--------------|--------------|--------------|
| a. | Old Irish | (.k'ė:.)n'e. | 'as long as' |
| b. | Modern Irish | (.ó:.)ləs. | 'knowledge' |
| c. | Manx | (.ó:.)ləs. | 'a charm' |
| d. | Gaelic | (.jó:.)Ləs. | 'knowledge' |

A word consisting of all light syllables has stress only on the first syllable, with no pattern of alternating stress. This would seem to indicate that a single foot is built at the left edge in such words, with all other syllables left unfooted.

- (20) [(\acute{L} L) σ σ :] in Goidelic
- | | | | |
|----|--------------|------------------------|------------------|
| a. | Old Irish | (.R'ė.ŋu.)ð'ɣ'.θ'e. | 'placed before' |
| | | *(.R'ė.ŋu.)(ð'ɣ'.θ'e.) | |
| b. | Modern Irish | (.á.n'əm'.)n'ə.xə. | 'names' |
| | | *(.á.n'əm'.)(n'ə.xə.) | |
| c. | Gaelic | (.á.nã.)mə.xəɣ. | 'mention' (v.n.) |
| | | *(.á.nã.)(mã.xəɣ.) | |

In OT terms, this can be attributed to the ranking of ALL-FT-LEFT above PARSE- σ , which means that only one foot is built, at the left edge of a word, even when there is room for more than one foot.

- (21) **ALL-FT-LEFT**
Align(Ft, L; PrWd, L)
The left edge of every foot corresponds to the left edge of a prosodic word.

	/R'ėŋuð'ɣ'θ'e/	ALL-FT-LEFT	PARSE- σ
	(.R'ė.ŋu.)(ð'ɣ'.θ'e.)	σ ! σ	
	☞ (.R'ė.ŋu.)ð'ɣ'.θ'e.		**

ALL-FT-LEFT comes into conflict with the WSP when heavy syllables occur in noninitial position: ALL-FT-LEFT says noninitial vowels should be unfooted and unstressed, WSP says heavy syllables should be footed and stressed.

As discussed by Prince (1990), Kager (1992, 1993ab), and others, there are various strategies to resolve this conflict. In this chapter I shall be examining the various strategies used by the Goidelic languages in the course of their historical development. In § 3.3 I look at the historical changes in prosodic structure that happened between Proto-Insular Celtic and Early Modern Irish, and in § 3.4 I look at each of the modern Goidelic dialects, exploring how each developed from Early Modern Irish and what the synchronic situation of each dialect is.

3.3 From Proto-Insular Celtic to Early Modern Irish

3.3.1 Shortening of unstressed long vowels in Proto-Goidelic

It is unknown where stress fell in Proto-Celtic, but Schrijver (1995, 16 ff.) has argued that in Proto-Insular Celtic (PIC), stress regularly fell on the initial syllable of the word. This pattern continued in the Goidelic branch of Insular Celtic through Old Irish and into most modern Goidelic dialects, with notable exceptions in Manx and the Irish of Munster and East Mayo, as we shall see.³

By the time Old Irish is attested, unstressed vowels (i.e. those not in the initial syllable) that were long in Proto-Insular Celtic had been shortened in accordance with the WSP (Thurneysen 1946, 31). An example is PIC **gába:mes* 'take' (1 pl. subjunctive, conjunct form⁴), which became

³ In Old Irish, compound verbs (i.e. verbs with one or more prefixes) were stressed on the second syllable, a fact which I shall not explore here.

In all modern Goidelic dialects, there are a handful of words whose first syllable contains an unstressable ∂ and which therefore stress the second syllable.

⁴ Conjunct verb forms are used in Old Irish when an element such as a particle precedes the verb; they contrast with absolute forms used when no such element precedes the verb. See Green (to appear) for *-mes as the 1 pl. conj. ending.

gávaĩ in Old Irish. Unstressed CVC syllables, however, remained heavy, as is proved by the fact that coda consonant loss in this environment caused compensatory lengthening. An example is *PIC **kénetlon* ‘kindred’, which became *k'éne:l* in Old Irish.

As discussed in § 1.3, phonological change happens when a constraint against a marked phonological pattern is promoted above other constraints. Indeed, this is what happened in the course of Proto-Insular Celtic: at the earlier stage, WSP was ranked low.

(23) PIC Stage 1

a.	/gaba:mes/	ALL-FT-L	MAX(μ)	MAX(seg)	WSP
	☞ (.gá.ba:.)mes.				*
	.ga(.bá:.)mes.	* !			
	(.gá.ba.)mes.		* !		

b.	/kenetlon/	ALL-FT-L	MAX(μ)	MAX(seg)	WSP
	☞ (.ké.net.)lon.				*
	.ke(.nét.)lon.	* !			
	(.ké.ne.)lon.			* !	

Later, WSP was promoted above MAX(μ), but was still below MAX(seg).

(24) PIC Stage 2

a.	/gaba:mes/	ALL-FT-L	MAX(seg)	WSP	MAX(μ)
	(.gá.ba:.)mes.			* !	
	.ga(.bá:.)mes.	σ !			
	☞ (.gá.ba.)mes.				*

b.	/kenetlon/	ALL-FT-L	MAX(seg)	WSP	MAX(μ)
	☞ (.ke.net.)lon.			*	
	.ke(.nét.)lon.	σ !			
	(.ké.ne.)lon.		* !		*

If there are no alternations that allow speakers to retrieve the old input form (/gaba:mes/) a more faithful input (/gabames/) will be formed by Lexical Optimization, as we have seen. Once this happens, the WSP \gg

MAX(μ) ranking is no longer recoverable. If later relevant forms enter the language—either through independent sound changes or through borrowing—the language is free to reestablish the MAX(μ) \gg WSP ranking.

The Stage 1 optimal candidate in (23), (.gá.ba:.)mes., which violates the WSP, also violates TROQ, and the Stage 2 optimal candidate in (24), (.gá.ba.)mes., meets both WSP and TROQ, so it is somewhat arbitrary to pick WSP as the phonological constraint that crucially interacts with MAX(μ): TROQ would have done just as well. Nevertheless, the two constraints are quite distinct: (H) L meets WSP but violates TROQ, as we shall see in Ulster, and (H) (H) meets TROQ but violates WSP, as we shall see in Manx.

3.3.2 New noninitial long vowels: WSP violation in Early Modern Irish

Indeed, the ranking of WSP and MAX(μ) had already changed when new unstressed long vowels entered Old Irish. They had several sources: after the shortening of unstressed long vowels discussed above, certain intervocalic consonant clusters were simplified, with compensatory lengthening of the preceding vowel. This happened both in stressed syllables (e.g. **sk'etlon* ‘story’ > O.Ir. *s'k'é:l*) and unstressed syllables (e.g. **kénetlon* ‘kindred’ > O.Ir. *k'éne:l*).⁵ Another example is the diminutive suffix *-a:n* < **-agnos* (cf. the Old Irish personal name *bróka:n* and the Pre-Old Irish inscriptional name BROCAGNI (genitive case)) (Thurneysen 1946, 79). These new unstressed long vowels created a surface violation of the WSP.

During the Old Irish period, two adjacent short vowels contracted to a long vowel, both in stressed syllables (*Ló.aθar* > *Ló:θar* ‘basin’) and in unstressed syllables (*érxo.ad* > *érxo:d* ‘injury’) (Thurneysen 1946, 71); the latter case introduced unstressed long vowels.

Unstressed long vowels entered Old Irish also in loans, e.g. the diminutive suffixes *-o:g* (borrowed from Brittonic: cf. Middle Welsh *-aug*, spelled <*-awc*>), as in *f'é:so:g* ‘beard’, and *-i:n* (borrowed from Latin *-īnus*), very common in personal names like *pá:drig'i:n* ‘(little) Patrick’. Loan-words like *ó:ro:d* ‘prayer’ < Latin *ōrātiō* and *áLto:r'* ‘altar’ < Latin

⁵ The consonant cluster is still found in the Middle Welsh equivalents of these words: *xwedəl* ‘story’ and *kenedəl* ‘kindred’ with secondary epenthetic *ə*. Jay Jasanoff (p.c.) points out that *xwedəl* is apparently a loan-word from Proto-Goidelic **sk'etlon*.

altāria also have unstressed long vowels.

In the Middle Irish period, noninitial long vowels entered the language through the vocalization of intervocalic voiced fricatives. This process was complete by the beginning of the Early Modern Irish (EMI) era.

(25) Vocalization of intervocalic voiced fricatives (examples taken from Mac Eoin 1993, 106)

	Old Irish	Middle Irish	EMI	Gloss
a.	ím'p'íð'e	ím'p'əjə	ím'p'i:	'entreaty'
b.	s'k'é:liγ'e	s'k'é:ləjə	s'k'é:li:	'storyteller'
c.	búnaðas	búnəγəs	búnu:s	'origin'
d.	d'éx'n'évar	d'éx'n'əwər	d'éx'n'u:r	'ten persons'
e.	tóR't'aṽil'	tóR't'əwəl'	tóR't'u:l'	'bulky'

In addition, loan-words from Anglo-Norman⁶ such as *bud'e:l* 'bottle' have noninitial long vowels. Words like these had final stress in Anglo-Norman and probably had irregular final stress in some dialects of Middle Irish as well (thus *bud'é:l*), but among the modern dialects only Manx treats differently (L H) words of Anglo-Norman origin and those of native origin.

Therefore, there were many words from a variety of sources with noninitial long vowels by the beginning of the EMI period, which is the latest point from which all modern Goidelic languages can be derived (Jackson 1951).

(26) Words with noninitial long vowels in EMI

a.	k'in'e:l	< O.Ir. k'én'e:l	< PIC *kénetlon	'kindred'
b.	álto:r'	< O.Ir. álto:r'	< Latin altá:ria	'altar'
c.	k'áNi:m'	< M.Ir. k'áNəjəm'	< O.Ir. k'éNiy'im'	'I buy'
d.	búd'e:l or bud'é:l	< Anglo-Norman buté:l'		'bottle'

The forms in (26a–c), as well as (26d) if it had initial stress (as it probably did at least in the dialects of EMI spoken in Connacht, Ulster, and Scotland), can be explained by proposing that MAX(μ) had come to dominate WSP. As mentioned in chapter 1, when Lexicon Optimization creates a

⁶ The dialect of French spoken by the Norman aristocracy in England. The Anglo-Norman king Henry II invaded Ireland in 1171.

new input which the output is faithful to, the faithfulness constraint regains its high rank. The ranking was now MAX(μ) ≫ WSP; the high rank of ALL-FT-L remained unchanged.

(27) Old Irish through Early Modern Irish: MAX(μ) ≫ WSP

	/k'in'e:l/	ALL-FT-L	MAX(μ)	WSP
	(.k'i.n'el.)		* !	
	.k'i(.n'é:l.)	σ !		
	☞ (.k'i.n'e:l.)			*

3.3.3 Lengthening of monomoraic words in Old Irish

A prediction made by Grouping Harmony, according to Prince (1990), is that (L) is the worst possible foot, and indeed it is well known from a wide variety of languages that (L) feet are disfavored, and underlying (L) words are very frequently augmented to either (L L) or (H). The generalization seems to be that feet must be binary under either syllabic or moraic analysis, and (L) is not binary under either analysis. When FTBIN outranks DEP(μ), underlying (L) words surface with lengthened vowels and become (H).

This phenomenon is found in Old Irish. As shown in (28a–b), in the conjunct forms of the *s*-subjunctive paradigm, the 3rd singular is characterized by the absence of both the subjunctive marker *-s-* and any ending (Thurneysen 1946, 391). When the root ends with a short vowel, however, the vowel is lengthened, as in (28c).

(28) *s*-subjunctives in Old Irish (conjunct forms)

	1 pl.	3 pl.	3 sg.	Gloss
a.	fúl-s-aṽ	fúl-s-ad	fúl	'support'
b.	tái-s-aṽ	tái-s-ad	tái	'come'
c.	g'é-s-aṽ	g'é-s-ad	g'é:	'pray'

Likewise, in nouns of the velar-stem declension, the nominative singular is characterized by the absence of both the stem-final consonant and any ending (Thurneysen 1946, 202 ff.). Again, when the stem vowel is short, it is lengthened in the nominative singular. (The *e ~ i* alternation in (29b) does not concern us here.)

(29) Velar-stem nouns in Old Irish

	Dat. pl.	Acc. sg.	Nom. sg.	Gloss
a.	R'í:γ-iv'	R'í:γ'	R'í:	'king'
b.	b'r'éγ-iv'	b'r'íγ'	b'r'í:	'hill'

The lengthening in forms like *g'é:* and *b'r'í:* is easily attributable to the ranking FTBIN \gg DEP(μ).

	/g'e/	FTBIN	DEP(μ)
a.	(.g'é.)	* !	
	☞ (.g'é:.)		*
b.	/b'r'i/	FTBIN	DEP(μ)
	(.b'r'í.)	* !	
	☞ (.b'r'í:.)		*

No lengthening occurs in CVC words (already exemplified by *fil* 'support' (3 sg. subj. conj.), *b'r'íγ'* 'hill' (acc. sg.)), indicating that coda consonants contributed to weight in Old Irish (at least in monosyllabic words, as alluded to above).

As has been mentioned, monomoraic words are allowed in Modern Irish, where CVC syllables are light.

(31) (L) words in Modern Irish

a.	t'áx	'house'
b.	t'é	'hot'

It would seem that the ranking of FTBIN and DEP(μ) has reversed in Modern Irish.

	/t'ax/	DEP(μ)	FTBIN
a.	☞ (.t'áx.)		*
	(.t'á:x.)	* !	

	/t'E/	DEP(μ)	FTBIN
b.	☞ (.t'é.)		*
	(.t'é:.)	* !	

This apparent demotion of a constraint (FTBIN) against a marked phonological pattern runs counter to the usual pattern of sound change, but it does not really jeopardize the theory. At some point, the ranking of FTBIN and DEP(μ) may not have been recoverable by speakers. Old Irish had very few words like /g'e/ and /b'r'i/ to begin with; some were reinterpreted with an underlying long vowel, e.g. /b'r'i:/, which was /b'r'i:/ by Early Modern Irish. Others were lost by paradigm leveling, e.g. /g'e/, an irregular subjunctive to the verb root *gud'* 'pray', which was eventually replaced by the regular form *gud'ə* > Modern Irish *gi:*.

Once the old ranking was no longer learnable to later speakers, they built the less marked FAITHFULNESS \gg PHONOLOGY ranking. When CVC words became light, since learners did not observe vowel lengthening in adult speech, they ranked DEP(μ) above FTBIN, since the surface forms obeyed DEP(μ) but violated FTBIN.

3.4 The modern Goidelic languages

The modern Goidelic languages handle the WSP violations of Early Modern Irish in several different ways. In Ulster and Gaelic, the EMI ranking MAX(μ) \gg WSP was reversed, resulting in the shortening of unstressed long vowels. In Munster and East Mayo, ALL-FT-L \gg WSP was reversed, shifting stress to the heavy syllable. Manx is more complicated, as it passed through two distinct stages of development. Connacht tolerates the WSP violations and does nothing to change the EMI ranking.⁷ I shall discuss each of these approaches in turn.

3.4.1 WSP \gg MAX(μ) in Ulster and Gaelic

In Ulster Irish and Gaelic, EMI unstressed heavy vowels were shortened.

⁷ The province of Leinster is now entirely English-speaking, but evidence from place-names in County Wicklow (de hÓir 1969) and Irish loan-words in the English of Durrow (Ó Conchubhair 1948) indicates that the Irish of Leinster (at least southern Leinster, closer to Munster), like that of Munster and East Mayo, shifted stress to non-initial heavy syllables.

As we shall see, this is attributable to the promotion of WSP above MAX(μ), as predicted by the Promotion of the Unmarked.

3.4.1.1 Ulster shortening of unstressed long vowels

EMI unstressed long vowels have been shortened in Ulster, usually with no change in vowel quality, except that EMI *o*: becomes either *ɔ* or *a* (33d–e).

(33) Shortening of unstressed long vowels in Ulster (examples taken from Hughes 1994, 626–7)

	Ulster	EMI	Gloss
a.	kál'in'	kál'i:n'	'girl'
b.	á:v'es'	á:v'e:s'	'exaggeration'
c.	ámədan	áməda:n	'fool'
d.	f'áNag ~ f'áNɔg	f'áNo:g	'crow'
e.	k'ó:Ltar' ~ k'ó:Ltɔr'	k'ó:Lo:r'	'musician'
f.	gálu:n	gálu:n	'gallon'

Describing the variety of Ulster Irish spoken in Torr, Sommerfelt (1922, 122) says these shortened long vowels “may be accompanied by secondary stress, but this stress is gradually being lost and the vowel is then reduced to *ə*.” See Ó Dochartaigh (1987, 19 ff.) for a discussion of vowel shortening in Ulster.

This shortening may be explained by proposing that Ulster has restored the ranking WSP, ALL-FT-L \gg MAX(μ) that was current early in Proto-Goidelic. This ranking means that the optimal candidate is the one in which an unstressed long vowel is shortened.

(34)

/kál'i:n'/	WSP	ALL-FT-L	MAX(μ)
(.ká.l'i:n')	*!		
☞ (.ká.l'in')			*
.ka(.l'i:n')		σ!	

This is a clear example of the Promotion of the Unmarked: WSP was promoted to undominated position, and MAX(μ) was demoted so that one candidate could surface as optimal. What the speakers did, in effect, was apply the contraposition of the Weight-to-Stress Principle, “If unstressed, then light,” to their language.

3.4.1.2 Variation in OT: Ulster trochaic shortening

As mentioned above, Grouping Harmony predicts that (H L) trochees should tend to become (L L) trochees, because (L L) trochees are better-formed than (H L) ones; the phenomenon is known as trochaic shortening, as discussed in § 3.1.1 for Fijian. This prediction is borne out in an irregularly applied process of Ulster whereby a stressed heavy syllable is shortened before an unstressed light syllable. The shortening is described by Stockman (1986), whose data come from Wagner (1958–1966, henceforth *LASID*). The tendency is for initial heavy syllables to be shortened in polysyllabic words. It is only a tendency, and does not happen in all words in all places. In fact, an examination of *LASID* vol. 1 reveals 52 forms in which the environment for trochaic shortening is met: of these, 38 show shortening rarely or never, eight show shortening sometimes, and only six show shortening usually. The phenomenon is more prevalent along the northern coast of County Donegal than elsewhere in Ulster.

(35) Trochaic shortening in Ulster

	Underlying form	Surface forms	Gloss	<i>LASID</i> vol. 1 map
a.	/e:naxa/	énaxə ~ é:naxə	'chickens'	35
b.	/d'a:rhər/	d'árhər ~ d'a:rhər	'brother'	101
c.	/d'a:nu:/	d'ánu ~ d'a:nu	'do' (v.n.)	254

These contrast with underlying (L L) and (L L L) words that never show long vowels, such as *Lóftə* 'loft' and *kórəgəs* 'Lent'. There is no shortening in monosyllabic words: *b'v*: 'alive'.

It is difficult to assess the exact status of trochaic shortening in Ulster. It may be an instance of lexical diffusion in process, spreading both lexically (word by word) and geographically (probably from Northern Donegal outward). Intuitively, this seems quite likely; however, if trochaic shortening is in lexical diffusion, then Kiparsky's (1995) definition of lexical diffusion is too strong. Kiparsky claims that lexical diffusion applies only to structure-building lexical rules. Trochaic shortening, however, cannot be viewed as a lexical rule, since it applies both within morphemes and across morpheme boundaries (as we shall see below); and there is no reasonable way that vowel shortening could be viewed as structure-

building.

It is also intuitively likely that trochaic shortening is a static subregularity like Labial Attraction in Turkish (Inkelas, Orgun & Zoll 1996), as it shows many of the same properties: it applies to a fixed set of roots that is not definable by any independent criteria. However, Inkelas, Orgun & Zoll argue that such subregularities are best accounted for not with cophonologies but by prespecifying some stems in the lexicon for a certain feature, leaving other stems unspecified for the feature. In the case of trochaic shortening, however, this analysis will not work, as there is no feature that can be underlyingly associated with a long vowel to make that vowel short in a polysyllabic word. I therefore have no alternative but to posit two cophonologies for Ulster: one with trochaic shortening, and one without.

Some words belong to the cophonology with shortening in almost all geographic locations.

(36) Cophonology A: Trochaic shortening

Underlying form	Surface form	Gloss	<i>LASID</i> vol. 1 map
/m'e:rak:n/	m'érəkan	'thimble'	62
/s'i:l'an/	s'il'ən	'thinks'	73
/mo:ra:n/	móran	'much'	100
/t'i:f'a/	t'ífə	'will see'	123
/f'e:l'aka:n/	f'él'əkan	'butterfly'	212
/fi:l'ɔ:g/	fíl'ɔg	'seagull'	217

However, most words belong to the cophonology without shortening in all or almost all geographic locations.

(37) Cophonology B: No trochaic shortening

Underlying form	Surface form	Gloss	<i>LASID</i> vol. 1 map
/ɔ:r'hi:/	ó:r'hi	'slime, as of cow in heat'	6
/ki:ra/	kí:rə	'sheep'	26
/plu:xta/	plú:xtə	'smothered'	28
/g'e:xa/	g'é:xə	'geese'	44

/ski:l'u:/	skí:l'u	'shoot' (v.n.)	59
/ro:war/	ró:wər	'dig' (v.n.)	65
/tu:rN'a/	tú:rN'ə	'spinning wheel'	69
/sɔ:pa/	só:pə	'soap'	71
/si:hru:/	sí:hru	'earn' (v.n.)	95
/s'u:kra/	s'ú:krə	'sugar'	98
/ge:l'lk'/	g'é:l'əlk'	'Irish'	114
/e:gi:n't'/	é:gin't'	'complain' (v.n.)	115
/e:l'u:/	é:l'u	'complain' (v.n.)	115
/e:dan/	é:dən	'face, forehead'	117
/d'e:d'u:/	d'é:d'u	'toothache'	130
/kra:wa/	krá:wə	'bones'	133
/ɔ:rdɔ:g/	ó:rdɔg	'thumb'	134
/tɔ:ru:/	tó:ru	'a wake'	196
/se:v'Ir'/	sé:v'ər'	'rich'	199

etc., etc.

Finally, some words seem to belong to one cophonology in some geographic locations and to the other in other locations.

(38) Words that belong to cophonology A in some locations and cophonology B in others

Underlying form	Surface forms	Gloss	<i>LASID</i> vol. 1 map
/e:naxa/	é:naxə ~ énoxə	'chickens'	35
/e:drEm/	é:drəm ~ édrəm	'light'	81
/p'i:N'axa/	p'í:N'axə ~ p'íN'axə	'pennies'	93
/d'a:rhar/	d'á:rhər ~ d'árhər	'brother'	101
/i:r'i:/	í:r'í ~ ír'í	'rise' (v.n.)	232
/d'a:nu:/	d'á:nu ~ d'ánu	'do' (v.n.)	254
/fi:xɔ:gi:/	fí:xɔgi ~ fíxɔgi	'periwinkles'	271

At first glance, it might be argued that the forms with a short stressed vowel on the surface have an underlying short vowel as well, and thus that the shortening is a historic rather than synchronic event, but for many forms this is provably false. Recall from chapter 2 that the underlying short vowels of Irish are unspecified for backness and acquire the feature [back]

from the surrounding consonants. For this reason, we know that certain forms must have underlying long vowels, as different vowels would surface from underlying short vowels.

(39) Actual UR with long vowel	Right SR	Hypothetical UR with short vowel	Wrong SR	Gloss
/m'ɛ:rakɑ:n/	m'érakɑn	/m'ɛrakɑ:n/	*m'érakɑn	'thimble'
/ɛ:naxɑ/	énaxə	/ɛnaxɑ/	*énaxə	'chickens'
/ɛ:drɛm/	édrɛm	/ɛdrɛm/	*édrɛm	'light'
/fɪ:xɔ:gi:/	fɪxɔgi	/fɪxɔ:gi:/	*fúxɔgi	'periwinkles'

In addition, many forms are associated with monosyllabic roots that always show long vowels.

(40) Form with trochaic shortening	Related monosyllabic form
a. m'érakɑn 'thimble'	m'ɛ:r 'finger'
b. s'íl'ən 'thinks'	s'í:l' 'think' (impv.) h'í:l' 'thought'
c. mórɑn 'much'	mó:r 'big'
d. t'íf'ə 'will see'	t'í: 'sees'
e. énaxə 'chickens'	é:n 'chicken'
f. p'íN'axə 'pennies'	p'í:N' 'penny'
g. d'ánu 'do' (v.n.)	d'á:n 'do' (impv.)

The phenomenon of trochaic shortening seems to be due to the relative ranking of TROQ, PARSE-σ, and MAX(μ). The candidate (.d'ár.hər.) meets both TROQ and PARSE-σ, but at the expense of a MAX(μ) violation. The candidate (.d'á:r.hər.) meets both MAX(μ) and PARSE-σ, but violates TROQ; and (.d'á:r).hər. meets MAX(μ) and TROQ but violates PARSE-σ.

As mentioned above, trochaic shortening in Ulster is not consistent, and both *d'árhər* and *d'á:rhər* are attested. But when *d'á:rhər* occurs, there is no way of deciding between (.d'á:r.hər.) and (.d'á:r).hər., because they are phonetically identical. It seems reasonable, however, to suppose that compliance with TROQ (which cross-linguistically is usually high ranked, and often undominated) is greater motivation than compliance with PARSE-σ. Therefore, in the tableaux that follow, I assume that TROQ is

high-ranked in all cases, and that it is the relative ranking of PARSE-σ and MAX(μ) that determines whether or not trochaic shortening will take place. (But nothing crucial hangs on this decision.)

In cophology A, the ranking is PARSE-σ ≫ MAX(μ), and the candidate with trochaic shortening is optimal.

(41)	/d'á:rhar/	TROQ	PARSE-σ	MAX(μ)
☞ (.d'ár.hər.)				*
(.d'á:r.hər.)	* !			
(.d'á:r).hər.			* !	

Cophology B has the opposite ranking, and the unshortened candidate is optimal.

(42)	/d'á:rhar/	TROQ	MAX(μ)	PARSE-σ
(.d'ár.hər.)			* !	
(.d'á:r.hər.)	* !			
☞ (.d'á:r).hər.				*

The other examples given in (35), (*é.na*).xə. ~ (*é:.*)na.xə., (*d'a.nu.*) ~ (*d'a:.*)nu., work the same way. The latter of these forms, underlying /d'a:nu:/, also shows shortening of a noninitial long vowel in the typical Ulster manner discussed above.

3.4.1.3 Gaelic shortening

In Gaelic, all unstressed formerly long vowels have been reduced to short *a*.

(43) Shortening of unstressed long vowels in Gaelic (examples from South Uist Gaelic: Mac Gill-Fhinnein 1966, 22)

	Gaelic	EMI	Gloss
a.	áran	ára:n	'bread'
b.	k ^h í.at	kóv'e:d	'guard'
c.	k ^h ʰs'axk	kós'í:xt	'walking'
d.	k ^h úNarst	kóNtu:r't'	'danger'
e.	íN'ak	fíN'o:g	'window'

Historically, shortening in Gaelic can be explained in the same way as

shortening in Ulster Irish: promotion of WSP above MAX(μ). Synchronically, however, it seems that these unstressed vowels are short, unlike Ulster, where the vowels in question are still underlyingly long. The fact that all vowels surface as *a* indicates that they have fallen together into a single phoneme, and as far as I can tell, this *a* is never pronounced long or half-long, which would point to an underlying long vowel. Both of these facts contrast with Ulster Irish, where (as discussed above) the different vowels are kept distinct and are occasionally pronounced long in unstressed position.

Nevertheless, underlying long vowels are shortened in Gaelic when they are destressed at the phrase level.

(44) Phrase-level shortening in Gaelic (examples from Arran: Holmer 1957, 62)

- | | | | | |
|----|--------|----------|--------------|---------------------------|
| a. | ká:rək | 'garden' | karə mó:r | 'big garden' ⁸ |
| b. | fa:l' | 'spade' | fal' vó:n'ə | 'peat spade' |
| c. | rɛ:t | 'road' | rɛt kárit' | 'shortcut' |
| d. | mɛ:N | 'middle' | mɛN əN távri | 'Midsummer' |

This shortening too can be explained by the ranking WSP \gg MAX(μ). The stress constraint at the phrase level seems to be RIGHTMOST(NP) (45); the tableau in (46) illustrates the ranking RIGHTMOST(NP), WSP \gg MAX(μ) for *rɛt kárit* 'shortcut' (44c).

(45) RIGHTMOST(NP)

The rightmost prosodic word in a complex NP receives main phrasal stress.

(46)

/rɛ:t kárit'/	RIGHTMOST(NP)	WSP	MAX(μ)
rɛ:t kárit'		* !	
rɛ́:t kárit'	* !		
☞ rɛt kárit'			*

This indicates that although the unstressed vowel in the words in (43) has been phonemicized as a short vowel, the ranking of WSP above MAX(μ) still obtains in Gaelic, though it is demonstrable only at the phrase level.

⁸ The loss of the final *k* is probably a phonetic effect of rapid speech.

3.4.2 WSP \gg ALL-FT-L in Munster, East Mayo, and Manx

3.4.2.1 Munster stress shift

The second way that the WSP violations or EMI were resolved in its daughter dialects was by promoting WSP and demoting ALL-FT-L. In Munster, Early Modern Irish WSP violations like *bóga:n* 'shell-less egg' have been solved by moving the stress to the heavy syllable, a phenomenon known as "forward stress" in the literature (e.g. O'Rahilly 1932, Blankenhorn 1981). The Munster pronunciation of 'shell-less egg' is *bəgá:n* (Ua Súilleabháin 1994, 481). Just as Ulster applied the contraposition, so Munster applied the primary statement, "If heavy, then stressed." This case can be accounted for in OT terms by proposing that WSP was promoted to undominated position; ALL-FT-L was demoted so that one candidate could surface as optimal. (The realization of the unstressed short vowel as *ə* is regular and will not concern us here.)

(47)

/bEga:n/	WSP	MAX(μ)	ALL-FT-L
(.bó.ga.n.)	* !		
☞ .bə(.gá.n.)			σ
(.bó.gan.)		* !	

But forward stress spread to forms where the first syllable was heavy as well.

(48) Forward stress in Munster

- | | | | |
|----|--------|---------------|--------------|
| a. | H H́ | d'i:vi:n' | 'idle' |
| b. | H H́ L | ba:dó:r'əxt | 'boating' |
| c. | H H́ H | ma:rn'é:li:xt | 'navigation' |

Initial stress in these forms would not be a WSP violation, so let us examine why they have forward stress. Forward stress began with WSP compliance in forms like *bóga:n* > *bogá:n*. It was reinforced by Anglo-Norman loan-words like *bod'é:l*, but I do not agree with O'Rahilly (1932) that the introduction of the Anglo-Norman loans CAUSED the stress shift in native words. Presumably, at first, (H H) words had initial stress in Munster, since (H́ H) is no more of a WSP violation than (H H́) is, but the pattern of (L H́)

words as well as Anglo-Norman (H H) words like *p'r'i:sú:n* ‘prison’ was extended to native (H H) words, and they became stressed (H H): *d'i:vi:n'*. EMI (L H L) words like *fr'íha:lə* ‘feeding’ and (L H H) words like *ásé:nti:xt* ‘disagreement’ were also shifted to *fr'əhá:lə* and *asé:nti:xt* to comply with the WSP. This established the pattern of stressing the second syllable if it was heavy, setting the stage for the shift of EMI (H H L) and (H H H) words to (H H L) and (H H H), as in *ba:dó:r'əxt* and *ma:rn'é:li:xt* from (48) above. The WSP motivated the shift from (L L H) to (L L H) (e.g. *markəré:r* ‘mackerel’) as well, and the pattern of stressing the second foot of the word was established. As mentioned above, in Green (1996b), and in chapter 4, the right-headed colon is used to circumscribe the first two feet of a word and stress the second of them. The colon is a prosodic constituent between the foot and the prosodic word: see Hayes (1995, 119).

Forms like these can be explained by proposing that in Munster Irish, a right-headed binary colon, consisting either of two feet or of a foot and a stray syllable, is built at the left edge of the word.

(49) The colon in Munster

PrWd	[×]	[×]
Colon	{ . × }	{ . × }
Ft	. (×)	(×) (×)
a.	bə gá:n	b. d'í: ví:n'

PrWd	[×]	[×]
Colon	{ . × }	{ . × }
Ft	(×) (×) .	(×) (×) (×)
c.	ba: dó: r'əxt	d. ma:r n'é: li:xt

The colon is a binary prosodic unit larger than the foot; its function is to group feet together in the same way that feet group syllables together. It can be used, as it is in Munster, to derive observed “stress-window” facts—instances where stress is limited to a certain domain larger than a foot but smaller than the prosodic word. This analysis is fully developed in chapter 4.

Further, in Munster, the short vowel *a* is stressed when it falls in the second syllable and is followed by *x*, regardless of whether the *x* is in the

coda of the second syllable or the onset of the third.⁹

(50) Stressing of noninitial *ax* in Munster

a.	/b'anaxt/	b'ənáxt	‘blessing’
b.	/bakaxa/	bəkáxə	‘lame’ (pl.)

This stressing of *ax* does not happen if the first or third syllable contains a long vowel, or if the *ax* falls later than the second syllable.

(51) Noninitial *ax* unstressed

a.	/fa:sax/	fá:səx	‘desert’
b.	/mElhaxa:n/	mólhəxá:n	‘wether’
c.	/sasanax/	sásənəx	‘Englishman’

To explain the behavior of /ax/, I must first discuss the notion of prominence. Hayes (1995, 270 ff.) discusses many languages in which one type of syllable may be more prominent than another type of syllable, without necessarily being heavier. For example, in Golin (Hayes 279) syllables with high tone are more prominent than syllables with low tone, and in Asheninca (Hayes 291, also § 4.3.2 of this dissertation) syllables with *i* before a nasal are more prominent than other syllables with *i*. For Munster, I propose that a syllable with *a* before *x* is more prominent than other light syllables.¹⁰ In optimality-theoretic terms, PKPROM (52) is met when *ax* is the head of its foot, but does not apply if *ax* is left unfooted.

(52) **PKPROM** (Prince and Smolensky 1993, 39)

x is a better peak than *y* if the prominence of *x* is greater than the prominence of *y*.

⁹ Actually, single intervocalic consonants are ambisyllabic after short stressed vowels (as we shall see in chapter 5), so *x* is in the coda even when another vowel follows it.

¹⁰ This special prominence of *ax* is seen also in Ulster, Manx, and certain dialects of Gaelic, where unstressed *ax* is not reduced to *ax*: Ulster *p'órtax* ‘bog’ (Quiggin 1906, 12, Wagner 1959, 189); Manx *k'éðax* ‘left hand’ (Broderick 1984, 256); Kintyre Gaelic *k'álox* ‘moon’ (Holmer 1962, 39), East Sutherland Gaelic *γ'ólax* ‘moon’ (lenited) (Dorian 1978, 165).

- (53)
- a. (.fá:.)sax. = fá:səx 'desert' (51a)
- b. (.sá.sa.)nax. = sásənəx 'Englishman' (51c)

The tableau in (54) shows the ranking PKPROM \gg FTFORM for /b'anaxt/ *b'ənáxt* 'blessing' (50a) and /bakaxa/ *bəkákə* 'lame' (pl.) (50b).

(54)

	/b'anaxt/	PKPROM	FTFORM
a.	(.b'á.nəxt.)	a !	
	☞ (.b'ə.náxt.)	ax	*

	/bakaxa/	PKPROM	FTFORM
b.	(.bá.kə.)xə.	a !	
	☞ (.bə.ká.)xə.	ax	*

PKPROM is overridden, however, by a higher-ranking constraint NOCLASH (55).

(55) NOCLASH

Two adjacent syllables should not both be foot-heads.

The effect of NOCLASH at the phrase-level is seen in the tableau in (56), which shows the ranking NOCLASH \gg WSP. The phrases illustrated are *k'ip'i:n'* 'match' and *k'ip'i:n' d'árəg* 'red match' (Ó Siadhail 1989, 31; glosses supplied by D. Ó Sé, p.c.).

(56)

	/k'ip'i:n'/	NOCLASH	WSP
a.	[.k'í.p'í:n'.]		* !
	☞ [.k'í.p'í:n'.]		

	/k'ip'i:n d'arg/ ¹¹	NOCLASH	WSP
b.	☞ [.k'í.p'í:n'.] [d'á.rəg.]		*
	[.k'í.p'í:n'.] [d'á.rəg.]	* !	

As shown in the tableau in (57), NOCLASH also dominates PKPROM. The

¹¹ The second vowel in the surface form *d'árəg* is epenthetic: see chapter 5 for epenthesis into clusters of falling sonority.

candidates evaluated in (57) are for *molhəxá:n* 'wether' (51b). In each candidate, the short vowel that is not reduced to ə is the head of the foot, as shown by the grid in (58). In (58b), the foot-head *ha* is in clash with the foot-head *xa:n*; in (58a) there is no clash.

(57)

	/mElhaxa:n/	NOCLASH	PKPROM
a.	☞ (.mól.hə.)(xá:n.)		o
b.	(.mól.ha.)(xá:n.)	* !	ax

(58) Metrical structure of the candidates in (57)

PrWd	[×]	[×]
Ft	(× .)(×)	(. ×)(×)
	L L H	L L H
a.	mól hə xa:n	b. *mólha xa:n

Stress can fall on the sequence *ax* in the second syllable, therefore, because of the special prominence of that sequence.

As Gussmann (1995) points out, there are some instances of apparent *ax* that are not stressed, even when they occur in a position where *ax* is stressable; an example is the suffix *-əxt*, roughly 'ness'.

(59) *-əxt* 'ness' unstressed

- a. át'əxt 'strangeness' Ó hÓgáin (1984, 78)
- b. bóxtəxt 'poorness'¹² Breatnach (1961, 51)

Gussmann proposes that the underlying vowel of *-əxt* 'ness' is not /a/ but /ə/; I would suggest it is actually /E/. Under my prominence-based analysis, all that is required is to say that /Ex/ does not have the same elevated prominence that /ax/ does.

Stress is not attracted to the epenthetic vowel in words like *dórəxə* 'dark' (orthographic <*dorcha*>) (Dillon and Ó Cróinín 1961, 224), indicating that this vowel too is underlying /E/¹³; nor is stress attracted to the ending of

¹² Used only in the phrase *dól ə móxtəxt* 'getting poorer', literally 'going into poorness'; the usual word for 'poverty' is *bóxtənas* (D. Ó Sé, p.c.).

¹³ In some languages (e.g. Iraqi Arabic: Broselow 1982), epenthetic vowels are

the past impersonal verb form *-ax*, as in *kásax* ‘one turned’ (Ó Siadhail 1989, 31). The ending may be underlyingly /-Ex/, or /-ay/ (its historical origin) with irregular final devoicing, or it may be /-ax/ but lexically marked as stressless. If /ax/ is preceded by /h/, forward stress is optional in Muskerry (*láhax* ~ *laháx* ‘mire’, *d’l’ihax* ~ *d’l’aháx* ‘lawful’), and is not found at all in West Kerry (*fáhax* ‘giant’, *k’áhax* ‘showery’) (Ó Siadhail 1989, 31). Apparently a preceding /h/ removes (optionally in Muskerry and obligatorily in West Kerry) the special prominence of /ax/, though I have no idea why this should be so.

3.4.2.2 East Mayo stress shift

The dialect of East Mayo (Lavin 1957, Dillon 1973), although geographically part of Connacht, is sufficiently distinct from the rest of Connacht Irish in terms of stress placement that it must be described separately from the rest of Connacht. East Mayo Irish, like Munster Irish, shows forward stress in words with noninitial long vowels.¹⁴

(60) Forward stress in East Mayo¹⁵

a.	(L H)	bəLá:n	‘bullock’	#19
b.	(H H)	ta:L’ó:r	‘tailor’	#238
c.	(L L H)	pəɾəgó:d	‘purgative’	#362
d.	(L H L)	gəbá:s’t’ə	‘cabbage’	#250
e.	(L H H)	spin’k’i:n’i:	‘little crags’	Lavin (1957)
f.	(H H L)	miərtú:nəx	‘ill-conditioned’	Dillon (1973)

Forward stress in East Mayo (L H) words can be explained in exactly the same way as in Munster: the promotion of WSP above ALL-FT-L.

simply invisible for purposes of stress placement; however, we shall see in chapter 4 that this is not true of Munster Irish.

¹⁴ According to Lavin (1957), this is true only of speakers in the more easterly parts of the district. Further to the west, speakers usually show the persistent initial stress characteristic of Connacht.

¹⁵ Numbers after East Mayo forms (e.g., #19, #238, etc.) refer to questionnaire answer numbers in *LASID* vol. 3, 351–9.

(61)

/bELa:n/	WSP	MAX(μ)	ALL-FT-L
(.bó.La:n.)	* !		
(.bó.Lan.)		* !	
☞ .bə(.Lá:n.)			σ

As with Munster, a full explanation of East Mayo stress depends on the colon, as we shall see in chapter 4.

In addition, stress is attracted to noninitial short vowels when both of the following conditions are met: (i) the syllable is closed by a fortis sonorant [L(‘) N(‘) m(‘)], and (ii) the word occurs at the end of a breath-group, i.e. before a pause.¹⁶ The quality of the stressed short vowel is usually reported as ə or ø before unpalatalized consonants, roughly the same phonetic quality as the ə of unstressed syllables.¹⁷ Before a palatalized consonant, the quality of the short vowel is reported to be i, just as in unstressed syllables ə is pronounced like a lax i before a palatalized consonant.

(62) Forward stress to syllables ending in fortis sonorants, before a pause

a.	kapəL	‘horse’	#165
b.	kapíL’	‘horses’	#181
c.	saláN	‘salt’	#315
d.	to:ríN’	‘boundary’	#960
e.	goróm	‘blue’	#237

Note that all the examples are disyllabic, though this may be accidental: there is no evidence that polysyllabic words behave differently.

Unlike the Munster treatment of *ax*, the East Mayo stressing of əL (etc.) occurs adjacent to heavy syllables.

¹⁶ At least, it appears that such words do not show forward stress when they are followed by another word in the same breath-group, but since *LASID* usually cites words in isolation, it is difficult to be positive about this.

¹⁷ The variation between ə and ø is not significant; probably a stressed ə sometimes sounded like ø to the fieldworker. Nevertheless, the fact that the stressed sound is mid leads me to suspect that the underlying vowel is /E/.

(63) *əL* adjacent to VV

- | | | | |
|----|----------------|---------------|-----------------------------|
| a. | to:riN' | 'boundary' | #960 |
| b. | iəriN' | 'iron' (gen.) | #607 |
| c. | e:drém | 'heavy' | <i>LASID</i> vol. 1, map 81 |
| d. | kól'u xa:s'íL' | place name | <i>LASID</i> vol. 3, 363 |

The stressing of *əL* (etc.) applies also to the epenthetic vowel.

(64) *əL* in epenthesis

- | | | | | |
|----|--------|------------------|---------|--------------------------|
| a. | gorém | < <i>gorm</i> > | 'blue' | #237 |
| b. | təróms | < <i>terms</i> > | 'terms' | <i>LASID</i> vol. 3, 362 |

From these facts, the following deductions may be made: (i) the underlying vowel in these syllables is /E/, and (ii) *əL*-type syllables are more prominent than light syllables, but not less prominent than heavy syllables. In fact, since there is no difference in the stressing of (H H) words like *ta:L'ó:r* (60b) and *to:riN'* (62d), it is clear that *əL*-type syllables are heavy in East Mayo Irish, and therefore that the fortis sonorants [L() N() m()] contribute to weight, but no other consonants do.¹⁸

But there is a difference between *əL*-type syllables and syllables with a long vowel: *əL*-type syllables attract stress only before a pause (65a), but not in the middle of a breath-group (65b–d). Syllables with long vowels attract stress even in mid-sentence (cf. *k'aNó:* 'will buy' in (65b)).

(65) Stress alternation in *əL*-type syllables

- | | | | |
|----|--------------------------|-----------------------------|------|
| a. | kapəL | 'horse' | #165 |
| b. | k'aNó: m'é kápəL əmá:rəx | 'I'll buy a horse tomorrow' | #165 |
| c. | s'in' kápəL d'ás | 'that's a nice horse' | #168 |
| d. | ən kápəL s'o | 'this horse' | #179 |

Descriptively, it seems that fortis sonorants are linked to a mora only if that mora occurs finally in the phonological phrase. I speculate that moras associated with fortis sonorants may link only to the right edge of PhonP, and not directly to the right edge of σ .

¹⁸ *ax* receives no special prominence in East Mayo: *b'aNaxt* 'blessing' (#926).

- | | |
|-------------|----------------------|
| (66) PhonP | * σ |
| \ | \ |
| μ | μ μ_1]PhonP |
| | |
| [+son,+tns] | [+son,+tns] |

μ_1 means "one or more moras."

This is, to be sure, a highly stipulative statement, not derivable from any well-accepted principles of prosodic phonology, but it does capture the observed facts. I have no more theoretically sound explanation for why *əL*-type syllables behave in this way.

It is not unprecedented in discussions of Irish phonology to say that the fortis sonorants may contribute to weight, in other words to bear a mora when in coda position. Ní Chiosáin (1991, 188 ff.) discusses an alternation of long and short vowels found in Connacht and Munster.

(67) Vowel length alternation in Connacht and Munster

- | | | |
|----|---------------------------------------|-----------------|
| a. | g'l'á:n (Connacht), g'l'áun (Munster) | 'valley' |
| b. | g'l'ánə (both) | 'valley' (gen.) |

This pattern contrasts with forms like those in (68), with long vowels throughout, and those in (69), with short vowels throughout.

(68) V: only

- | | | |
|----|-------|---------------|
| a. | bá:n | 'white' |
| b. | bá:nə | 'white' (pl.) |

(69) V only

- | | | |
|----|-------|---------------|
| a. | glán | 'clean' |
| b. | glánə | 'clean' (pl.) |

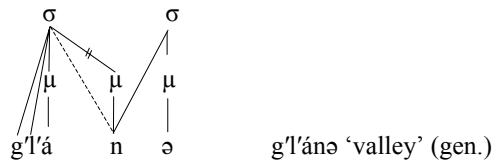
As it happens, the forms that show the alternation historically had a fortis sonorant, and still do in Ulster and East Mayo (*g'l'áN* 'valley' vs. *glán* 'clean'). Ní Chiosáin's analysis of the alternation is that in forms like Connacht *g'l'á:n* 'valley', the /n/ is underlyingly associated with a mora. When this moraic consonant is in the coda of a syllable, the mora is delinked from the consonant and associates with the preceding vowel.

(70) Moraic consonants (after Ní Chiosáin 1991)



In onset position, e.g. in *g'l'ánə* (69b), where there is no lengthening of the preceding vowel, Ní Chiosáin (1991, 203) says degemination causes the mora to be removed.

(71) Moraic consonants in intervocalic position



The intervocalic consonant is thus ambisyllabic, which Ní Chiosáin holds is generally true after short vowels in Irish. The mora originally associated with the *n* is not conserved after delinking, but is deleted.

Under Ní Chiosáin's analysis, in Ulster and East Mayo *g'l'aN*, there is no delinking and reassociation; rather, the *N* remains moraic.

Fortis sonorants in the codas of noninitial syllables (e.g. in EMI *káɸəL* 'horse') are apparently still moraic only in East Mayo, and then only in pause. There is no syllable lengthening in Connacht and Munster *káɸəl*, and in Ulster (where the form is *káɸəL*) noninitial heavy syllables are always lightened, as we saw above in § 3.5.1.1.

In conclusion, therefore, East Mayo Irish is like Munster in shifting stress to noninitial heavy syllables, but the two dialects have slightly different inventories of heavy syllables, since East Mayo but not Munster considers *əL*-type syllables heavy in pause.

3.4.2.3 Manx shortening and stress shift

Manx has two treatments of EMI (L H) words, depending on the origin of the word. If the word was (Ľ H) in Old Irish, or if a word became (Ľ H) through the vocalization of an intervocalic voiced fricative, the development is like that of Ulster Irish and Gaelic: from (Ľ H) to (Ľ L).

(72) (Ľ H) to (Ľ L) in Manx (examples from Broderick 1984 and 1986, 148)

	Middle Irish	Manx	Gloss
a.	b'éga:n	bégan	'a little'
b.	mún'e:l	mónal	'neck'
c.	tóNo:g	tónag	'duck'
d.	fúN'o:g	ún'ag	'window'
e.	g'éñəwəl' > g'enu:l'	g'énal	'happy'

But other cases of noninitial stressed vowels show forward stress, like Munster and East Mayo Irish. Forward stress is found in old (Ȟ H) words (73), Anglo-Norman (Ľ Ȟ) and (Ȟ H) loan-words (74), and in words with vocalization of a voiced fricative (the only examples are of *w < v*) after a consonant (75). Notice in all these cases that if the first syllable had a long vowel or diphthong in Middle Irish, it has been shortened in Manx. Examples are from Broderick (1984 and 1986, 148–9).

(73) Forward stress in old (Ȟ H) words

	Middle Irish	Manx	Gloss
a.	á:RN'e:n	ané:n	'work done at night'
b.	bó:ka:n	bogé:dn	'brownie' (in folklore)
c.	kľ:xlo:ɣ	kaxlé:	'changing'
d.	kúara:n	kərə:n	'sandal'
e.	fá:ga:l'	fegé:l'	'leaving'
f.	f'é:so:g	fezé:g	'beard'

(74) Forward stress in Anglo-Norman words

	Middle Irish	Manx	Gloss
a.	bod'é:l	bodé:l'	'bottle'
b.	ka:bá:n	kabé:dn	'cabin'
c.	koRN'é:l	kən'é:l'	'corner'
d.	daN's'é:r	dan'd'é:r	'danger'
e.	p'r'í:sú:n	prizú:dn	'prison'
f.	s'er'v'í:s'	s'əvé:s'	'service'

- (75) Forward stress in *Cw* clusters
- | | | | |
|----|--------------|-----------|---------------|
| | Middle Irish | Manx | Gloss |
| a. | ánwaN | anú:n | ‘weak’ |
| b. | d’árwad | d’arú:d | ‘forgetting’ |
| c. | tálwin’ | talú:d’n’ | ‘land’ (gen.) |

The development of the Manx stress pattern can be explained as follows. At an early date, Manx promoted TROQ and demoted MAX(μ) (once again showing the Promotion of the Unmarked). As shown in the tableau in (76), in the primary grammar (made up of native words), this had the effect of shortening the long vowel in *béga:n* (72a); but there was no effect on (H H) words like *bó:ka:n* (73b), because they did not violate TROQ.

(76) Manx Stage 1

a.	/b'ega:n/	TROQ	ALL-FT-L	MAX(μ)
	(.b'é.ga:n.)	* !		
	.b'e.(gá:n.)		* !	
	☞ (.bé.gan.)			*

b.	/bo:ka:n/	TROQ	ALL-FT-L	MAX(μ)
	☞ (.bó:.) (ka:n.)			
	(.bó:.)kan.			* !
	(.bo:.) (ká:n.)		* !	

Following Inkelas, Orgun & Zoll’s (1996) argument that subregularities are better accounted for with prespecification than cophologies,¹⁹ I assume that the Anglo-Norman loan-words in (74) were prespecified for final stress.

(77) Anglo-Norman loan-words in Manx

- | | | | |
|----|-------------|-----------|----------|
| a. | /bodé:l'/ | bodé:l' | ‘bottle’ |
| b. | /ka:bé:n/ | kabé:dn | ‘cabin’ |
| c. | /karn'é:l'/ | kən'é:l' | ‘corner’ |
| d. | /dan'd'é:r/ | dan'd'é:r | ‘danger’ |

¹⁹ Where possible: recall from § 3.4.1.2 that trochaic shortening in Ulster cannot be explained this way.

- | | | | |
|----|-------------|-----------|-----------|
| e. | /pri:sú:n/ | prizú:dn | ‘prison’ |
| f. | /s'ervé:s'/ | s'əv'é:s' | ‘service’ |

Later, as happened in Gaelic, old (L H) words like *b'égan* were reinterpreted as underlyingly (L L). Once this happened, the only (L H) words in the language were the end-stressed Anglo-Norman words like *bod'é:l*. At this point, the *Cw* clusters of (75) above received an epenthetic ə, and later, the sequence əwə contracted to u:.

- (78) *CwV* > *Cəwə* > *Cu:*
 d'árwad > d'árəwəd > d'áru:d ‘forgetting’ (74b)

The new (L H) words like *d'áru:d* took over the forward stress of the Anglo-Norman words, becoming *d'arú:d* and the like. Also, the native (H H) words like *bó:ka:n* took over the Anglo-Norman stress pattern, becoming *bo:ká:n*. This was accomplished by building a binary right-headed colon at the left edge of the word. The full story of Manx stress will be given in chapter 4.

3.4.3 Retention of MAX(μ) >> WSP in Connacht

In Connacht, nothing relevant to the current discussion has changed since Early Modern Irish. Neither the shortening of Ulster Irish and Gaelic nor the stress-shift of Munster takes place in Connacht, and words like *il'a:n* ‘island’ (Ó Máille 1974, 151) continue to violate the WSP. So in Connacht, as in EMI (cf. (27) above), both MAX(μ) and ALL-FT-L outrank the WSP. Connacht is thus the only modern Goidelic dialect in which WSP is low-ranking.

(79)

/il'a:n/	MAX(μ)	ALL-FT-L	WSP
☞ (.í.l'a:n.)			*
(.í.l'an.)	* !		
.i(l'á:n.)		σ !	

Some researchers (O’Rahilly 1932, Ó Sé 1984, Ó Siadhail 1989) have argued that there is some evidence that suggests the possibility that (L H) words had forward stress at one point in the history of Connacht, but then reverted to initial stress.

The first bit of evidence is a sound change whereby short *a* in the initial syllable has become a high vowel (underlying /I/, surface *i* or *u* depending on context) before long *a*: in the next syllable (Ó Siadhail 1989, 39).

(80) $a > I / _ C_0 a$:

	EMI	Modern Connacht	Gloss
a.	kába:s't'ə	gúba:s't'ə	'cabbage'
b.	ána:l'	úna:l'	'breath'
c.	skáda:n	skúda:n	'herring'
d.	b'áRa:n	b'íra:n	'nuisance'
e.	L'áda:n	L'ída:n	'burr of a teazle'

O'Rahilly (1932, 99) suggests that what has happened is that the vowel of the initial syllable has been affected by the forms in Munster, where the stress is on the second syllable and the first vowel has become ə (cf. Munster *gəbá:s't'ə*, *əná:l'*, *skədə:n*, *b'ərá:n*, *L'ədə:n*). Under this analysis, Connacht followed the vocalism of Munster, but retained initial stress, hence *gəba:s't'ə*, etc. Then the stressed ə became a high vowel. In my opinion, however, it seems unnecessary to appeal to Munster forms for this change. Simple dissimilation of a low vowel to a high vowel before another low vowel could account for *ána:l' > úna:l'*. Hence, the forms in (80) do not necessarily support the hypothesis of quondam forward stress in Connacht.

The second bit of evidence for forward stress in Connacht comes from forms like *klá:s't'ə* 'college', which appears to be in free variation with *kóla:s't'ə* (Ó Sé 1984). Ó Siadhail (1989) explains this as having gone through a stress shift (*kóla:s't'ə > kəlá:s't'ə*) and subsequent deletion of the pretonic vowel (*kəlá:s't'ə > klá:s't'ə*). This does not happen in words with consonants that would make illicit onsets: *skúda:n*, **skdá:n* 'herring' (80c).

This type of variation is conveniently accounted for with multiple grammars, as any individual speaker will presumably prefer either the apocopated or unapocopated variant, depending on various social circumstances. The constraints at issue here are ALL-FT-L, WSP, and DEP(seg). The fact that both variants *kóla:s't'ə* and *klá:s't'ə* have initial stress shows that ALL-FT-L remains high-ranking in Connacht. Therefore the two grammars vary in their ranking of WSP and DEP(seg). In the grammar pro-

ducing *kóla:s't'ə*, DEP(seg) outranks WSP, so that no sound may be removed in order to achieve stress on a heavy syllable.

(81)

/kEla:s't'a/	ALL-FT-L	DEP(seg)	WSP
☞ .kó.la:s't'ə.			*
.kə.lá:s't'ə.	σ !		
.klá:s't'ə.		* !	

In the grammar producing *klá:s't'ə* the ranking is WSP ≫ DEP(seg), so that a heavy syllable may move to the left edge of the word and be stressed.

(82)

/kEla:s't'a/	ALL-FT-L	WSP	DEP(seg)
.kó.la:s't'ə.		* !	
.kə.lá:s't'ə.	σ !		
☞ .klá:s't'ə.			*

Presumably in words like *skúda:n* a higher ranking constraint on acceptable onset clusters at the left edge of a prosodic word (call it LICENCEDONSET(PrWd)) blocked **skdá:n*.²⁰

(83)

/skIda:n/	LICONS(PW)	ALL-FT-L	WSP	DEP(seg)
☞ .skú.da:n.			*	
.skə.dá:n.		σ !		
.skdá:n.	* !			*

So there is no really convincing evidence that Connacht ever had forward stress. The evidence that has been adduced in favor of the hypothesis can all be explained without recourse to the argument that (L H) shifted from initial stress to final stress and back to initial stress. Thus Connacht indeed has remained unchanged in terms of stress placement since Early Modern Irish.

3.5 Conclusions

We have seen that most of the historical changes in prosodic structure may

²⁰ See chapter 5 on the prosodic licensing of onsets.

be attributed to the various rankings of three constraints: WSP, ALL-FT-L, and MAX(μ). The various rankings result from different applications, or the nonapplication, of the Promotion of the Unmarked. In Proto-Insular Celtic, MAX(μ) was ranked below the others.

- (84) Proto-Insular Celtic WSP \gg MAX(μ) cf. (23)
 ALL-FT-L \gg MAX(μ)

In Old Irish, MAX(μ) had been promoted above WSP, allowing unstressed long vowels. This was due not to the Promotion of the Unmarked but to the natural high rank of faithfulness constraints when output forms are faithful to input forms.

- (85) Old Irish/EMI MAX(μ) \gg WSP cf. (27)
 ALL-FT-L \gg WSP

In Modern Irish, the various dialects diverged in their rankings of these constraints. Ulster and Gaelic reverted to the Proto-Insular Celtic ranking, promoting WSP as a constraint against a marked phonological pattern, and demoting MAX(μ).

- (86) Ulster, Gaelic WSP \gg MAX(μ) cf. (34)
 ALL-FT-L \gg MAX(μ)

In Munster and East Mayo, WSP was promoted, and ALL-FT-L was demoted, resulting in noninitial stress in words with noninitial heavy syllables.

- (87) Munster, E. Mayo WSP, MAX(μ) \gg ALL-FT-L cf. (47), (61)

In Manx, ALL-FT-L and MAX(μ) became ranked; in Old Irish they had been unranked with respect to each other. Anglo-Norman words had the same ranking but used ALL-FT-R instead of ALL-FT-L.

- (88) Manx ALL-FT-L \gg MAX(μ) \gg WSP (native) cf. (76)
 ALL-FT-R \gg MAX(μ) \gg WSP (Ang.-N.) cf. (77)

In Connacht, the Old Irish/EMI ranking remained.

- (89) Connacht ALL-FT-L, MAX(μ) \gg WSP cf. (79)

In this chapter, I have examined much of the evidence that the Goidelic languages bring to bear on the prosodic hierarchy. We have seen the continuing role of the Weight-to-Stress Principle in the history of the Goidelic languages, and the effects it has had on stress placement and syllable weight. Further, we have seen that variation within a dialect (*d'a:rhər* ~ *d'arhər* in Ulster; native vs. Anglo-Norman words in early Manx) can be attributed to alternate constraint rankings between various grammars; this follows from the arguments made in chapter 1 that a proper analysis of free variation relies on multiple grammars with varying constraint rankings, rather than unranked constraints within a single grammar. The issue of “forward stress” in Munster, East Mayo, and Manx, which I left unresolved in this chapter, is thoroughly analyzed in chapter 4.

CHAPTER FOUR
FORWARD STRESS IN GOIDELIC AND
THE ROLE OF THE PROSODIC COLON¹

In chapter 3 we saw how the Weight-to-Stress Principle has affected the prosodic structure of the Goidelic languages. We saw that WSP compliance in Ulster and Gaelic caused unstressed long vowels to shorten, and compliance in Munster, East Mayo, and Manx caused noninitial long vowels to take stress. Noninitial stress in Goidelic languages is traditionally referred to as “forward stress.” The details of forward stress, which were not examined in chapter 3, will be fully explored here.

The peculiar thing about forward stress in Goidelic is that it moves stress to a peninitial heavy syllable, even when the initial syllable is heavy. Simple WSP compliance cannot account for this, since [H H́ ...] is no less of a WSP violation than [H́ H ...] is, yet [H H́ ...] is the correct pattern. On the other hand, simple avoidance of initial stress is not the answer either, as stress does fall on the initial syllable in [H́ L ...] and [Ĺ L L ...]. A further peculiarity is that stress never falls beyond the third syllable, so long vowels in the fourth syllable (or further right) cannot attract stress.

In this chapter I show that the most insightful explanation of Goidelic forward stress relies on the colon, a level of the prosodic hierarchy between the foot and the prosodic word. In § 4.1 I give a general introduction to the colon, discussing what makes up a colon and how the colon patterns in the prosodic hierarchy. In § 4.2 I discuss how the colon can be used to derive ternary stress patterns in Hungarian and Passamaquoddy. In § 4.3 I show how the colon can be used as a sort of “super-foot” in Eastern Ojibwa and Asheninca, and in § 4.4 I show that the colon can be used as a measure of prosodic size in Neo-Štokavian. In § 4.5 I argue against the unbounded colon, and in § 4.6 I show how the colon can be used to account for the stress patterns of Munster, East Mayo, and Manx.

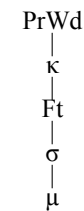
4.1 Introduction to the colon

The prosodic hierarchy was originally designed to work above the word level, to represent the structure that governs the interaction between syntax and phonology (Selkirk 1980 et seqq., Inkelas & Zec 1995; see also the articles collected in *Phonology Yearbook 4* (1987) and Inkelas & Zec 1990).

¹ An early version of part of this chapter appears as Green (1996b).

More recently, the prosodic hierarchy has been argued to represent structure within the word as well (e.g. Nespor & Vogel 1986, Cohn 1989, Inkelas 1989), and it is the prosodic structure within the word that is the focus of this dissertation. The prosodic hierarchy assumed here contains, to begin with, the elements McCarthy & Prince (1993a, 1) refer to as “the authentic units of prosody: mora (μ), syllable (σ), foot (Ft), prosodic word (PrWd).” I propose to refine the prosodic hierarchy by the addition of another unit, the colon (κ), between the foot and prosodic word. The Prosodic Hierarchy within the word level argued for in this dissertation is thus as shown in (1).

(1) Prosodic Hierarchy



I should emphasize that I believe this hierarchy to be available to all languages as a function of UG, but that not all levels are necessarily present in all languages. If a language has no processes that seem to require any given level of this hierarchy, the speakers of that language presumably do not construct that level. In principle, one should not be surprised to find languages without cola, or without feet, or without moras. The syllable and prosodic word perhaps are universally present; at least, I have never heard of a language that makes do without them. I should further mention that I do not believe that the number of prosodic levels between the word and the segment is necessarily limited to a maximum of four (κ , Ft, σ , μ). In principle, a language could have a prosodic level between the colon and the word, but probably only in a language with exceptionally long words would one be able to find evidence for such a level.

In his definition of the colon, Hayes (1995, 119) says, “Cola seem to come in two varieties: unbounded (created by the End Rule), and binary with initial prominence (apparently an analogue of the syllabic trochee).” Nevertheless, in his discussion of Asheninca (294), he builds a binary colon with final prominence. Thus Hayes’ implicit claim is that cola can be

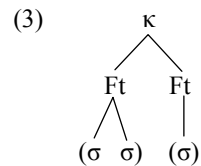
either binary or unbounded and either left-headed or right-headed. But I shall argue below that all cola are binary, and that the unbounded colon is not necessary in prosodic theory.

Whereas feet are built over syllables, cola are built over feet. As will be shown in the discussion of stress in both Asheninca (§ 4.3.2) and Munster Irish (§ 4.6.1), however, unless one is willing indiscriminately to build degenerate feet (and then later remove them), a binary colon must also be able to include an unfooted syllable.

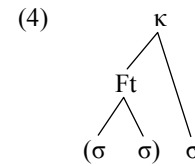
If a colon can include both feet and syllables, it will violate the Strict Layer hypothesis (Selkirk 1984b, Nespor & Vogel 1986, Inkelas 1989), which demands that a prosodic category consist only of members of the next lower category.

- (2) Strict Layer hypothesis (Selkirk 1984b, 26)
A category of level i in the [prosodic] hierarchy immediately dominates a (sequence of) categories of level $i - 1$.

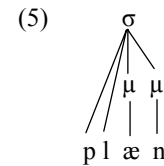
Under Strict Layering, a colon could consist only of feet; any stray syllables would force the construction of degenerate feet (see e.g. Hayes 1995, 95 ff.).



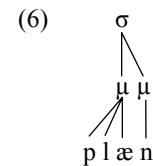
Exhaustive parsing (Itô 1986, Selkirk 1986, Inkelas 1989), on the other hand, looks from the bottom up, saying that all elements must be incorporated into higher levels, and thus prohibiting the stray syllable from remaining unincorporated. But by abandoning Strict Layering, while maintaining exhaustive parsing (as in Cohn 1993), an element that for any reason is ineligible to be parsed by the next highest level (e.g. a syllable that must be left out of a foot, or a foot out of a colon), may be parsed into the lowest prosodic category that will accept it. For example, a stray syllable may be incorporated into a colon, as shown by the structure in (4). Under this analysis, there is no need for the theoretically undesirable degenerate foot.



This is reminiscent of the usual treatment of syllable onsets: in a word like *plan*, the onset consonants are not eligible to be included under the first mora, and so are associated directly with the syllable node.



This contrasts with the view of Hyman (1985) and Zec (1988), where Strict Layering requires that onset consonants associate with the first mora of the syllable.



Since onset consonants are generally understood not to contribute to syllable weight, and since moras are understood to be units of syllable weight, the common view among phonologists is that the structure in (5) is preferred to that in (6) (see e.g. Hayes 1989). Since Strict Layering has been abandoned for onsets, it can be abandoned elsewhere, so that the structure in (4) is preferable to that in (3), since degenerate feet are theoretically undesirable.

Hayes (1995) proposes that because of the Strict Layering hypothesis, binary cola must have only feet as their terminals; this results in temporarily allowing degenerate feet in his analysis of Asheninca (see below). I propose instead that because of exhaustive parsing, a binary colon may

explaining the behavior of full and reduced vowels in a straightforward, natural manner. But its assumption that full vowels are inherently bimoraic has been challenged by Teeter & LeSourd (1983) and LeSourd (1988). They point out that vowels longer than normal full vowels can be derived in certain environments. Hayes considers these longer vowels trimoraic, but I think the two views can be reconciled in an alternative analysis.

I suggest that all vowels are underlyingly monomoraic, and the derived longer vowels are bimoraic. Further, full (non-ə) vowels are more prominent than the reduced vowel ə. Then I hypothesize that monomoraic syllables with full vowels have enough salience to meet the constraint FTSALIENCE (Zec 1994), even though they violate FTBIN. Zec (1994) defines FTSALIENCE as “Feet are associated with tone” for Neo-Štokavian, but more generally the definition can be simply “Feet are salient,” and the decision of what counts as salient is made on a language-particular basis. In Neo-Štokavian, tone makes a foot salient. In Passamaquoddy, a full vowel makes a foot salient, perhaps due to its greater sonority.⁷

A foot made up of a single syllable with ə will violate both FTSALIENCE and FTBIN, but two ə syllables will meet FTBIN.

(14)

Foot type	FTSALIENCE	FTBIN
(.Cá.), (.Cé.), (.Cí.), (.Có.), (.Cǎ.)	✓	*
(.Cá.)	*	*
(.Cə.Cá.)	*	✓

Feet in Passamaquoddy are iambic, so the peak is on the right. This is defined by the constraint IAMBIC PROMINENCE (cf. IAMBQ). This permits (.Cə.Cý.) feet (where v is any full vowel), but not (.Cv.Cý.), (.Cv.Cá.), or (.Cə.Cá.).

(15) **IAMBIC PROMINENCE**

In a structure (W S), S is more prominent than W.

⁷ Kenstowicz (to appear) has a quality-based account of languages that treat ə differently from full vowels. Under his analysis a constraint against ə as a foot peak (*P/ə) outranks similar constraints against full vowels as foot peaks (*P/i, *P/a, etc.). See also Cohn & McCarthy (1994) on the status of ə as less than a full vowel.

(16)

Foot type	FTSALIENCE	IAMB PROM
(.Cə.Cý.)	✓	✓
(.Cv.Cý.)	✓	*
(.Cv.Cá.)	✓	*
(.Cə.Cá.)	*	*

Finally, IDENT prevents changing ə in the input to a full vowel in the output. The constraints are ranked as follows: IDENT » IAMB PROM » FTSALIENCE, FTBIN, as shown in the following tableau. To save space, (17c) shows only the vowels of the output candidates; the feet in the candidates are indexed for clarity.

(17)

	/wəməsəɲəməɲəl/	IDENT	IAMB PROM	FTSAL	FTBIN	
a.	☞ (.wə.má.)(sə.ná.)(mə.nál.)		***	***		
	(.wə.má.)(sə.ná.)(mə.nál.)	*!***				
b.		/wicohkəmal/	IDENT	IAMB PROM	FTSAL	FTBIN
	☞ (.wí.)(cǒh.)(ké.)(mál.)				****	
	(.wí.cǒh.)(ke.mál.)		*!*			
c.		/mekənutəsəpənik/	IDENT	IAMB PROM	FTSAL	FTBIN
	☞ (é.) ₁ (ə.ú.) ₂ (ə.á.) ₃ (ə.í.) ₄		3	3	1	
	(é.) ₁ (ə.ú.) ₂ (ə.á.) ₃ (ə.í.) ₄	3 !			1	
	(e.á.) ₁ (u.á.) ₂ (ə.í.) ₄		1 2 !			

Constraints governing the formation of the colon and the assignment of primary and secondary stress will give the surface forms listed in (12–13). The relevant constraints are PARSEFT, COLONBINARITY, ALL-κ-RIGHT, COLONFORMLEFT, and PROSODICWORDRIGHT. Analogous to the three latter constraints are ALL-κ-LEFT, COLONFORMRIGHT, and PROSODICWORDLEFT, but these constraints are not used in Passamaquoddy.

(18) Constraints on colon formation

a. **PARSEFT**

Feet are parsed into cola.

- b. **COLONBINARITY**
Cola are binary (over feet and syllables).
- c. **ALL-κ-RIGHT** **ALL-κ-LEFT**
Align(κ, R; PrWd, R) Align(κ, L; PrWd, L)
- d. **COLONFORMRIGHT** **COLONFORMLEFT**
Cola are right-headed. Cola are left-headed.
- e. **PROSODICWORDRIGHT** **PROSODICWORDLEFT**
PrWds are right-headed. PrWds are left-headed.

In languages without the colon, the definition of PARSEFT is “Feet are parsed into prosodic words,” and the constraints that refer directly to the colon (18b–d) are presumably not found. It has frequently been thought that all constraints are universal, and that constraints that seem to play no role in a certain language are simply very low-ranked in that language. Nevertheless, many constraints can be found in the literature that are clearly language-specific (e.g. McCarthy & Prince’s 1994 ALIGN-*um* for Tagalog: see § 1.2.1.2), and it is reasonable to assume that there are no constraints governing a certain prosodic category, such as the colon, in languages that do not have that prosodic category.

In Passamaquoddy, PROSODICWORDRIGHT, COLONFORMLEFT, and PARSEFT are unviolated; PARSEFT crucially dominates ALL-κ-RIGHT and COLONBINARITY. The tableau in (19) evaluates structures like those of *wəmə̀sə̀nə̀mə̀nəl* (12b), *wicohkə̀mal* (12c), and *məkə̀nutəsə̀pə̀nik* (13b). For convenience, I label reduced-vowel syllables (Cə) “L” and full-vowel syllables (Cv) “H”, although, as mentioned above, they are all monomoraic, the difference being one of prominence rather than weight.

(19)

	/LLLLL/	PWDR	COLFML	PRSFT	ALL-κ-R	COLBIN
a.	☞ [{(L̇)(L)} {(L̇)(L)}]				σσσσ	*
	[(L)(L) {(L̇)(L)}]			*!		
b.	/HHHH/	PWDR	COLFML	PRSFT	ALL-κ-R	COLBIN
	☞ [{(Ḣ)(H)} {(Ḣ)(H)}]				σσ	
	[(H)(H) {(Ḣ)(H)}]			*!*		

c.

	/HLHLLH/	PWDR	COLFML	PRSFT	ALL-κ-R	COLBIN
	☞ [{(Ḣ)(LH)} {(L̇)(LH)}]				σσσσ	
	[(H)(LH) {(L̇)(LH)}]			*!*		

Since tertiary stress is not marked by Stowell or LeSourd, it is not clear that it has phonetic reality. Nevertheless, the colon is necessary in order to predict correctly the placement of secondary stress. In a system that admits only the foot and prosodic word above the syllable, secondary stress is predicted in more places than it actually occurs.

- (20) [×] [×]
 (×)(. ×) (. ×) . (×)(. ×) (. ×) (. ×)
 H L H L H L H L H L L L H
 a. * à kə̀ nù tə̀ má kə̀n b. * mè kə̀ nù tə̀ sá pə̀ nìk

- [×]
 (×)(×)(. ×)(×)(. ×)
 H H L H H L L
 c. * àt pàhk wə̀ nì kə̀h sə̀ wə̀k

As we saw above, the colon allows us to predict which syllables do receive secondary stress, and which do not.

4.3 The colon as “super-foot”

In some languages, stress is restricted to a certain portion of the word, a phenomenon known as a “stress window.” For example, in § 4.6.1 we shall see that stress in Munster Irish may fall only on one of the first three syllables of a word. The colon can be used as a “super-foot” to group feet together in order to delineate this stress window, as we shall see in the following discussions of Eastern Ojibwa and Asheninca.

4.3.1 Eastern Ojibwa

In Eastern Ojibwa (an Algonquian language of central Ontario: Kaye 1973, Piggott 1974, 1983), it seems at first glance that stress is applied to every heavy (CVV, not CVC) syllable, and to every second light syllable counting from left to right.⁸ Also a final light syllable is stressed. The first

⁸ I am abstracting away from a handful of words of the shape CVNCV (N = na-

The only alternative would be to propose that the prosodic word could count three feet from the right edge (or two feet, ignoring the final extrametrical foot), an extremely undesirable notion that makes the predictive ability of metrical theory far too powerful and unconstrained. The binary colon is thus the only reasonable mechanism for explaining the facts of stress placement in Eastern Ojibwa. A binary colon is used like a “super-foot” to group feet together and delineate the range of primary stress: in this language, within the two rightmost (nonextrametrical) feet.

4.3.2 Asheninca

The analysis of stress in Asheninca (an Arawakan language of Peru), according to Payne (1990) and Hayes (1995, 288 ff.), depends on the notion of prominence. The prominence system of Asheninca is given in (25); $|x| > |y|$ means ‘ x is more prominent than y ’.

(25) Prominence system of Asheninca
 $|CVV| > |Ca|, |Co|, |Ce|, |CiN| > |Ci|$

(26) Stress pattern of Asheninca

- | | | |
|----|-------------------|---------------------------|
| a. | ñàawyàatawákariri | ‘what he saw in a vision’ |
| b. | nawisawètánaka | ‘I went in vain’ |
| c. | kaNtimáitaçya | ‘however’ |
| d. | pàatikákeri | ‘you stepped on him’ |

The derivation of stress is as follows. First, iambs are formed from left to right; final syllables are extrametrical, and CVC syllables are light. Hayes builds degenerate feet over the fourth syllable of (27c) and (d), but this is unnecessary. If elements are exhaustively parsed from left to right into cola, unfooted syllables will be included in the colon once it is built.

(27) Build iambs; final extrametricality

- | | | | |
|----|---|----|------------------------------------|
| a. | $(\times)(\times)(. \times) (. \times)$ | b. | $(. \times) (. \times) (. \times)$ |
| | H H L L L L $\langle L \rangle$ | | L L L L L L $\langle L \rangle$ |
| | ñàawyàata wá ka ri ri | | na wì sa wè ta ná ka |
| c. | $(. \times)(\times) .$ | d. | $(\times)(. \times) .$ |
| | L L H L $\langle L \rangle$ | | H L L L $\langle L \rangle$ |
| | kaN ti mái ta çya | | pàa ti ká ke ri |

Next, a binary colon is built at the right edge; it applies End Rule Right based on the prominence hierarchy in (25), as shown in (28). The degree of prominence of syllables that are heads of feet is indicated by asterisks beneath the word.

(28) Build cola; apply End Rule Right based on prominence.

- | | | | |
|----|---|----|------------------------------------|
| a. | $\{ \times . \}$ | b. | $\{ . \times \}$ |
| | $(\times)(\times)(. \times) (. \times)$ | | $(. \times) (. \times) (. \times)$ |
| | H H L L L L $\langle L \rangle$ | | L L L L L L $\langle L \rangle$ |
| | ñàawyàata wá ka ri ri | | na wì sa wè ta ná ka |
| | * * * * | | * * * |
| | * * * | | * * |
| | * * | | |
| c. | $\{ \times . \}$ | d. | $\{ \times . \}$ |
| | $(. \times)(\times) .$ | | $(\times)(. \times) .$ |
| | L L H L $\langle L \rangle$ | | H L L L $\langle L \rangle$ |
| | kaN ti mái ta çya | | pàa ti ká ke ri |
| | * * * | | * * * |
| | * * | | * * * |
| | * | | * |

As we see, the colon is headed by the most prominent syllable; if both syllables are equally prominent, the rightmost syllable heads the colon. But the Continuous Columns Constraint means that only the head of a foot may head a colon. If, as in (28d), the rightmost member of the colon does not have a grid mark (i.e. is not the head of a foot), it cannot become the head of the colon, regardless of its prominence.

Next, as shown in (29), a prosodic word is built over the colon; again, with only one colon, one cannot tell whether End Rule Left or Right is employed. Stress is assigned as follows: a syllable with three grid marks is assigned primary stress; to the left of the primary stress, a syllable with a single grid mark is assigned secondary stress, unless it is the syllable immediately preceding the primary stress (e.g. *ti* in (29c)), in which case it is not stressed. Syllables to the right of the primary stress (e.g. the first *ri* in (29a)) have no surface realization of stress.

(34) **ALIGNBASE**Align(Base_{MascPl}, R; κ, R)

The right edge of every masc. pl. base corresponds to the right edge of some colon.

Zec does not propose a constraint to limit suffixation of *-ov* only to those cases where ALIGNBASE makes it necessary. For convenience, I consider augmentation with *-ov* to be a violation of DEP, although it is unlikely that *-ov* is phonologically epenthetic, as canonical DEP violations are. As shown in the tableau in (35), ALIGNBASE dominates DEP.

	/vitez/	ALIGNBASE	DEP
a.	(.vi.tez.)	*!	
	☞ {(vi.te.)zov.}		**

	/manastir/	ALIGNBASE	DEP
b.	☞ {(ma.na.)stir.}		
	{(ma.na.)(sti.rov.)}		*!*

The full range of facts in Neo-Štokavian is actually far more complicated than this, but this analysis can begin to explain the distribution of the augment *-ov-*. The facts of stress placement in Neo-Štokavian are complicated, relating in part to the placement of tone; for this reason, I have not considered the prominence polarity for cola in Neo-Štokavian. I shall not explore the full range of facts here, but refer the reader to Zec (1994).

4.5 The question of the unbounded colon: Garawa

So far our discussion of the colon has assumed that, like the foot, the colon is binary.¹¹ Empirically, however, there seems to be some evidence for unbounded cola, although it is theoretically undesirable to admit unbounded cola as well as binary cola, as such a theory would be less constrained than a theory that admits only binary cola.

The evidence that has been adduced for the unbounded cola comes from languages where secondary stress falls at the opposite end of the word from primary stress, with tertiary stress on alternate syllables in between. Languages that have been analyzed thus include Maithili (Hayes

¹¹ See Walker (1996) for a convincing argument against the unbounded foot.

1995, 149 ff.) and Garawa (Halle & Clements 1983, 20–1; Halle & Vergnaud 1987, 43). I focus on the stress pattern of Garawa (Australian: Furby 1974), but the analysis can be extended to other patterns as well.

In Garawa, primary stress falls on the initial syllable of a word, secondary stress falls on the penult, and tertiary stress on every second syllable to the left of the secondary stress; but no stress ever falls on the second syllable of a word.¹²

(36) Stress in Garawa

a.	yámi	‘eye’
b.	púnjala	‘white’
c.	wátjimpaŋu	‘armpit’
d.	kámalařinji	‘wrist’
e.	yákalákalampa	‘loose’
f.	ŋánkiriřikĩřimpàyi	‘fought with boomerangs’
g.	ŋámpaláŋjnmûkunjina	‘at our many’
h.	nářiŋjnmûkunjinamiřa	‘at your own many’
i.	nímpaláŋjnmûkunânjimiřa	‘from your own two’

Under the traditional analysis of a pattern like that in (36), syllables are parsed into trochees, and the prosodic word applies End Rule Left.

(37)	[×]
	(× .) (× .) (× .) (× .) (× .)	
a.	ním pa lâ ŋin mù ku nâ ŋji mì řa	
	[×]
	(× .) (× .) (× .) (× .)	
b.	ná ři ŋin mù ku ŋjî na mì řa	

Then, an unbounded colon is built beneath the prosodic word and applies End Rule Right. However, in order to accommodate the head of the prosodic word, a second colon, unbounded and one foot long, must be built at the left edge.

¹² Furby uses the mark (̄) to indicate tertiary stress; I alter this to (˘) to conform with the notation used elsewhere in this chapter. Note that *tj* and *ŋj* are single segments: a lamino-alveolar stop and nasal respectively.

- (38) [×]
 { × } { × }
 (× .) (× .) (× .) (× .) (× .)
 a. ním pa lâ ñin mù ku nâ ñji mì řa

- [×]
 { × } { × }
 (× .) . (× .) (× .) (× .)
 b. ná ři ñin mù ku ñjî na mì řa

In addition to the theoretical undesirability of unbounded cola mentioned above, this analysis is also stipulative in building prosodic structure first at the bottom, then at the top, and then in the middle, rather than simply from the bottom up. But this ordering is necessary to get the right result: if the right-headed colon were built before the left-headed prosodic word, the word layer would see only the single grid mark of the colon at the right edge, and would be obliged to put its grid mark there.

- (39) [×]
 { × }
 (× .) (× .) (× .) (× .) (× .)
 a. * ním pa lâ ñinmù ku nâ ñji mí řa

- [×]
 { × }
 (× .) . (× .) (× .) (× .)
 b. * ná ři ñinmù ku ñjî na mí řa

Alternatively, two binary cola could be built, one at each end of the word. Unfortunately, a trochaic colon would have to be built at the left edge and an iambic colon at the right edge.

- (40) [×]
 { × . } { . × }
 (× .) (× .) (× .) (× .) (× .)
 a. ním pa lâ ñinmù ku nâ ñji mì řa

- [×]
 { × . } { . × }
 (× .) . (× .) (× .) (× .)
 b. ná ři ñinmù ku ñjî na mì řa

But this situation could be motivated by an inclination to make the right edge of a word prominent, as by giving it secondary stress.¹³ The desired result can be achieved with a constraint FINALPROMINENCE (41) ranked above ALL-κ-LEFT and COLONFORMRIGHT but below PROSODIC WORD-LEFT and unranked with respect to PARSE-FT.

(41) **FINALPROMINENCE**

The right edge of a prosodic word is prominent.

In the tableaux in (42) we see how the stress pattern of Garawa is derived. PROSODICWORD-L is high ranking, so primary stress must fall on the head of the leftmost colon. PARSE-FT and FINALPROMINENCE are unranked with respect to each other, and the optimal candidate is the one that has only one violation between these two constraints: only one foot is left unparsed, and the final foot is prominent, as it receives secondary stress.

(42)

/nimpalañinmukunanñjimiřa/	PWD-L	PRS-FT	FIN PRM	ALL-κ-L	κ-FM-L
a. ☞ [{(óσ)(ôσ)}(ôσ){(ôσ)(òσ)}]		*		6σ	*
[{(ôσ)(ôσ)(ôσ){(ôσ)(óσ)}]		**!*		6σ	
[{(óσ)(ôσ)}(ôσ){(òσ)(ôσ)}]		*	*!	6σ	
[{(òσ)(ôσ)}(ôσ){(ôσ)(óσ)}]	*!	*		6σ	*
[{(óσ)(ôσ)}(ôσ)(ôσ)(ôσ)]		**!*	*		*
[{(óσ)(ôσ)}{(òσ)(ôσ)}(ôσ)]		*	*!	4σ	

b.

/nařinmukunñjinamiřa/	PWD-L	PRS-FT	FINPRM	ALL-κ-L	κ-FM-L
a. ☞ [{(óσ)σ}(ôσ){(ôσ)(òσ)}]		*		5σ	*
[{(ôσ)σ(ôσ){(ôσ)(óσ)}]		**!*		5σ	
[{(óσ)σ}(ôσ){(òσ)(ôσ)}]		*	*!	5σ	
[{(òσ)σ}(ôσ){(ôσ)(óσ)}]	*!	*		5σ	*
[{(óσ)σ}(ôσ)(ôσ)(ôσ)]		**!*	*		*
[{(óσ)σ}{(òσ)(ôσ)}(ôσ)]		*	*!	3σ	

¹³ My thanks to David Odden for this suggestion.

The Optimality-Theoretic treatment of the “initial dactyl” of (42b) is to rank ALIGN-L (43) above ALL-FT-R (Cohn & McCarthy 1994). Compliance with ALIGN-L forces a foot to appear at the left edge of the prosodic word, and compliance with ALL-FT-R forces all remaining feet to cluster toward the right edge of the word.

- (43) **ALIGN-L** (PrWd to Ft)
Align(PrWd, L; Ft, L)
The left edge of every prosodic word corresponds to the left edge of some foot.

The interaction of these constraints is shown in the tableau in (44). All of the candidates in (42b) follow the footing of the optimal candidate of (44).

(44)	/naʃɲinmukunjinamiʃa/	ALIGN-L	ALL-FT-R
	[.na.ʃi.ɲin.)(mu.ku.)(ɲji.na.)(mi.ʃa.)]	* !	12σ
	☞ [(na.ʃi.)ɲin.(mu.ku.)(ɲji.na.)(mi.ʃa.)]		13σ
	[(na.ʃi.)(ɲin.mu.)ku.(ɲji.na.)(mi.ʃa.)]		14σ !
	[(na.ʃi.)(ɲin.mu.)(ku.ɲji.)na.(mi.ʃa.)]		15σ !
	[(na.ʃi.)(ɲin.mu.)(ku.ɲji.)(na.mi.)ʃa.]		16σ !

So we see that the facts of Garawa and similar cases can be accounted for with the binary colon, and the unbounded colon is unnecessary. Let us now examine how the colon can be used to account for the stress pattern in some Goidelic languages.

4.6 The colon in Goidelic

As alluded to in the previous chapter, stress in Munster, East Mayo, and Manx is attracted to heavy syllables. In this chapter I propose that the binary colon (Halle & Clements 1983, Hammond 1987, Hayes 1995) can be used to account for the placement of stress in these Goidelic dialects.

Previous discussions of stress in Munster include Loth (1913), van Hamel (1926), O’Rahilly (1932), Blankenhorn (1981), Ó Sé (1989), Docherty (1991), Gussmann (1995), and Rowicka (1996).

4.6.1 Munster stress: The data

I begin with the placement of primary stress¹⁴ in two- and three-syllable words. First of all, if the second syllable of a word is heavy, it is stressed (recall that CVC syllables are light).¹⁵

- (45) Stress 2nd σ if H (see References for abbreviations of sources)
- | | | | |
|----|-------|-----------------|------------------------|
| a. | L H | kər.ká:n | ‘pot’ (CI 42, Mk 50) |
| b. | L H L | fʀ’ə.há:lə | ‘feeding’ (SCD 202) |
| c. | L H H | a.sé:n.ti:xt | ‘disagreement’ (BB 99) |
| d. | H H | d’i:.ví:n’ | ‘idle’ (Mk 113, Rg 69) |
| e. | H H L | re:.sú:n.tə | ‘reasonable’ (Rg 77) |
| f. | H H H | ma:r.n’é:.li:xt | ‘navigation’ (BB 152) |

If the second syllable is light, and there is at least one heavy syllable in the word, the leftmost heavy syllable is stressed.

- (46) Stress leftmost H
- | | | | |
|----|-------|-------------|-----------------------|
| a. | H L | bó:.hər | ‘road’ (Rg 54, S 220) |
| b. | L L H | m’a.lə.vó:g | ‘satchel’ (DÓC 233) |
| c. | H L L | t’ái.lə.kə | ‘gift’ (Mk 27) |
| d. | H L H | ú:.də.ra:s | ‘authority’ (Mk 36) |

If all the syllables are light, the first syllable is stressed.

- (47) Stress leftmost σ
- | | | | |
|----|-------|----------|---------------------------|
| a. | ! L | á.səl | ‘donkey’ (CD 170) |
| b. | ! L L | á.lə.gər | ‘loud talk’ (BB 7, CD 85) |

¹⁴ Information about secondary stress is inconsistently and incompletely reported in the sources, so I consider only primary stress. Sjoestedt (1931) and Ó Sé (1989) give some general indications of secondary stress, but it is difficult to determine secondary stress in all words from their rules. The primary sources usually indicate secondary stress only in compound words, which I am not considering here.

¹⁵ I am abstracting away here from the following facts: (i) there are some lexical exceptions to this stress pattern (Ó Sé 1989, 151); (ii) certain suffixes with heavy syllables never attract stress; and (iii) other heavy suffixes attract stress even when, prosodically speaking, they should not (Ó Siadhail and Wigger 1975, 78, Ó Sé 1989, 150–1, Ó Siadhail 1989, 30, Gussmann 1995). I believe that these suffixes are marked in the lexicon as “stressless” or “always stressed,” respectively.

In four- and five-syllable words, only the first three syllables are considered.¹⁶

- (48) [Ľ L L]... words
- a. [Ľ L L] H L á.də.rə.ga:lə 'mediation' (gen.) (BB 98)¹⁷
- b. [Ľ L L] L fō.hə.rə.gə 'bathe' (v.n.) (Ky 136)
- c. [Ľ L L] H pá.tə.lə.xa:n 'a plump creature' (BB 171)
- d. [Ľ L L] H H é.t'ə.r'ə.xa:ni: 'vulgar person' (SCD 171)
- e. [Ľ L L] L H l'é.h'ə.l'ə.xə.s'u:l' 'stand-offish' (BB 146)
- (49) [L L Ȟ]... words
- a. [L L Ȟ] L fo.dər.lúə.səx 'bustling' (SCD 196)
- b. [L L Ȟ] H L i.m'ə.g'é:.n'u:lə 'distant' (pl.)¹⁸
- c. [L L Ȟ] H ga.n'ə.v'i:.n'i: 'grains of sand' (BB 118)
- d. [L L Ȟ] L L a.mə.ró:.d'ə.h'ə 'unfortunate' (BB 8)
- (50) [Ȟ L H]... words
- a. [Ȟ L H] L d'íə.gə.su:ləxt 'piety' (BB 87)¹⁹
- b. [Ȟ L H] H áum.pə.ra:ni:xt 'affliction' (CD 112)
- (51) Other patterns
- a. [L Ȟ L] H xə.m'á:.də.d'i:s't' 'keep' (3 pl. imperf.) (Ky 135)
- b. [Ȟ L L] L má:.hə.r'ə.xə 'mothers' (Ky 135)

For the sake of completeness I should mention that Munster has stressed monosyllables of both shapes [L] and [H].

¹⁶ This is the three-syllable "stress window" of Ó Sé (1989). Gussmann (1995) cites some forms with stress on the fourth syllable, but Ó Sé (p.c.) informs me that these forms are unreliable, as they seem to be based on forms from nonnative speakers.

¹⁷ The source cites nominative *ádərəga:l*, but Ó Sé (p.c.) confirms that the genitive also has initial stress.

¹⁸ This form is cited by Gussmann (1995), who gets his data mostly from the same sources I do, but I cannot find the original source for this word. Ó Sé (p.c.) confirms antepenultimate stress on this word, rather than the penultimate stress cited by Gussmann.

¹⁹ Ó Sé (p.c.) points out that speakers whose Irish is influenced by English phonology have penultimate stress in [H L H L] words; this was confirmed for me by an informant who is a fluent Irish speaker but whose native language is English, who said *d'íəgəsú:ləxt*.

(52) Stressed monosyllables

- a. Ľ bá 'cows' (Mk 18, Rg 12)
- b. Ȟ b'ó: 'alive' (CI 32, Rg 14)

As will be discussed in chapter 5, Munster Irish has two environments in which an epenthetic vowel is inserted: first, into CC clusters where C₁ is a sonorant and C₂ is neither a voiceless stop nor homorganic with C₁ (e.g. /ar'g'ad/ *ár'əg'əd* 'money': see § 5.3.1.1), and second, into CC clusters of rising sonority where the cluster is not prosodically licensed as an onset (e.g. /əg'n'a/ *əg'n'ə* 'mind': see § 5.2.2). Both epenthetic vowels are visible for the purposes of stress placement: first, /armaku:l' *árəmaku:l'* 'tender' (CD 168) has the initial stress of an underlying (LLLH) word like *pátələxa:n* (48c), not the final stress of an underlying (LLH) word like *əmədə:n* 'fool' (DOC 213); and /sa:kra:lta/ *sá:kəra:lha*²⁰ 'easy-going' (BB 194) has the initial stress of an underlying (HLHL) word like *d'íəgəsú:ləxt* (50a), not the penultimate stress of an underlying (HHL) word like *re:sú:ntə* (45e).

The facts of Munster stress may be summarized as follows: if the second syllable is heavy, it is stressed. If the second syllable is light the leftmost heavy syllable (within the three-syllable "stress window") is stressed. If the first three syllables are light, the first syllable is stressed. Stress always falls on one of the first three syllables. As we shall see below, all these facts can be accounted for in a simple and elegant theoretical framework.

4.6.2 Munster stress: the problem

The simple cases, where there are no heavy syllables and stress falls on the initial syllable, can be explained under the analysis laid out in chapter 3. There, we saw the role of several constraints in stress placement, notably WSP ("if heavy, then stressed; and if unstressed, then light") and ALL-FT-LEFT ("only one foot per word, at the left edge"). Syllables are parsed into moraic trochees, beginning at the left edge of the word. Except in initial position, however, L L sequences are NOT parsed into (L L) feet, since there is no pattern of alternating stress; as we saw in § 3.2, this is due to the ranking of ALL-FT-LEFT above PARSE-σ.

The ranking ALL-FT-LEFT » PARSE-σ is shown in the tableau in (53) for the word *fōhərəgə* 'bathe' (v.n.) (48b), which I assume is underlyingly /fōhəra/ (with an epenthetic vowel between *h* and *r*: see chapter 5), but

²⁰ /lt/ surfaces as *lh* in many varieties of Munster Irish.

short vowels surface as reduced ə when they are not the heads of feet.²¹

(53)

/fohɾaga/	ALL-FT-L	PARSE-σ
☞ (.fó.hə).rə.gə.		**
(.fó.hə).(rá.gə.)	σ ! σ	

Heavy syllables, however, are footed when noninitial; as shown in chapter 3, this is because WSP is ranked higher than ALL-FT-LEFT. This ranking is shown for the word *kərká:n* ‘pot’ (45a) in the tableau in (54).

(54)

/kErka:n/	WSP	FTFORM	FTBIN	ALLFTL	PARSE-σ
(.kór.)(ka:n.)	* !		*	σ	
(.kór.ka:n.)	* !	*			
(.kər.ká:n.)		* !			
(.kór.)ka:n.	* !		*		*
☞ .kər.(ká:n.)				σ	*

When there is room for two feet in a word, it is the second foot in the word whose head syllable receives main stress. This may be assigned to the ranking of PRWD-RIGHT above PARSE-σ; PRWD-RIGHT cannot be ranked with respect to ALL-FT-LEFT. The tableau in (55) illustrates this ranking in the words *m’aləvɔ:g* ‘satchel’ (46b), *d’i:ví:n’* ‘idle’ (46d), and *t’əiləkə* ‘gift’ (46c). Although the initial syllable in the optimal candidate in (55a) does not receive primary stress, the fact that it is not reduced to ə shows that it is the head of a foot.

(55)

a.

/m’alvo:g ²² /	WSP	PRWD-R	ALLFTL	PARSE-σ
☞ (.m’á.lə).(vó:g.)			σσ	
(.m’á.lə.)vo:g.	* !			*
.m’ə.lə.(vó:g.)			σσ	* ! *
(.m’á.lə).(vo:g.)	* !	*	σσ	

²¹ Generally, all short vowels surface as ə when they are unstressed, as in /skada:n/ *skədə:n* ‘herring’ and /kaso:g/ *kəsó:g* ‘coat’; however, when /a/ is followed by a long high vowel in the next syllable, it surfaces as /a:/ */kal’i:n’/ kal’i:n’* ‘girl’; */k’artu:/ k’artú:* ‘correct’ (v.n.).

²² The surface candidates have an epenthetic vowel between / and v: see chapter 5.

b.

/t’əilaka/	WSP	PRWD-R	ALLFTL	PARSE-σ
(.t’əi.)(lá.kə.)		* !	σ	
(.t’əi.)(lá.kə.)	* !		σ	
☞ (.t’əi.)lə.kə.				**
.t’əi.(lá.kə.)	* !		σ	*

A way to comply with the WSP without violating ALL-FT-LEFT would be to shorten a noninitial heavy syllable. As we saw in chapter 3, this is the technique used in Ulster; in Munster, however, this is prohibited by high-ranking MAX(μ).

(56)

/m’alvo:g/	MAX(μ)	WSP	ALL-FT-L	PARSE-σ
(.m’á.lə.)vo:g.	* !			*
☞ (.m’á.lə).(vó:g.)			σσ	

The data given above in (45a, b), (46a, b, c), (47), (48b), (50a, d), (51b), and (52) can all be accounted for with only these constraints. But consider forms such as *asé:nti:xt* ‘disagreement’ (45c), *ma:rn’é:li:xt* ‘navigation’ (45f), and *ú:dəra:s* ‘authority’ (46d). As shown in (57), the constraints as given above would falsely predict final stress in these forms.

(57)

a.

/ase:nti:xt/	WSP	PRWD-R	ALL-FT-L	PARSE-σ
(.á.)(se:n.)(tí:xt.)	**!	*	σσσ	
.a.(sé:n.)(tí:xt.)	*	* !	σσσ	*
*☞ .a.(se:n.)(tí:xt.)	*		σσσ	*

b.

/ma:rn’é:li:xt/	WSP	PRWD-R	ALL-FT-L	PARSE-σ
(.má:r.)(n’é:.)li:xt.)	**	* !	σσσ	
(.ma:r.)(n’é:.)li:xt.)	**	* !	σσσ	
*☞ (.ma:r.)(n’é:.)li:xt.)	**		σσσ	

c.

/u:dəra:s/	WSP	PRWD-R	ALL-FT-L	PARSE-σ
*☞ (.ú:.)də(rá:s.)	*		σσ	*
(.ú:.)də(rá:s.)	*	* !	σσ	*

A common means of preventing stress from falling on the final syllable is the theory of extrametricality (Hayes 1979, 1980, 1995), which says that a

prosodic constituent at an edge of a domain (in the unmarked case, the right edge) may be marked as extrametrical and therefore unavailable to prosodic processes. The specific instance of a final syllable being unavailable for stress has been formulated as the constraint NONFIN(ó) (58) (Prince & Smolensky 1993, 43, Hung 1994, Cohn & McCarthy 1994, Ní Chiosáin to appear).

(58) **NONFIN(ó)**

The head syllable of a PrWd is not final in the PrWd.

Ranking NONFIN(ó) above PRWD-R will give the right result in *ú:dəra:s* but falsely predicts **d'i:vi:n'* instead of *d'i:vi:n'* 'idle' (45d).

(59)

	/u:dəra:s/	NONFIN(ó)	PRWD-R
a.	☞ (.ú:.)də.(ra:s.)		*
	(.u:.)də.(rá:s.)	* !	

	/d'i:vi:n'/	NONFIN(ó)	PRWD-R
b.	*☞ (.d'i:.) (vi:n')		*
	(.d'i:.) (vi:n')	* !	

Of course, the opposite ranking PRWD-R » NONFIN(ó) will yield the opposite results: *d'i:vi:n'* but **u:dərá:s*. Apparently NONFIN(ó) is simply not the relevant constraint here.

What is needed, therefore, is some mechanism to take the final syllable of *ú:dəra:s* out of consideration while leaving the final syllable of *d'i:vi:n'* in consideration. That mechanism, I argue, is the colon.

4.6.3 Munster stress: the solution

The right-headed binary colon may be used in Munster to explain the different behavior of *ú:dəra:s* and *d'i:vi:n'*. By building a right-headed binary colon at the left edge of the word, the final syllable of *ú:dəra:s* is excluded from the colon, but the final syllable of *d'i:vi:n'* is included.

(60)

[×]	[×]
{ × . }	{ . × }
(×) (×)	(×)(×)
H L H	H H
a. ú: dəra:s	b. d'i:vi:n'

Because the final syllable of *ú:dəra:s* falls outside of the colon, it is not eligible to become the head syllable of the word, i.e. to receive primary stress. The ranking COLONBINARITY, COLONFORMRIGHT, ALL-κ-LEFT » PARSE-FT gives us the correct results. The tableaux in (61) show that the optimal candidate is the one in which a binary, right-headed colon appears at the left edge of the word.

(61)

	/d'i:vi:n'/	COLBIN	COLFMRT	ALL-κ-L	PARSE-FT
a.	☞ [{(d'i:.) (vi:n')}]				
	[{(d'i:.) (vi:n')}]		* !		
	[{(d'i:.) } (vi:n')]	* !			*

	/u:dəra:s/	COLBIN	COLFMRT	ALL-κ-L	PARSE-FT
b.	☞ [{(ú:.)də} (ra:s.)]				*
	[{(u:.)də} (rá:s.)]	* !			
	[(u:.) {də} (rá:s.)]			σ !	*

All the data that could not be accounted for without the colon now can be accounted for: the colon consistently selects a heavy second syllable as the locus of stress, as shown in (62).

(62)

	/a:se:nti:xt/	COLBIN	COLFMRT	ALLκL	PRS-FT
a.	☞ [{a.(sé:n.)} (tí:xt.)]				*
	[a. { (se:n.) } (tí:xt.)]			σ !	

	/ma:r'n'e:li:xt/	COLBIN	COLFMRT	ALLκL	PRS-FT
b.	☞ [{(ma:r) (n'é:.)} (lí:xt.)]				*
	[(ma:r) { (n'e:.) } (lí:xt.)]	* !			

The analysis of the data of (53)–(55), which could be explained without

the colon, does not suffer when the colon enters the picture.

- (63) [×] [×] [×]
 { . × } { × . } { × . }
 (×) (× .) (×)
 L H L L L L H L L
 a. kərká:n b. fó hə rə gə c. t'ói lə kə

Thus all the two- and three syllable forms of (45)–(47) can be explained. Turning to the four- and five-syllable forms of (48)–(51), the forms *ádər'əga:lə* ‘mediation (gen.)’ (48a), *im'əg'é:n'u:lə* ‘distant’ (pl.) (49b), and *d'íəgasu:ləxt* ‘piety’ (50a) can be accounted for by proposing that only a single colon may be built, even if there is room for more than one, and even if a heavy syllable is left unstressed; in other words, that ALL-κ-L outranks WSP as well as PARSE-FT.

- (64)
- | | /adIr'aga:la/ | ALL-κ-LEFT | WSP | PARSE-FT |
|----|-------------------------------|------------|-----|----------|
| a. | ☞ [{(á.də).r'ə.} (ga:.)lə.] | | * | * |
| | [{(a.də).r'ə.} {(gá:.)lə.}] | σ!σσ | | |
-
- | | /Im'Ig'e:nu:la/ | ALL-κ-LEFT | WSP | PARSE-FT |
|----|------------------------------------|------------|-----|----------|
| b. | ☞ [{(i.m'ə.)(g'é:.)} (n'u:.)lə.] | | * | * |
| | [{(i.m'ə.)(g'é:.)} {(n'ú:.)lə.}] | σ!σσ | * | |
-
- | | /d'íəgasu:lExt/ | ALL-κ-LEFT | WSP | PARSE-FT |
|----|--------------------------------|------------|-----|----------|
| c. | ☞ [{(d'íə).gə.} (su:.)ləxt.] | | * | * |
| | [{(d'íə).gə.} {(su:.)ləxt.}] | σ!σ | * | |

Forms that end with two heavy syllables, like *ét'ər'axa:ni:* ‘vulgar person’ (48d) and *áumpəra:ni:xt* ‘affliction’ (50b) are also easily explained.

- (65)
- | | /Et'Ir'axa:ni:/ | ALL-κ-LEFT | WSP | PARSE-FT |
|----|----------------------------------|------------|-----|----------|
| a. | [{(e.t'ə.)r'ə.} {(xa:.)ní:.)}] | σ!σσ | * | |
| | ☞ [{(é.t'ə.)r'ə.} (xa:.)ní:.)] | | ** | ** |

- b.
- | | /aumpara:ni:xt/ | ALL-κ-LEFT | WSP | PARSE-FT |
|--|-----------------------------------|------------|-----|----------|
| | [{(a.um).pə.} {(ra:.)ní:xt.}] | σ!σ | ** | |
| | ☞ [{(á.um).pə.} (ra:.)ní:xt.)] | | ** | ** |

In some cases cola and feet must be degenerate, or in other words, nonbinary. Munster has words of the shape [L L] and [H], which are smaller than a fully formed colon, and words of the shape [L], which are smaller than a fully formed foot. Since these words are fully stressed content words, they must have full prosodic structure in spite of their subminimal size.

(66) Subminimal words in Munster

- a. [{(á.səl.)}] ‘donkey’ (41a)
 b. [{(b'ó:.)}] ‘alive’ (46b)
 c. [{(bá:.)}] ‘cows’ (46a)

Roots like these violate COLBIN and FTBIN in order to comply with DEP. The behavior of Munster is in contrast to that of languages like Axininca Campa (Spring 1990, McCarthy & Prince 1993a) and Lardil (Hale 1973, Wilkinson 1988, Prince & Smolensky 1993), which do augment subminimal roots. The Munster ranking DEP » COLBIN, FTBIN is illustrated in the tableau in (67). ☞ indicates any epenthetic CV syllable.

- (67)
- | | /asal/ | DEP | COLBIN | FTBIN |
|----|-------------------|-------|--------|-------|
| a. | ☞ [{(á.səl.)}] | | * | |
| | [{(á.səl.) ☞.}] | * ! * | | |
-
- | | /b'ó:/ | DEP | COLBIN | FTBIN |
|----|------------------|-------|--------|-------|
| b. | ☞ [{(b'ó:.)}] | | * | |
| | [{(b'ó:.) ☞.}] | * ! * | | |
-
- | | /ba/ | DEP | COLBIN | FTBIN |
|----|-----------------|---------|--------|-------|
| c. | ☞ [{(bá:.)}] | | * | * |
| | [{(bá:.)}] | * ! | * | |
| | [{(bá:.) ☞.}] | * ! * * | | |

We have now seen how the colon can be used successfully to account for the entire range of facts concerning the attraction of stress to heavy syllables in Munster.

4.6.4 Stress in East Mayo

In chapter 3 we saw that East Mayo shows virtually the same pattern of stress as Munster Irish.

(68) Stress in East Mayo Irish²³

a.	(L L)	brádəx	‘thief’	Lavin (1957)
b.	(L L L)	fárəg’ə	‘sea’	Lavin (1957)
c.	(H L)	kí:rə	‘sheep’	Lavin (1957)
d.	(H L L)	kǒ:rsənəxt	‘neighborhood’	Dillon (1973)
e.	(H L H)	kǒ:rsəni:	‘neighbors’	Dillon (1973)
f.	(L H)	bəLá:n	‘bullock’	#19
g.	(H H)	ta:L’ó:r	‘tailor’	#238
h.	(L L H)	pəragó:d’	‘purgative’	#362
i.	(L H L)	gəbá:s’t’ə	‘cabbage’	#250
j.	(L H H)	spij’k’í:n’í:	‘little crags’	Lavin (1957)
k.	(H H L)	miərtú:nəx	‘ill-conditioned’	Dillon (1973)

The facts of stress placement in East Mayo Irish can be explained in the same way as Munster: one right-headed binary colon is built at the left edge of the word, defining the stress window.

(69) The colon in East Mayo

	[×]	[×]
	{ × . }	{ × . }
	(× .) .	(×) . (×)
	L L L	H L H
a.	fá rəg’ə	b. kǒ:rsə ni:
	[×]	[×]
	{ . × }	{ . × }
	. (×)(×)	(×)(×) .
	L H H	H H L
c.	spij’k’í: n’í:	d. miərtú:nəx

The colon is therefore necessary to account for stress in East Mayo

²³ Numbers in (68f–i) refer to questionnaire answer numbers in *LASID* vol 3, 351–9.

as well as Munster.

4.6.5 Stress in Manx

As we saw in chapter 3, at an early stage of Manx, native words had initial stress (70), while Anglo-Norman words had forward stress (71).

(70) Manx stage 1: initial stress in native words

a.	d’áru:d	‘forgetting’
b.	bó:ka:n	‘brownie’ (in folklore)
c.	kó:so:laxə	‘comparing’
d.	béga:n <i>later</i> bégan	‘a little’

(71) Manx stage 1: forward stress in Anglo-Norman words

a.	bodé:l	‘bottle’
b.	pri:sú:n	‘prison’

This pattern was simplified, perhaps gradually, until all words with a heavy second syllable showed forward stress. Unstressed long vowels were shortened in order to comply with the WSP.

(72) Manx stage 2: forward stress in all eligible words

a.	d’áru:d
b.	bo:ká:n > bogé:dn
c.	ko:só:laxə > kosó:laxə
d.	bodé:l
e.	pri:sú:n > prizú:dn

Anglo-Norman words were no longer lexical exceptions, but behaved like native words. Words with all light syllables (including the *bégan* type that had been (L H) in EMI) maintained initial stress.

(73) Manx stage 2: initial stress in all-light words

a.	bégan	‘a little’
b.	bánaxən	‘blessings’

The fixing of stress on a second heavy syllable can be accounted for by building a binary right-headed colon at the left edge of the prosodic word.

(74) The colon in Manx

- | | |
|--|---|
| <p>[×]</p> <p>{ × }</p> <p>(× .)</p> <p>L L</p> <p>a. bégan</p>
<p>[×]</p> <p>{ . × }</p> <p>. (×)</p> <p>L H</p> <p>c. bodé:l</p>
<p>[×]</p> <p>{ . × }</p> <p>. (×)</p> <p>L H</p> <p>e. d'arú:d</p>
<p>[×]</p> <p>{ . × }</p> <p>(×)(×) . .</p> <p>H H L L</p> <p>g. ko: só: la xə</p> | <p>[×]</p> <p>{ × . }</p> <p>(× .)</p> <p>L L L</p> <p>b. bá naxən</p>
<p>[×]</p> <p>{ . × }</p> <p>(×)(×)</p> <p>H H</p> <p>d. pri:sú:n</p>
<p>[×]</p> <p>{ . × }</p> <p>(×)(×)</p> <p>H H</p> <p>f. bo:ká:n</p> |
|--|---|

In Manx, unlike Munster, WSP came to dominate MAX(μ), so that unstressed long vowels surfaced as short.

(75) Manx Stage 2: WSP » MAX(μ)

- | <p>a.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="width: 20%;">WSP</th> <th style="width: 20%;">MAX(μ)</th> </tr> </thead> <tbody> <tr> <td>/bo:ka:n/</td> <td></td> <td></td> </tr> <tr> <td>[{(bo:)(ká:n.)}]</td> <td>* !</td> <td></td> </tr> <tr> <td>☞ [{.bo.(ká:n.)}]</td> <td></td> <td>*</td> </tr> </tbody> </table>
<p>b.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="width: 20%;">WSP</th> <th style="width: 20%;">MAX(μ)</th> </tr> </thead> <tbody> <tr> <td>/pri:su:n/</td> <td></td> <td></td> </tr> <tr> <td>[{(.pri:)(sú:n.)}]</td> <td>* !</td> <td></td> </tr> <tr> <td>☞ [{.pri.(sú:n.)}]</td> <td></td> <td>*</td> </tr> </tbody> </table> | | WSP | MAX(μ) | /bo:ka:n/ | | | [{(bo:)(ká:n.)}] | * ! | | ☞ [{.bo.(ká:n.)}] | | * | | WSP | MAX(μ) | /pri:su:n/ | | | [{(.pri:)(sú:n.)}] | * ! | | ☞ [{.pri.(sú:n.)}] | | * | |
|--|-----|--------------|--------------|-----------|--|--|------------------|-----|--|---------------------|--|---|--|-----|--------------|------------|--|--|--------------------|-----|--|----------------------|--|---|--|
| | WSP | MAX(μ) | | | | | | | | | | | | | | | | | | | | | | | |
| /bo:ka:n/ | | | | | | | | | | | | | | | | | | | | | | | | | |
| [{(bo:)(ká:n.)}] | * ! | | | | | | | | | | | | | | | | | | | | | | | | |
| ☞ [{.bo.(ká:n.)}] | | * | | | | | | | | | | | | | | | | | | | | | | | |
| | WSP | MAX(μ) | | | | | | | | | | | | | | | | | | | | | | | |
| /pri:su:n/ | | | | | | | | | | | | | | | | | | | | | | | | | |
| [{(.pri:)(sú:n.)}] | * ! | | | | | | | | | | | | | | | | | | | | | | | | |
| ☞ [{.pri.(sú:n.)}] | | * | | | | | | | | | | | | | | | | | | | | | | | |

	WSP	MAX(μ)
/ko:so:laxa/		
[{(ko:)(só:.)}la.xə.]	* !	
☞ [{.ko.(só:.)}la.xə.]		*

Other changes, such as the change of *a:* to *e:*, intervocalic voicing, and the preocclusion of nasals after long vowels, also happened, resulting in the Late Spoken Manx forms *bogé:dn* from *boká:n* and *prizú:dn* from *prisú:n*. As these changes are not in the realm of prosodic phonology, I do not deal with them here.

4.7 Conclusions

We have now seen the full explanation of stress placement and the role of the WSP in the Goidelic languages. In chapter 3 we saw that the WSP has played a recurring role in the history of these languages, causing unstressed long vowels to shorten in some dialects, and to attract stress in others. In this chapter we have seen how the binary colon is used not only to derive tertiary stress patterns, “stress-window” effects, and minimum size requirements in a variety of languages, but also offers an insightful analysis of the distribution of stress in Munster Irish, East Mayo Irish, and Manx. Further, we have seen how either the facts cannot be successfully accounted for without reference to the colon, or else a less constrained (and therefore less predictive) theory is required. We have looked at the evidence for unbounded cola, and seen that it is difficult to find an explanation for the data that is not stipulative or does not require an overly powerful theory.

We have now seen most of the Goidelic evidence for the prosodic hierarchy argued for in this dissertation: the evidence from stress placement and syllable weight presented in chapters 3 and 4 all contributes to the analysis. In chapter 5, we turn to syllable structure, and see how evidence from epenthesis, syllabification, and permissible onsets further supports the analysis.

CHAPTER FIVE
ISSUES IN THE SYLLABIC STRUCTURE OF IRISH AND GAELIC

We have now seen much evidence for the prosodic constituency that I have been proposing. In chapters 3 and 4, evidence from stress placement and syllable weight in Goidelic was presented in favor of the current analysis of the prosodic hierarchy. In this chapter I turn to the syllabic structure of Irish and Gaelic, and show the evidence to be found here. In § 5.1 I look at the syllabification of intervocalic consonants, arguing that consonants are ambisyllabic after a short stressed vowel. In § 5.2 I discuss the syllabification of clusters, and show that reference to the several constituents within the prosodic hierarchy is necessary for an analysis of the distribution of onsets in Irish. In particular, I show that less well-formed onsets are permitted at higher levels on the prosodic hierarchy, while lower levels are less tolerant.

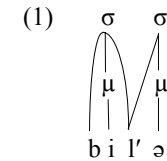
In § 5.3, I look at clusters of falling sonority, where C_1C_2 clusters in which C_1 is a sonorant and C_2 is neither a voiceless stop nor homorganic with C_1 are disfavored in Irish and Gaelic after short vowels, and are repaired with epenthesis, and in some cases historically with metathesis. This section includes an analysis of epenthesis in Barra Gaelic, where it is argued that the “contrastive syllabification” of previous analyses is actually derivable from facts of stress.

5.1 Ambisyllabicity

There is a split among researchers on Irish dialects regarding the syllabification of intervocalic consonants. Many authors (e.g. Ó Cuív 1944, 64; de Bhaldraithe 1945, 60; de Búrca 1958, 56; Mhac an Fhailigh 1968, 58) have made the claim for Irish that when a single consonant appears after a short stressed vowel (e.g. in *bil'ə* ‘anger’), the consonant is syllabified into the coda of the first syllable, thus *bil'.ə*. But other authors (e.g. Sjoestedt 1931, 127; Breatnach 1947, 73), studying virtually the same dialects, have made the opposite claim, namely that the syllabification of such a word is *bi.l'ə*. The easiest way to reconcile the two opinions is to hypothesize that consonants in this position are actually ambisyllabic, as claimed by Ní Chiosáin (1991, 202).

When a consonant is simultaneously in the coda of one syllable and in the onset of the following syllable, the consonant is said to be ambisyl-

labic.¹ In the example in (1), the *l'* is ambisyllabic.



As Borowsky, Itô, and Mester (1984) argue, the difference between ambisyllabicity and gemination is not one of representation but one of implementation. In some languages, coda consonants are moraic, that is, they make a syllable heavy, while in other languages coda consonants are not moraic and have no effect on syllable weight. And in some languages, ambisyllabic consonants are geminated (durationally longer), while in other languages ambisyllabic consonants are not geminated. But there is not necessarily a correlation between moraic consonants and gemination. In English, coda consonants are moraic, but ambisyllabic consonants are not geminated (Hammond 1997), while in Malayalam, coda consonants are nonmoraic, but ambisyllabic consonants are geminated (Mohanam 1986, Tranel 1991). Thus, whether an ambisyllabic consonant is to be interpreted as a geminate in a given language is determined by the phonetic implementation of the phonology, and is not predictable from the phonological representation. In Irish, coda consonants are nonmoraic and ambisyllabic consonants are not phonetically longer than other consonants,² and so Irish does not have gemination.

Irrefutable evidence for ambisyllabicity in Irish is hard to come by, but there is a fair amount of circumstantial evidence. First, the intuition of native speakers such as Ní Chiosáin herself is that consonants after short stressed vowels are ambisyllabic. Second, although de Bhaldraithe (1945, 60) claims that the syllabification is *bil'.ə*, he states, “The point of least prominence can be somewhere in the consonant itself.” He does not specifically define what he means by “prominence,” but he states that the syl-

¹ Ambisyllabicity has been argued for in English by a wide variety of authors, including Anderson & Jones (1974), Kahn (1976), Myers (1987), Treiman & Danis (1988), Treiman & Zukowski (1990), Turk (1993), Rubach (1996), and Hammond (1997), among others; such authors would argue, for example, that the *p* in *happy* is ambisyllabic.

² At least, no one has ever said that they are; I have not performed duration measurements myself.

lable boundary is the point of least prominence. Thus I believe that his statement is an attempt to describe ambisyllabicity, written in an era (1945) before the notion of ambisyllabicity was familiar to linguists.

Apparently, ambisyllabicity in Irish is limited to the position after a short stressed vowel. All researchers agree that in other positions, prevo-calic consonants belong solely to the onset of the second syllable.

In the examples below, the period (.) is used to indicate a crisp syl-lable boundary (i.e. no ambisyllabicity); an ambisyllabic consonant is indi-cated by a point above the symbol (e.g. [ḷ]).

(2) Ambisyllabicity after short stressed vowel (de Bhaldraithe 1945, 60)

- a. bíl'ə 'anger'
 b. k'r'éd'ə 'believe' (v.n.)
 c. kúḶa:s't'ə 'college'

(3) No ambisyllabicity after unstressed vowel (ibid.)

- a. g'l'úim̩.ə d o:r' 'lobster-catcher'
 b. tə.bák 'tobacco'

(4) No ambisyllabicity after long vowel (ibid.)

- a. í:Nə 'wonder'
 b. kú:Nə 'help'
 c. f ó:d'u: 'set' (v.n.)

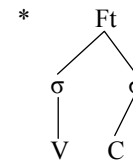
The environment for ambisyllabicity in Irish is reminiscent of the envi-ronment in which close contact effects have been argued for in other lan-guages. The correlation of close contact (*Silbenschnittkorrelation*), dis-cussed by Trubetzkoy (1939), is as follows: when a vowel is said to be in close contact with a consonant, it means at least that the consonant closes the vowel's syllable, although other refinements of the definition are pos-sible.³ Close contact is said to be found after short or lax vowels in Dutch (Smith et al. 1989, Hayes 1995) and Swedish (Witting 1977, S. R. Ander-son 1984); the lengthening of consonants after short stressed vowels in Welsh (B. J. Williams 1983ab, 1985 and references therein) and gemina-tion in the same environment in Old High German (Braune & Eggers 1987,

³ For example, S. R. Anderson (1984), discussing Trubetzkoy's analysis of Hopi, proposes that a vowel and consonant are in close contact when they are together in the nucleus, as opposed to when the consonant is in the coda or margin.

Ham to appear) may be due to close contact as well. It thus seems that the function of ambisyllabicity in Irish is to extend a stressed CV syllable to CVC, in other words, to bring the vowel into close contact with the fol-lowing consonant. Even though CVC syllables are metrically light in Irish, they are apparently still somehow more salient than CV syllables.

In Optimality-Theoretic terms, a constraint CLOSECONT achieves the desired effect.

(5) **CLOSECONT**



Within a foot, a vowel is tautosyllabic with a following consonant.

Ambisyllabicity is prohibited by the constraint ONESYLL.

(6) **ONESYLL**

A segment is a member of exactly one syllable.

Also relevant is ONSET, which says that a syllable must have a consonant onset. The syllabification VC.V is prohibited by this constraint.

(7) **ONSET** (McCarthy & Prince 1993a, 30)

*_c[V

Ambisyllabicity is achieved by ranking CLOSECONT and ONSET above ONESYLL, which means that a vowel may meet CLOSECONT in Irish by violating ONESYLL but not by violating ONSET.

(8)

/bíl'a/	CLOSECONT	ONSET	ONESYLL
(bí.l'ə)	* !		
(bí'l.ə)		* !	
☞ (bí'l'ə)			*

Since CLOSECONT applies only within a foot, a ONESYLL violation across a foot boundary would be fatal. This accounts for the absence of ambisyl-

labicity after a long vowel or an unstressed vowel.

	/ku:na/	CLOSECONT	ONSET	ONESYLL
a.	☞ (kú:).nə			
	(kú:n).ə		* !	
	(kú:ń).ə			* !

	/tabák/ ⁴	CLOSECONT	ONSET	ONESYLL
b.	☞ tə.(bák)			
	təb.(ák)		* !	
	tə(bák)			* !

As mentioned in chapter 3, Irish permits words of the shape (L), but among such words CVC is far more common than CV. Historically, this is because CVC was heavy (at least in monosyllables) in Old Irish, which had a bimoraic minimum word requirement. Therefore Old Irish had no CV words for Modern Irish to inherit; furthermore, French and English, the two languages from which most loan-words in Irish have been borrowed, also disallow CV content words. Synchronically in Modern Irish, the preference for CVC words is attributable to the influence of CLOSE CONT on the lexicon: most words must be at least /CVC/ so that CLOSE CONT may be obeyed.

Nevertheless, there are a few CV words in Irish (e.g. *t'é* 'hot') that are not augmented in any way. This indicates that DEP(seg) and DEP(μ) outrank CLOSECONT. (In (10c), *C* indicates any epenthetic consonant.)

	/t'E/	DEP(seg)	DEP(μ)	CLOSECONT
a.	☞ t'é			*
b.	t'é:		* !	
c.	t'éC	* !		

Intervocalic clusters of two consonants, in most cases, are syllabified with a syllable break between the two consonants.⁵

⁴ Final stress is lexically specified in this word.

⁵ The judgments of how clusters are syllabified are those of Ní Chiosáin (p.c.). The forms are cited in her native dialect, that of Connemara (Connacht).

- (11) Obstruent + obstruent clusters
- l'íg'.t'ər 'one lets'
 - fá:g.tər 'one leaves'
 - úəx.tər 'top'
- (12) Obstruent + sonorant clusters
- l'ék'.n'əx 'mumps'
 - áx.rən 'entanglement'
 - fás'.n'e:s' 'information'
- (13) Sonorant + sonorant clusters
- dér'.n'ə 'fists'
 - án.rə 'soup'
 - ha:r.lə 'happened'
- (14) Sonorant + obstruent clusters
- ol.kəs 'evil'
 - o:l.tə 'drunk'
 - k'ar.tu: 'correct' (v.n.)

However, internal clusters of *s* + stop are syllabified with the *s* ambisyllabic.

- (15) *s* + stop clusters
- aš't'əx 'strange'
 - ašpə 'luck'
 - foškə 'shadow'

Treiman & Zukowski (1990) have shown that *st* clusters in English behave much the same way, with the *s* ambisyllabic after a short vowel; it has been proposed that *sp st sk* are actually single complex segments in English (Fudge 1969, Fujimora & Lovins 1978, Selkirk 1982, Lamontagne 1993, among others). Whatever the status of such clusters in English, the parallel behavior in Irish suggests that they have the same status there.

5.2 Prosodic licensing of onsets

Although it was mentioned above that most intervocalic clusters in Irish are syllabified heterosyllabically, there is an interesting deviation from that

behavior in clusters of rising sonority. Cross-linguistically, languages tend to disfavor consonant clusters that cross syllable boundaries in which C_2 is more sonorous than C_1 ; in other words, in a sequence $VC_1.C_2V$, the consonant cluster must have falling sonority. If C_1C_2 has rising sonority, the preferred syllabification is $V.C_1C_2V$. See Hooper (1976), Murray & Vennemann (1983), Vennemann (1988), Clements (1990), and Rice (1992) for examples from a wide variety of languages.

I assume a sonority hierarchy similar to that proposed by Dell & Elmedlaoui (1985) for Imdlawn Tashlhiyt Berber (see also Prince & Smolensky 1993, 12).

(16) Consonants in the sonority hierarchy (> means ‘more sonorous than’)
Glide > r > l > Nasal > Vcd. fric. > Vcls. fric. > Vcd. stop > Vcls. stop

To achieve $V.C_1C_2V$ syllabification in rising-sonority clusters, I invoke the Syllable Contact Law of Murray & Vennemann (1983) and Vennemann (1988), stating it in terms of an OT constraint SYLLABLE CONTACT (17), which prohibits rising sonority clusters across syllable boundaries.

(17) **SYLLABLECONTACT**

In a sequence $\alpha . \beta$ (where $.$ indicates a syllable boundary), the sonority of α is greater than the sonority of β .

However, in some languages, not all clusters that are permitted word-initially are permitted to be onset clusters word-internally. Steriade (1982) discusses Ancient Greek, where some permissible word-initial clusters are heterosyllabic internally (e.g. *sm*, *kt*, *p^{hs}*, *gn*, *bl*, *gm*), while others are tautosyllabic internally (e.g. *kr*, *k^{hl}*, *pn*, *br*). Similarly, in Icelandic (Itô 1986 and references therein), clusters such as *pl*, *gr*, *lj* are heterosyllabic internally, while clusters such as *pr*, *tr*, *kj* are tautosyllabic internally, but all are permissible word-initially.

In every instance, the clusters that are tautosyllabic internally have steeper rises in sonority than those that are heterosyllabic internally. This condition is an indication of minimal sonority distance (Hooper 1976, Selkirk 1984a, Levin 1985, Steriade 1986): for an onset cluster to be well-formed, there is a minimal distance along the sonority hierarchy that must be traveled between C_1 and C_2 in a cluster. Many authors have assigned indices to the various levels of the sonority hierarchy and determined

minimal distance by subtraction, but I prefer a more impressionistic approach: speakers intuitively know which clusters are “steep enough” for their language, and which are not, without doing subtraction. Thus, among the Greek clusters, only voiceless stop + sonorant and voiced stop + *r* (the most sonorous sonorant, since Greek lacks glides) are tautosyllabic. In Icelandic only voiceless stop + *r/j/w* are tautosyllabic. In both of these languages, only steeper sonority rises are permitted at σ [], while both steeper and shallower sonority rises are permitted at $prWd$ [].

(18) Shallow sonority rise only higher on prosodic hierarchy

Greek: $prWd$ [] permits clusters like *sm*, *kt*, *p^{hs}*, *gn*, *bl*, *gm*, *br*, *k^{hl}*, etc.
 σ [] permits only voiceless stop + liquid and voiced stop + *r*

Icelandic: $prWd$ [] permits clusters like *pl*, *gr*, *lj*, *pr*, *tr*, *kj*, etc.
 σ [] permits only voiceless stop + *r/j/w* (e.g. *pj*, *tr*, *kw*)

σ [] means σ [] that does not coincide with $prWd$ [] .

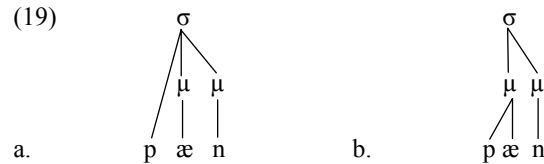
Onsets permitted at σ [] are thus a proper subset of onsets permitted at $prWd$ []. In general, steeper sonority rises are better formed onset clusters than shallower sonority rises; for example, while *kr* and *kn* both have rising sonority, only the steeper *kr* is permitted to be an onset cluster in English. To explain the distribution of onsets word-initially and word-internally, I propose the principle of prosodic licensing of onsets, which says that higher levels of the prosodic hierarchy tolerate less well formed onsets than lower levels of the prosodic hierarchy do.

Clements (1990, 288) lists a number of languages in which the assumption that onset clusters have rising sonority and coda clusters falling sonority is violated. Specifically, he lists several onset clusters with sonority plateaus and falls, e.g. Russian *mnu* ‘I crumple’, *tkut* ‘they weave’, *rta* ‘mouth’ (gen.), *lba* ‘forehead’ (gen.), etc. Such clusters are heterosyllabic word-internally, supporting the theory that $prWd$ [] tolerates less well-formed onsets than σ [].

According to the usual assumption (made e.g. by Hayes 1989), syllable onsets are not linked to the initial mora of the syllable, but directly to the syllable node.⁶ Thus an English word like *<pan>* has the structure of

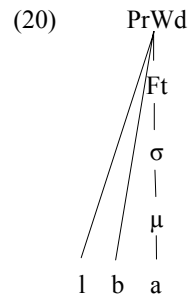
⁶ Although under some early accounts of moraic theory (e.g. Hyman 1985, Zec 1988), onsets were associated with the mora.

(19a), not (19b).



I suggest that this is attributable to prosodic licensing of onsets: at the lowest level on the prosodic hierarchy, namely μ , onsets are not permitted at all. When an onset is not permitted at a certain level, it attaches to the lowest level where it is licensed. In (20a), the *p* is not licensed at the μ level—no onsets are—so it attaches to the σ level, where it is licensed.

Similarly, when a word-initial cluster is not permitted at the σ level, e.g. *lba* in Russian, it skips the σ level and attaches directly to the PrWd level, where it is licensed.



Not only is $_{\text{PrWd}}$ more tolerant than $_{\sigma}$, but also $_{\text{Ft}}$ may fall between them, and be less tolerant than $_{\text{PrWd}}$ but more tolerant than $_{\sigma}$. Evidence for this comes from Munster Irish, as we shall see below.

Of course, exactly which onsets will be permitted at which level is determined on a language-specific basis: Icelandic, Ancient Greek, and Irish all prohibit *lb-* word-initially, but Russian permits it.

By extension, it may also be expected that $_{\text{PrWd}}$ tolerates less well-formed codas than $_{\sigma}$; this may be true, but I do not pursue this question further here.

5.2.1 Syllabification in Connacht and Ulster

The generalization that higher prosodic levels license less well-formed on-

sets than lower levels holds in Irish as well. Word-initially, Connacht and Ulster Irish permit a variety of rising-sonority clusters: stop + liquid, stop + nasal, *s* + liquid, *s* + nasal, noncoronal fricative + liquid, and noncoronal fricative + nasal.⁷

(21) Word-initial onset clusters in Connacht & Ulster Irish

a.	Stop + liquid		
	klox	‘stone’	Rm 46
	trɔ:kər’ə	‘mercy’	Ty 335
b.	Stop + nasal ⁸		
	k’n’e	‘good appearance’	Rm 47
	g’n’e:	‘aspect’	NC 56
c.	<i>s</i> + liquid		
	s’L’i:w	‘mountain’	Ty 322
	sram	‘mucus (in the eyes)’	Rm 213
d.	<i>s</i> + nasal		
	sm’ir	‘marrow’	Rm 204
	sNa:w	‘swim’ (v.n.)	Ty 324
e.	Noncoronal fricative + liquid		
	f’r’agər’	‘answer’ (impv.)	Rm 96
	xrak’əN’	‘skin’ (len.)	Ty 261
f.	Noncoronal fricative + nasal ⁸		
	γ’n’e:	‘aspect’ (len.)	NC 56
	γ’n’e:s’	‘complexion’ (len.)	Rm 110

As we saw in (12), repeated in (22), obstruent + nasal and noncoronal fricative + liquid clusters like *kn*, *sn*, and *xr* are heterosyllabic word-internally. However, in Connacht and Ulster, when the sonority rise is relatively steep, namely in clusters of *s* + liquid and stop + liquid, the first consonant of the cluster is ambisyllabic.

⁷ Also permitted are *s* + stop clusters, which, as mentioned above, may be viewed as complex segments. For the remainder of this discussion I abstract away from *s* + stop clusters.

⁸ In Ulster and many varieties of Connacht, stop + nasal and noncoronal fricative + nasal clusters are not allowed, *n* having become *r* in these environments.

(22) Heterosyllabicity in internal shallow-rising clusters

- a. l'ék'.n'əx 'mumps'
 b. áx.rən 'entanglement'
 c. fás'.n'e:s' 'information'

(23) Ambisyllabicity in *s* + liquid clusters

- a. láš.rəx 'flames'
 b. ás'l'əŋ' 'vision'

(24) Ambisyllabicity in stop + liquid clusters⁹

- a. ókrəs 'hunger'
 b. eð'r'ə 'work' (gen.)
 c. aġləs' 'church'

For Connacht and Ulster Irish, the relatively steep stop + liquid and *s* + liquid clusters are sufficiently well formed to be permitted at σ], but shallower clusters of obstruent + nasal and noncoronal fricative + liquid, are permitted only at PrWd], as in (21 b, d, e, f). This is summarized in (25).

(25) Prosodic licensing of onsets in Connacht and Ulster

Cluster shape	PrWd]	σ]
Stop + liquid	✓	✓
<i>s</i> + liquid	✓	✓
Noncor. fric. + liquid	✓	*
Obstruent + nasal	✓	*

To account for this variability in the behavior of clusters, I propose a constraint LICENSEDONSET(σ).

(26) LICENSEDONSET(σ)

Only better formed onsets are permitted at σ].

What is considered a “better formed onset” is determined on a language-specific basis: for example, *pl* is steep enough to be licensed at σ] in Greek and Irish, but must be heterosyllabic internally in Icelandic.

An obvious question is whether the Ft] edge participates in onset li-

⁹ (21b) and (c) have variants in Connacht with initial heavy syllables: *áib'r'ə* and *á:gləs'*; in these cases, there is a syllable break before the first consonant of the cluster.

censing. But as we saw in chapter 3, high ranking ALL-FT-LEFT in Ulster and Connacht means that all feet are word-initial, so there is no way to distinguish between PrWd] and Ft] in these dialects. In Munster, however, as we shall see below, there is a difference between clusters permitted at PrWd] and those permitted at Ft].

The facts described in (22)–(24) are accounted for by the ranking CLOSECONT, LICENSEDONSET(σ) » SYLLABLE CONTACT » ONESYLL. This ranking drives closed syllables at relevant points, implemented by heterosyllabic parsing of clusters prohibited word-internally, e.g. *xr* in (27a), and ambisyllabicity of the first consonant of clusters permitted word-internally, e.g. *sr* in (27b) and *kr* in (27c).

(27)

/axran/	CLOSECONT	LICONS(σ)	SYLLCONT	ONESYLL
☞ (áx.rən)			*	
(á.xrən)	* !	*		
(áx.rən)		* !		*

b.

/lasrax/	CLOSECONT	LICONS(σ)	SYLLCONT	ONESYLL
(lás.rəx)			* !	
(lá.srəx)	* !			
☞ (lásrəx)				*

c.

/Ekras/	CLOSECONT	LICONS(σ)	SYLLCONT	ONESYLL
(ók.rəs)			* !	
(ó.krəs)	* !			
☞ (ókrəs)				*

How two consonants with a sonority rise between them will be syllabified intervocally depends on how steep the sonority rise is: if it is relatively shallow (noncoronal fricative + liquid, obstruent + nasal), they will be in separate syllables. But if the rise is steep (stop + liquid, *s* + liquid), the consonants will both be in the onset of the second syllable; the first consonant will also be in the coda of the first syllable in order for the vowel to achieve close contact. Word initially, both shallow-rising and steep-rising clusters are permitted. Presumably there is a constraint on what clusters are permitted at PrWd], which include all those permitted at σ], and others as well.

5.2.2 Syllabification and epenthesis in Munster

In Munster Irish, onsets are even more restricted than in Connacht and Ulster. In addition to $_{PrWd}[$ and $_{\sigma}[$, Munster also uses $_{Ft}[$ as a licenser, since (as we saw in chapters 3 and 4) stress can fall on noninitial syllables in Munster, drawing feet away from the left edge of the prosodic word.¹⁰ As expected, $_{Ft}[$ is more restrictive of onsets than $_{PrWd}[$, but not so restrictive as $_{\sigma}[$. In Munster, no clusters are permitted at $_{\sigma}[$; relatively steep stop + liquid clusters are permitted at $_{Ft}[$ and $_{PrWd}[$; and relatively shallow clusters (*m* + coronal sonorant, stop + fricative, fricative + liquid, obstruent + nasal) are permitted only at $_{PrWd}[$.

(28) Prosodic licensing of onsets in Munster

Cluster shape	$_{PrWd}[$	$_{Ft}[$	$_{\sigma}[$
Stop + liquid	✓	✓	*
<i>m</i> + cor. son.	✓	*	*
Stop + fricative	✓	*	*
Fricative + liquid	✓	*	*
Obstruent + nasal	✓	*	*

In (29) are shown the clusters permitted at $_{PrWd}[$ in Munster. The examples come from Sjoestedt (1931), 124–5 unless otherwise noted: see references for abbreviations of sources.

(29) Clusters permitted at $_{PrWd}[$

- a. Stop + liquid
 glá:n ‘clean’
 krá: ‘anguish’
 k’r’əxá:n ‘small potato’ SCD 118
- b. *m* + coronal sonorant
 mráxtən’t’ ‘live’ (v.n.)
 mní: ‘woman’ (dat.)
- c. Stop + fricative
 gvá:l’t’ ‘take’ (v.n.)

¹⁰ However, as we saw in chapter 4, cola are always word-initial in Munster, so we cannot distinguish between $_{\kappa}[$ and $_{PrWd}[$.

- d. Fricative + liquid
 srá:d’ ‘street’
 xrá: ‘anguish’ (len.)
 hr’íəl ‘voyage’ (len.)
- e. Obstruent + nasal
 g’n’í:v ‘deed’
 knəpá:n ‘flower-bud’ BB 61

Only the steepest clusters, those of stop + liquid, are permitted foot-initially.

(30) Only stop + liquid clusters permitted at $_{Ft}[$

- a. ə(brá:n) ‘April’
 b. ə(blá:l’) ‘botching’
 c. ə(prú:n) ‘apron’
 d. l’a(drá:)nəx ‘tedious’
 e. po(k’l’é:m’) ‘frolic’
 f. e(b’r’ú:) ‘work’ (v.n.)

Any clusters that threaten to violate these restrictions are repaired with epenthesis. This means that all $_{\sigma}[$ not coinciding with $_{Ft}[$ or $_{PrWd}[$ have no clusters at all, only single-consonant onsets.

(31) Epenthesis into prohibited clusters in Munster

- a. (ágə)lə *(áglə) ‘fear’
 b. (ókə)rəs *(ókrəs) ‘hunger’
 c. (lásə)rəx *(lásrəx) ‘flames’
 d. (áxə)rən *(áxrən) ‘entanglement’
 e. (áhə)r’əs’ *(áhr’əs’) ‘imitation’
 f. (s’áu)məərə *(s’áu)mrə ‘room’
 g. (ág’ə)n’ə *(ág’n’ə) ‘mind’
 h. im’ə(n’í:) *(im’n’í:) ‘anxiety’
 i. adə(ví:m’) *a(dví:m’) ‘I acknowledge’
 j. am’ə(l’í:xt) *a(m’l’í:xt) ‘wretchedness’

The relevant constraints in Munster, in addition to those already proposed for Connacht/Ulster, are * $_{\sigma}[$ CC and LICENSED ONSET(Ft).

(32) *_σ[CC

Onset clusters are not permitted at _σl.

(33) LICENSEDONSET(Ft)

Only better formed onsets are permitted at Ft_l.

For Munster Irish, only stop + liquid clusters qualify as “better formed” under this constraint. The ranking of constraints in Munster is LICENSEDONSET(Ft), *_σ[CC, SYLLABLECONTACT » DEP; this ranking drives epenthesis into unlicensed clusters.

The onsets *gn* and *kn* are licensed at PrWd_l, so there is no epenthesis in (34a–b). *br* is licensed at Ft_l, so there is no epenthesis in (34c). However, *dv* is not licensed at Ft_l, nor are *gl* and *gn* licensed at _σl, and the Syllable Contact Law prevents a heterosyllabic syllabification, so epenthesis breaks up these clusters in (34d–f).

	/g'n'i:v/	LICONS(Ft)	* _σ [CC	SYLLCONT	DEP
a.	☞ [(g'n'i:v)]				
	[g'ə(n'i:v)]				* !

	/knapa:n/	LICONS(Ft)	* _σ [CC	SYLLCONT	DEP
b.	☞ [knə(pá:n)]				
	[kənə(pá:n)]				* !

	/abra:n/	LICONS(Ft)	* _σ [CC	SYLLCONT	DEP
c.	☞ [ə(brá:n)]				
	[əb(rá:n)]			* !	
	[əbə(rá:n)]				* !

	/advi:m'/	LICONS(Ft)	* _σ [CC	SYLLCONT	DEP
d.	[a(dví:m')]	* !			
	[ad(ví:m')]			* !	
	☞ [adə(ví:m')]				*

	/agla/	LICONS(Ft)	* _σ [CC	SYLLCONT	DEP
e.	[(áglə)]		* !		
	[(áglə)]			* !	
	☞ [(áglə)lə]				*

	/ag'n'a/	LICONS(Ft)	* _σ [CC	SYLLCONT	DEP
f.	[(ágl'n'ə)]		* !		
	[(ágl'n'ə)]			* !	
	☞ [(ágl'ə)n'ə]				*

5.2.3 Summary

In this section we have seen a considerable amount of evidence for the prosodic licensing of onsets. We have seen in general that less favored onsets are permitted only by higher levels of the prosodic hierarchy, and that onsets permitted at lower levels are always a subset (and often a proper subset) of onsets permitted at higher levels. Thus, in Greek and Icelandic, as well as Connacht and Ulster, both steeper and shallower clusters are permitted at PrWd_l, but only steeper clusters are permitted at _σl not coinciding with PrWd_l. (As mentioned above, feet in Connacht and Ulster are always word-initial, so Ft_l is not relevant in these dialects.) In Munster, both steeper and shallower clusters are permitted at PrWd_l, but only steeper clusters are permitted at Ft_l not coinciding with PrWd_l; no clusters at all are permitted at _σl not coinciding with Ft_l or PrWd_l. A further ramification of the prosodic licensing of onsets is that the lowest level of the hierarchy, the mora, permits no onset at all.

The table in (35) summarizes the permissible onsets in the various dialects of Irish, as generated by the interaction of the constraints LICENSEDONSET(Ft), *_σ[CC, SYLLABLECONTACT, and DEP.

(35) Prosodic licensing of onsets

Prosodic edge	Connacht/Ulster			Munster		
	C-	CC-(steep)	CC-(shallow)	C-	CC-(steep)	CC-(shallow)
PrWd _l	✓	✓	✓	✓	✓	✓
Ft _l	N/A	N/A	N/A	✓	✓	*
_σ l	✓	✓	*	✓	*	*
μ _l	*	*	*	*	*	*

5.3 Clusters of falling sonority

Further evidence for the prosodic hierarchy comes from the treatment of falling-sonority clusters. All modern Goidelic languages disfavor consonant clusters in which C₁ is more sonorous than C₂, unless the sonority drop is sufficiently steep. In general, these are repaired with epenthesis.

(36) Epenthesis into clusters of falling sonority

Old Irish	gorm	‘blue’
Modern Irish	gorəm	id.
Manx	gorəm	id.
Gaelic	kərəm	id.

This process had not happened yet in Old Irish, and is rather sporadically attested in Manx. As data from Manx are scanty, I shall not discuss this language further, but focus on Modern Irish and Gaelic. Occasionally in Irish, falling-sonority clusters have been repaired with historical metathesis, as we shall see below.

5.3.1 Irish

5.3.1.1 Epenthesis

As discussed by Ní Chiosáin (1990; 1991, 178 ff.; to appear) and Ó Siadhail (1989, 20 ff.), in all dialects of Irish an epenthetic ə breaks up underlying clusters of falling sonority where C₂ is neither a voiceless stop nor homorganic with C₁. Epenthesis takes effect both when the cluster is word-final (37) and when it is intervocalic (38).

(37) Epenthetic ə in Irish (examples from Ní Chiosáin to appear)

a.	/s'alv/	s'aləv	‘possession’
b.	/banv/	banəv	‘piglet’
c.	/gorm/	gorəm	‘blue’
d.	/s'El'g'/	s'el'əg'	‘hunt’
e.	/an'm'/	an'əm'	‘name’
f.	/d'arg/	d'arəg	‘red’

(38) Epenthetic ə in Irish: intervocalic position (Ní Chiosáin to appear)

a.	/sil'v'Ir'/	sil'əv'ər'	‘pleasant’
b.	/an'v'i:/	an'əv'i:	‘animal’
c.	/d'armad/	d'arəməd	‘mistake’
d.	/alga/	aləgə	‘algae’
e.	/m'anma/	m'anəmə	‘mind’
f.	/ar'g'ad/	ar'əg'əd	‘money’

Ní Chiosáin (to appear) proposes a constraint *rg against clusters of con-

sonants with a relatively shallow drop in sonority (e.g. *lv*, *nv*, *rm*, *lg*, *nm*, *rg*). This constraint is ranked above DEP (which prohibits epenthesis),¹¹ so that the optimal form has an epenthetic vowel breaking up the undesirable cluster.

(39)

/d'arg/	*rg	DEP
d'arg	*!	
☞ d'arəg		*

The constraint *rk against clusters with a relatively great sonority drop (e.g. *lp*, *rk*) is ranked below DEP, so that the optimal candidate has no epenthetic vowel (e.g. *k'ark* ‘hen’).

(40)

/k'ark/	DEP	*rk
☞ k'ark		*
k'arək	*!	

There is no epenthetic vowel into a cluster that follows a long vowel or diphthong.

(41) No epenthesis following heavy syllable (Ní Chiosáin to appear)

a.	t'e:rmə	*t'e:rəmə	‘term’
b.	l'e:rgəs	*l'e:rəgəs	‘insight’
c.	duəlgəs	*duələgəs	‘duty’

In monomorphemic words of three or more syllables (underlyingly), there seems to be dialectal variation. Ní Chiosáin (to appear) reports no epenthesis in Connemara (Connacht), but other dialects (e.g. Déise (Munster) and Tory (Ulster)) do have epenthesis (see references for abbreviations of sources).¹²

¹¹ Ní Chiosáin uses the older term FILL.

¹² I do not have enough evidence to determine whether all Connacht dialects pattern like Connemara and all Munster and Ulster dialects like Déise and Tory respectively. It is entirely possible that the variation illustrated here does not correspond to the major Ulster/Connacht/Munster splits.

(42) Polysyllabic words

a. No epenthesis in Connemara (Ní Chiosáin to appear)

bar**ə**rəx 'barbarian'skol**ə**rnəx 'cackling'

b. Epenthesis in Déise (SCD) and Tory (Ty)

bar**ə**bə**r**əxt 'barbarity' SCD 40skol**ə**g**ə**rni 'cackling' Ty 318

Ní Chiosáin's analysis works for the Connemara dialect she describes. In brief, she sees epenthesis as limited by PARSE- σ : there is no epenthesis in /l'e:rǵəs/ and *barbərəx* because *(l'e:)rǵəs and *(barə)bərəx have too many PARSE- σ violations. See Ní Chiosáin (to appear) for a full analysis and discussion.

But Ní Chiosáin does not address the facts in the dialects that do have epenthesis in (42), e.g. Déise and Tory, which call for a different analysis. As far as I can tell, no Irish dialect permits epenthesis after a long vowel; even the dialects that do have epenthesis in (42) do not have it in (41). For these dialects, the analysis of epenthesis requires a slightly different constraint from Ní Chiosáin's *rg: the constraint I propose, called *FT(rg), prohibits clusters of shallow falling sonority within a foot, but permits them across a foot boundary.¹³

(43) *FT(rg)

*(...C₁C₂...) where C₁ is a sonorant and C₂ is not a voiceless stop

Ranking *FT(rg) above DEP permits epenthesis into the disfavored clusters when they are foot-internal.

	/d'arg/	*FT(rg)	DEP
a.	(d'arg)	* !	
	☞ (d'arəg)		*

¹³ See Broselow (1982) for a discussion of metrically conditioned epenthesis.

b. ¹⁴	/ar'g'ad/	*FT(rg)	DEP
	(ar'g'əd)	* !	
	☞ (ar'ə)g'əd		*

c.	/l'e:rgas/	*FT(rg)	DEP
	☞ (l'e:r)gəs		
	(l'e:)rǵəs		* !

d. ¹⁵	/skElgarni:/	*FT(rg)	DEP
	(skolgər)ni	* !	
	☞ (skolə)gərni		*

Since *FT(rg) does not apply when C₂ is a voiceless stop, there is no epenthesis in words like *olkəs* 'evil'.

(45)	/Elkas/	*FT(rg)	DEP
	☞ (olkəs)		
	(olə)kəs		* !

In all dialects, there is no epenthesis into a foot-internal cluster of falling sonority when C₂ is homorganic with C₁.

(46) No epenthesis into homorganic cluster (Ní Chiosáin 1991, 195 ff.)

a. gam'b'i:n' *gam'əb'i:n' '(exorbitant) interest'

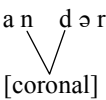
b. m'andər *m'anədər 'instant'

c. t'əŋgə *t'əŋgə 'tongue'

As Ní Chiosáin (1991) argues, these homorganic clusters are linked to a common place node. Introduction of an epenthetic vowel would therefore require crossing association lines.

¹⁴ One potentially interesting candidate is omitted from this tableau: (ar')g'əd. This ill-formed candidate violates FTBIN but meets DEP, indicating that FTBIN outranks DEP. But as we saw in chapter 3, Irish freely permits monomoraic words like /'axt/ 'come' (v.n.) without epenthesis (*'t'axət), proving that DEP outranks FTBIN. Somehow, FTBIN seems to be violable in words that are underlyingly monomoraic (e.g. /'axt/), but inviolable in words that are underlyingly bimoraic or larger (e.g. /ar'g'ad/).

¹⁵ This example comes from Ulster Irish, so the unstressed long vowel is shortened in accordance with the pattern described in chapter 3.


- (47) $m' a n d \dot{a} r$ $* m' a n \dot{a} d \dot{a} r$
 [coronal]
 [cor] [-cor]

Since Goldsmith (1976) it has been widely assumed in phonology that association lines may not cross; in OT terms there is a constraint LINECROSS which is apparently unviolated in all languages.

- (48) **LINECROSS**
 Association lines do not cross.

In Irish, LINECROSS outranks *FT(rg), so there is no epenthesis into homorganic clusters.

(49)

/m'andar/	LINECROSS	*FT(rg)	DEP
 (m'andər)		*	
(m'anə)dər	* !		*

5.3.1.2 Metathesis

A second repair strategy for clusters of falling sonority is metathesis. Some polysyllabic words employ metathesis to eliminate the illicit clusters. Not all words do this, and the metathesis has apparently been lexicalized in the words that have it. Thus, it is preferable to view this as a historical change whose effects are now seen in only certain forms. Metathesis is mostly found in Connacht, but is sporadically attested elsewhere.

- (50) Metathesis in Connacht (de Bhaldraithe 1945, 115 ff.)
- | Middle Irish | Metathesized form | Gloss |
|--------------|-----------------------|---------------|
| a. t'el'g'əN | t'l'ig'əN | 'condemns' |
| b. bolgəm | blogəm | 'mouthful' |
| c. t'irmax | t'r'uməx | 'dry weather' |
| d. murxəy | mroxə | personal name |
| e. konxəwər | kroxu:r ¹⁶ | personal name |

None of the forms with metathesis are underlyingly monosyllabic. Appar-

¹⁶ The change of *kn-* to *kr-* is regular in this variety of Connacht.

ently, epenthesis has always been the only option here.

- (51) Epenthesis in monosyllables
- | | | | |
|------------|--------|--------|---------|
| a. /bElg/ | boləg | *blog | 'belly' |
| b. /gErm/ | gorəm | *grom | 'blue' |
| c. /an'm'/ | an'əm' | *n'am' | 'name' |

There is neither metathesis nor epenthesis after long vowels (52), but there is metathesis in underlyingly trisyllabic forms (53).

- (52) /ge:l'g'a/ ge:l'g'ə 'Irish' (de Bhaldraithe 1945, 40)
 *gle:g'ə
 *ge:l'əg'ə

- (53) /pIrgado:r'/ prugədo:r' 'purgatory' (de Búrca 1958, 136)


With (53) can be compared *purgədo:r'* in non-metathesizing dialects (Ní Chiosáin to appear).

An OT analysis can be given for a historical dialect at a point when metathesis was a productive process. In addition to *FT(rg) and DEP, PARSE-σ and the constraint LIN(earity) against metathesis are needed.

- (54) **LIN-IO** (McCarthy & Prince 1995, 371) — "No metathesis"
 The input representation is consistent with the precedence structure of the output representation, and vice versa.

High-ranking PARSE-σ means that a one-syllable word can be extended into two light syllables, which are still a foot, but that a two- or three-syllable word cannot be extended into three or four syllables, which would be more than a foot, leaving a syllable out of the foot. As we saw in chapter 3, ALL-FT-L outranks PARSE-σ, so candidates with noninitial feet are not competitive in the tableaux.

(55)

	/bElg/	PARSE-σ	*FT(rg)	LIN-IO	DEP
a.	(bolg)		* !		
	 (boləg)				*
	(blog)			* !	

b.

/bElgəm/	PARSE-σ	*FT(rg)	LIN-IO	DEP
(bolgəm)		* !		
(bolə)gəm	* !			*
☞ (blogəm)			*	

c.

/pIrgado:r'/	PARSE-σ	*FT(rg)	LIN-IO	DEP
(purgə)do:r'	*	* !		
(purə)gədo:r'	**!			*
☞ (prugə)do:r'	*		*	

We saw in the tableau in (44c) that there is no epenthesis after a long vowel, because *FT(rg) does not prohibit *rg*-type clusters across a foot boundary. This, of course, is also the reason that there is no metathesis after a long vowel.

(56)

/ge:l'g'a/	PARSE-σ	*FT(rg)	LIN-IO	DEP
☞ (ge:l')g'ə	*			
(ge:)l'əg'ə	**!			*
(gle:)g'ə	*		* !	

Although metathesis is no longer a productive part of the grammar, it was used at some point as a way of repairing *FT(rg) violations without incurring PARSE-σ violations. Metathesized forms like *blogəm* ‘mouthful’ are now lexicalized as underlying /blogəm/ in the relevant dialects, while epenthesized forms like *boləg* ‘belly’ are underlying /bolg/. This lexicalization in metathesized forms is proved by the Middle Irish verb ‘condemn’: present *t'el'g'eN*: past *h'el'g'*. If these forms had developed phonologically like *bolgam* > *blogəm* and *bolg* > *boləg*, one should expect to find modern present *t'l'ig'əN* and past *hil'əg'*; but the actual past tense is *hl'ig'* (de Búrca 1958, 34). This shows that the metathesized form *t'l'ig'əN* was reinterpreted as having the underlying root /t'l'ig'/.

Historically, the replacement of expected **hil'əg'* with actual *hl'ig'* may be viewed as analogical.

(57)

<i>tig'əN</i>	:	<i>hig'</i>	::	<i>t'l'ig'əN</i> :	X
present		past		present	
‘understand’				‘condemn’	

X = *hl'ig'* ‘condemn’ (past)

In chapter 1, I outlined a Correspondence-Theoretical analysis of paradigm leveling in which an Output-Output faithfulness constraint between two related forms of a paradigm outranked a phonological constraint that would otherwise affect one of the output forms. The high-ranking constraint demanding identity between the related forms of a paradigm forced a phonological process to apply in a place where it would not be expected phonologically. Under this analysis, I propose an output-output faithfulness constraint CONTIG-PRESPAST, which outranks LIN-IO.

(58) CONTIG-PRESPAST

The sequence of segments in the past tense is identical to the sequence of segments in the present tense.

As we saw in (55a), the ranking of LIN-IO above DEP means that epenthesis is preferred to metathesis in underlyingly monosyllabic forms. But high ranking CONTIG-PRESPAST means that metathesis is used when it achieves paradigm uniformity.

(59)

/hIl'g'/	*FT(rg)	CONTIG-PRESPAST	LIN-IO	DEP
Pres: <i>t'l'ig'əN</i>	* !	*		
(hil'əg')		* !		*
☞ (hl'ig')			*	

This tableau applies to a point in time when the verb was still underlyingly /t'l'ig'/. In modern Connacht the input is /t'l'ig'/. as there are no alternations that would cause the learner to posit anything else.

5.3.2 Gaelic

Two of the most interesting phenomena in Gaelic syllable structure are hiatus and epenthesis. Hiatus is encountered when, historically, two adjacent vowels are in separate syllables; this contrasts with diphthongs, which are in the same syllable. In the examples in (60), the forms on the left are historically monosyllabic, while the forms on the right are historically disyllabic (the period (.) marking the syllable boundary).

(60) Hiatus in Gaelic

	Historical monosyllables	Historical disyllables
a.	<i>piəy</i> ‘food’	<i>pi.əy</i> ‘let (him) be’
b.	<i>Ruəy</i> ‘red’	<i>Ru.ə</i> ‘promontory’
c.	<i>tuən</i> ‘poem’	<i>tu.an</i> ‘hook’

The phonetic realization of the contrast between the two types varies from dialect to dialect. In some mainland Gaelic dialects, the distinction has been lost, and the two types are homophonous.¹⁷ On the other hand, in his description of the South Hebridean dialect, Borgstrøm (1940, 152–3) says:

In Barra hiatus sometimes, especially after a short vowel, sometimes after a long vowel or a falling diphthong (*ia, ua*, etc.) takes the form of a glottal catch, produced by a closure of the vocal chords followed by a sudden opening. But the real glottal catch is not a necessary part of any word; mostly there is no complete closure, but only a slight movement, a break in the tension of the vocal chords, which, however, is quite sufficient to give on the impression of a clear syllabic limit... In Harris hiatus is frequently filled by a short and often rather indistinct *h*, e.g. *po^hə* or *po.ə* ‘submerged rock’ (*bodha*).

For the dialect of Lewis, however, he says (1940, 54) that the distinction is entirely tonal: the original disyllables have a high tone on the first vowel and a low tone on the second, while the original monosyllables have a high tone on both vowels. According to Ternes (1973), in the dialect of Applecross, Ross-shire, the contrast has become one of duration: the original monosyllables are markedly longer than the original disyllables. He proposes that the original monosyllables are trimoraic and the original disyllables are bimoraic.

Epenthesis arose historically in the same environments in Gaelic as in Irish (see § 5.3.1.1 above): between a sonorant and a following consonant unless that consonant is homorganic or a voiceless stop (in Gaelic terms, an aspirated stop). As was the case with hiatus, not all dialects of Gaelic have a phonetic distinction between original disyllables and original monosyllables that have undergone epenthesis, but many do. Examples of the contrast are shown in (61); the epenthetic vowels are underlined.

(61) Epenthesis in Gaelic		
	Underlying monosyllables	Underlying disyllables
a.	<u>a</u> ram ‘army’	aran ‘bread’
b.	s’a <u>L</u> ak ‘hunt’ (v.n.)	s’aLəγ ‘sight, spectacle’
c.	ma <u>r</u> av ‘dead’	potəx ‘old man’

Borgstrøm (1937), describing Barra Gaelic, gives the difference between the two types as one of syllabification: under his analysis, the underlying

¹⁷ This is true, for example, in Kintyre (Holmer 1962b) and East Sutherland (Dorian 1978).

disyllables have a syllable break after the intervocalic consonant (thus *ar.an*, *s’aL.əγ*, *pot.əx*), while the forms with the epenthetic vowel have the syllable break before the consonant (thus *a.ram*, *s’a.Lak*, *ma.rav*). Much has been made of this apparently contrasting syllabification in Barra Gaelic in recent years, notably in Clements (1986). However, Bosch & de Jong (1997) show convincing phonetic evidence from Barra that the contrast is fundamentally not one of syllabification but one of stress: underlying disyllables have initial stress (thus *áran*, *s’áLəγ*, *pótəx*), while forms with epenthesis stress the epenthetic vowel (thus *arám*, *s’aLák*, *maráv*).

In § 5.1 we saw that in Irish, consonants are ambisyllabic after short stressed vowels (e.g. the *l* in *bíl’ə* ‘anger’ (2) is ambisyllabic), but not after unstressed vowels (e.g. the *b* in *tábák* ‘tobacco’ (4b) is uniquely in the onset of σ_2). I assume that the same is true in Gaelic, which accounts for the perceived difference in syllabification: the *t* in *pótəx* is ambisyllabic because the preceding syllable has a short stressed vowel, while the *r* in *maráv* is uniquely in the onset of σ_2 because the preceding syllable is unstressed.

(62) Underlying disyllable	Underlying monosyllable
pótəx	ma.ráv

Borgstrøm gives the syllabification *pót.əx* because ambisyllabic consonants are frequently perceived as being uniquely in the coda of σ_1 . As mentioned above, many researchers on Irish claimed that words like ‘anger’ were syllabified *bíl’.ə*; also, most English dictionaries syllabify words like *happy* as *hæp.i*.

Under “normal circumstances” stress in Gaelic falls on the initial syllable of the word, as we saw in chapter 3. What drives the forward stress in the epenthetic forms seems to be an inclination to keep the *r* and *v*, which are adjacent in the underlying form /marv/, as close together as possible (cf. Lamontagne 1996). This is consistent with the opinion of one of Borgstrøm’s informants regarding *s’aLák* ‘hunt’ (v.n.) (underlying /s’aLk/) and *fjáNak* ‘crow’ (underlying /fjaNak/): “In *fjáNak* there is a ‘space’ between the two syllables, [the informant] could pronounce *fjáN-ak*. In *s’aLák* the *L* and the *k* are so ‘close together’, that such a separation is impossible” (Borgstrøm 1937, 78; transcription modified to conform with the system used here). I propose a constraint ADJACENCY to describe this inclination.

(63) **ADJACENCY**

If two consonants are adjacent in the input, they are uniquely tautosyllabic in the output.

ADJACENCY, *FT(rg), and CLOSECONT all rank high in Gaelic; FTFORM (trochaic) and DEP are violated in order that the higher ranking constraints may be obeyed.

/marv/	ADJACENCY	*FT(rg)	CLOSECONT	FTFORM	DEP
(.márv.)		* !			
(.márv̩.)	* !				*
(.má.r̩v̩.)			* !		*
☞ (ma.rárv̩)				*	*

In Barra Gaelic at least, epenthetic vowels are stressed in order to keep the underlyingly adjacent consonants uniquely in the same syllable. However, several issues remain to be answered about Gaelic syllables: first of all, how are epenthetic vowels in other dialects accounted for? For example, what about Applecross Gaelic, in which, according to Ternes (1973), epenthetic vowels are longer than underlying vowels, but still unstressed (*pótax* vs. *márv̩*)? And what about the parallelism alluded to above between original monosyllables and disyllables in both hiatus and epenthesis environments? (In Lewis (Borgström 1940), original monosyllables like *piə* ‘food’ and *arəm* ‘army’ have a rising pitch while original disyllables like *pi.ə* ‘let (him) be’ and *aran* ‘bread’ have a falling pitch; and in Applecross (Ternes 1973), *piə* and *arəm* are said to be trimoraic, while *pi.ə* and *aran* are bimoraic.) I cannot address these issues here, but leave them for future research.

5.4 Conclusions

In this chapter I have examined several issues in syllable structure, in particular the relationship between the syllable and the other levels of the prosodic hierarchy. I have shown how footing affects the syllabification of intervocalic consonants and consonant clusters, and have argued that the onsets that are permitted at one level of the prosodic hierarchy are a subset of the onsets permitted at a higher level. Footing also bears on contact effects between consonants, as we saw that some dialects permit *rg*-type

clusters across a foot boundary but not within a foot.

We have now seen a wide range of evidence for the prosodic hierarchy argued for in this dissertation. In chapter 3, facts of syllable weight and stress placement were shown to be dependent on the Weight-to-Stress Principle, and to provide evidence for the mora, syllable, foot, and word, and the relationship between these various levels. In chapter 4 we saw that an additional prosodic level, the colon, must be admitted to the hierarchy between the foot and the prosodic word. And in chapter 5 we have seen that the distribution of onsets, as well as facts of epenthesis, provides further evidence for the prosodic hierarchy. Chapter 6 summarizes the main theoretical points of the dissertation, provides an overview of the historical changes that have happened in the Goidelic languages, and suggests directions for future research.

fricatives became glides and then contracted with surrounding vowels to create long vowels.

(4)	Old Irish	Middle Irish	Early Mod. Irish	Gloss
a.	ím'p'íð'e	ím'p'əjə	ím'p'i:	'entreaty'
b.	s'k'é:li'y'e	s'k'é:ləjə	s'k'é:li:	'storyteller'
c.	búnaðas	búnəγəs	búnu:s	'origin'
d.	d'éx'n'évar	d'éx'n'əwər	d'éx'n'u:r	'ten persons'
e.	tóR't'eṽil'	tóR't'əwəl'	tóR't'u:l'	'bulky'

The first epenthesis also took place between Old Irish and Early Modern Irish; this is the epenthesis described in § 5.3 into clusters of falling sonority, unless the second consonant was either a voiceless stop or homorganic with the preceding sonorant. It happened only after a short vowel, not after a long vowel or diphthong.

(5)	O.Ir. gorm	>	EMI gorəm	'blue'
	O.Ir. k'erk	>	EMI k'ark	'hen'
	O.Ir. dualgas	>	EMI duəlgəs	'right, duty'

This epenthesis was never phonemicized, however, and remains predictable in the modern languages. In Gaelic, the epenthetic vowel is usually a copy of the preceding vowel. In some dialects (e.g. Barra), stress shifted to the epenthetic vowel; in other dialects (e.g. Applecross), the epenthetic vowel became long.

(6)	O.Ir. arm	>	Barra arám	'army'
			Applecross ára:m	

After the Early Modern Irish period, the differences among the dialects began to emerge. In the northern areas (Ulster and Scotland) unstressed long vowels were shortened.

(7)	EMI kál'i:n'	>	Ulster kál'in'	'girl'
	EMI á:v'e:s'	>	Ulster á:v'es'	'exaggeration'
	EMI ára:n	>	Gaelic áran	'bread'

In Gaelic, all these shortened vowels became *a* and were lexicalized as such.

(8)	EMI kóv'e:d	>	Gaelic kʰʷi.at	'guard'
	EMI kós'i:xt	>	Gaelic kʰʷs'axk	'walking'

In Ulster, stressed long vowels in polysyllabic words are often shortened, especially in the varieties spoken along the northern coast of Donegal.

(9)	EMI é:naxə	>	Ulster é:naxə ~ é:naxə	'chickens'
	EMI d'e:nəv̄	>	Ulster d'á:nu ~ d'ánu	'do' (v.n.)

In Manx, unstressed long vowels were shortened after an initial light syllable, but not after an initial heavy syllable. As in Gaelic, these shortened vowels were lexicalized as *a*.

(10)	EMI b'éga:n	>	Manx bégan	'a little'
	EMI g'énu:l'	>	Manx g'énal	'happy'
	EMI bó:ka:n	>	Early Manx bó:ka:n	'brownie' (in folklore)

After epenthesis broke up clusters of consonant + *w*, the epenthetic vowel contracted with the *w* to create *u:*.

(11)	Mid.Ir. d'árṽəd	>	d'árəwəd > d'áru:d	'forgetting'
------	-----------------	---	--------------------	--------------

Anglo-Norman loan words maintained the final stress they had in French, and eventually native Manx words with noninitial long vowels shifted stress forward too.

(12)	Ang.-N. buté:l'	>	bodé:l'	'bottle'
	Ang.-N. pri:sú:n	>	p'r'i:sú:n	'prison'
	Early Manx bó:ka:n	>	bo:ká:n	'brownie'
	Early Manx d'áru:d	>	d'arú:d	'forgetting'

Finally, long vowels were shortened in pretonic syllables.

- (13) p'ri:sú:n > Late Spoken Manx prizú:dn 'prison'
 bo:ká:n > Late Spoken Manx bogé:dn 'brownie'

In East Mayo and Munster, noninitial long vowels that were unstressed in Early Modern Irish became stressed, after both light and heavy initial syllables.

- (14) EMI búLa:n > East Mayo bəLá:n 'bullock'
 EMI tá:L'ó:r' > East Mayo ta:L'ó:r 'tailor'
 EMI bóga:n > Munster bəgá:n 'shell-less egg'
 EMI d'i:ṽi:n' > Munster d'i:vi:n' 'idle'

In addition, East Mayo shifted stress to noninitial syllables closed by a tense sonorant, and Munster shifted stress to noninitial EMI *ax* when in the second syllable and not adjacent to a heavy syllable.

- (15)a. EMI kápəL > East Mayo kapəl 'horse'
 EMI tó:rəN' > East Mayo to:riN' 'boundary'
 EMI góram > East Mayo gorəm 'blue'
- b. EMI b'ánaxt > Munster b'ənáxt 'blessing'
 EMI bákaxə > Munster bəkáxə 'lame' (pl.)
 EMI fá:sax > Munster fá:səx 'desert'
 EMI móLtaxa:n > Munster mólhəxá:n 'wether'
 EMI sásənox > Munster sásənəx 'English'

Finally, Munster had a second epenthesis, into consonant clusters of rising sonority. It did not happen word-initially, nor to clusters of stop + liquid before a stressed syllable.

- (16) EMI áglə > Munster áglə 'fear'
 EMI ág'n'ə > Munster ág'ən'ə 'mind'
 EMI ádví:m' > Munster adví:m' 'I acknowledge'
- EMI glán > Munster glán 'clean'
 EMI g'n'í:ṽ > Munster g'n'í:v 'deed'
 EMI ób'r'ú: > Munster eb'r'ú: 'work' (v.n.)

Of course, various other phonological changes happened through the course of Goidelic history, but these are the most important changes in the prosodic structure.

6.3 Directions for future research

Many issues in the prosodic phonology of the Goidelic languages still remain to be addressed in future research. For example, in chapter 3 we saw that “forward stress” began with WSP compliance in (L H) forms and was extended to (H H) forms as well, where forward stress does not enforce WSP compliance. In chapter 4 we saw that the colon is a successful means to account for forward stress, but exactly how the colon developed in languages that had previously not made use of it remains an interesting question.

In chapter 5 I argued that short stressed vowels in Irish are preferably followed by a tautosyllabic consonant, and I pointed out that a similar preference can be found in other languages as well (e.g. Welsh, English, Dutch, Swedish, etc.) Previous analyses have assumed that this is due to a preference for heavy syllables, but since CVC syllables are light in Irish, it is possible that a different explanation is in order.

In addition, much more work on the prosodic licensing of onsets remains to be done; the material in chapter 5 is just a beginning. I hope that evidence from a wide variety of languages will support the hypothesis that higher levels of the prosodic hierarchy are more tolerant of onsets than lower levels.

It is possible that many of the questions that I have raised could be answered more fully through additional fieldwork on the surviving varieties of Irish and Scots Gaelic. Someday I hope to be able to conduct such fieldwork.

In the following sections I focus in detail on two issues in the prosodic phonology of the Goidelic languages that I have not addressed in this dissertation, but which still need to be examined in theoretical terms. First, there is vowel lengthening before certain consonants and consonant clusters; and second, the behavior of vowels before *h*.

6.3.1 Vowel lengthening

To a lesser or greater extent, all modern Goidelic dialects have lengthened vowels that were short in Old Irish before certain consonants or clusters of consonants. Ó Siadhail (1989, 48) lists these under the rubric “Syllable lengthening before tense consonants,” but it is not clear that all the consonants in question can reasonably be called tense. Ní Chiosáin (1991, 188

ff.) discusses the lengthening processes that are found in her dialect of Connemara (Connacht).

To begin with, there is a tendency (more prevalent in some dialects than in others) to lengthen (or diphthongize) vowels in a closed syllable before one of the tense sonorants *R()*, *L()*, *N()*, as well as *m()* and *η()*.

(17) Lengthening before tense sonorant (see References for abbreviations of sources)

	Middle Irish	Modern forms	Gloss	Source
a.	baR	Ulster ba:r	'top'	Ur 83
b.	g'aR	Manx ge:r	'short'	HLSM3 13
d.	k'aN	Manx k'aun	'head'	HLSM3 13
e.	kaN't'	Gaelic k'haiN't'	'speaking'	GUD 16
f.	haL	Ulster ha:L ¹	'yonder'	Ur 127
g.	koL'	Conn. kail'	'forest'	CF 110
h.	am	Muns. aum	'time'	DOC 213
i.	im'	Conn. i:m'	'butter'	CF 110
j.	Loṅg	Muns. lu:ṅg	'ship'	DOC 232

This lengthening happens only in closed syllables, not in open syllables. The addition of a vowel-initial suffix will cause the vowel to remain short, but with a consonant-initial suffix the long variant surfaces.

(18) Length alternations (examples from Ní Chiosáin 1991)

Middle Irish	Modern Irish	Gloss
g'l'aN	g'l'a:n	'valley'
g'l'aN-ə	g'l'an-ə	'valley' (gen.)
g'l'aN-tə	g'l'a:n-tə	'valleys'

As Ní Chiosáin points out, forms like these contrast with others that have no length variation.

(19)	Middle Irish	Modern Irish	Gloss
a.	ba:n	ba:n	'white'
	ba:nə	ba:nə	'white' (pl.)

¹ In many varieties of Ulster, Mid. Ir. *a* is still short before *L*.

b.	glan	glan	'clean'
	glanə	glanə	'clean' (pl.)

Ní Chiosáin's (1991) analysis is that the final sonorant in words like *g'l'a:n* 'valley' (18) is underlyingly marked as moraic, but that moraic consonants are prohibited in Irish, so the mora reassociates with the preceding vowel when the consonant is in coda position.

Vowel lengthening is found also before a consonant cluster in which the first member was a tense liquid (*L()* *R()*).

(20) Vowel lengthening before tense liquid cluster

	Middle Irish	Modern forms	Gloss	Source
a.	poL's'e:r	Conn. pail's'e:r	'pilchard'	Rm 162
b.	soL's'ə	Manx sail'z'ə	'lights'	HLSM3 143
c.	b'eRNəy	Gaelic pja:rnəy	'gap'	GUD 17
d.	aRd	Ulster a:rd	'high'	Ur 82
e.	uRLa:r	Muns. u:rla:r	'floor'	DOC 243

Some dialects also have lengthening of a high vowel before a nasal + voiceless obstruent cluster. In Connemara (Ní Chiosáin 1991), this lengthening is optional.

(21)	s'im'p'l'i: ~ s'i:m'p'l'i:	'simple'
	im'p'ər'ə ~ i:m'p'ər'ə	'emperor'
	min't'ər' ~ mi:n't'ər'	'people'
	kunte: ~ ku:nte:	'county'
	unsə ~ u:nsə	'ounce'

In Connacht, short stressed vowels are optionally lengthened (in the case of /I/ and /a/) or diphthongized (in the case of /E/) before clusters of voiced obstruent + sonorant.

(22) Optional lengthening/diphthongization (examples from Ó Siadhail 1989, 50 ff.)

a.	/Eb'r'a/	aib'r'ə ~ eb'r'ə	'work' (gen.)
b.	/aglIs'/	a:gləs' ~ agləs'	'church'

c.	/g'lv'r'a/	g'i:v'r'ə ~ g'iv'r'ə	'winter'
d.	/gEv'n'a/	gair'n'ə ~ gev'n'ə	'smiths'
e.	/madri:/	ma:dri: ~ madri:	'dogs'

This lengthening is limited to clusters in which C₁ is a voiced obstruent; there is never lengthening when C₁ is voiceless.

(23) No lengthening

a.	/IkraS/	ukrəs	'hunger'	CF 15
b.	/Lasraxi:/	Lasrəxi:	'flames'	Er 192
c.	/axraN/	axrəN	'entanglement'	Er 25
d.	/ahr'Is'/	ahr'əs'	'relate'	Er 36
e.	/af'r'aN/	af'r'əN	'Mass'	Er 32

Some of the instances of lengthening before a consonant cluster coincide with instances of syncope of a medial vowel.

(24) Syncope

a.	si:l's'ə 'lights'	/sElas + PAL-a ²	soləs 'light'	/sElas/
b.	aib'r'ə 'work' (gen.)	/Ebir' + PAL-a/	obər' 'work'	/Ebir'/

Under Ní Chiosáin's analysis, the lengthening is caused by the syncope: the mora attached to the underlying vowel is reassociated when the vowel is deleted. However, this analysis is undesirable for two reasons: first, it does not explain lengthening in forms without syncope (e.g. *páil's'e:r* (20a), *a:gləs'* (22b)); and second, it incorrectly predicts lengthening when syncope coincides with a cluster that does not begin with a voiced obstruent.

(25) Syncope but no lengthening (examples from CFD 129 and 355)

a.	sokrə 'more quiet'	/sEkIr' + a/	sokər' 'quiet'	/sEkIr'/
b.	l'et'r'əxi: 'letters'	/l'Et'Ir' + axi:/	l'et'ər' 'letter'	/l'Et'Ir'/

Thus, the lengthening seen in (22) still awaits a complete theoretical

² PAL-a indicates an ending /-a/ that causes palatalization of the preceding consonant or cluster.

analysis.

6.3.2 Vowels before *h*

The final issue relating to prosody that I have not addressed has to do with the treatment of vowels before *h* in Ulster Irish. To begin with, long vowels have been shortened before *h*, at least in the dialects of southern and central Donegal.³ Examples may be cited from Meenawannia (Quiggin 1906), Teelin (Wagner 1959), and Tangaveane (Hughes 1986).

(26) Shortening before *h* in Donegal (examples from Quiggin 1906)

	EMI	Donegal	Gloss
a.	sNa:həd	sNahəd	'needle'
b.	sə:hər	səhər	'labor'
c.	t'r'e:h'ax	t'r'ehax	'excellent'
d.	t'i:h'ə	t'ihə	'houses'

This shortening is distinct from the shortening in polysyllabic words described above in (9) (the type of *t'i:f'ə ~ t'if'ə*), since that shortening is prevalent only in northern Donegal, and shortening before *h* is found in southern and central Donegal. It is difficult to conceive of an empirically insightful reason why *h* should trigger this shortening, but the facts seem to indicate this is the correct statement of the environment.

Also in Donegal we find diphthongization of *a* to *ai* before original *h'*.

(27) Diphthongization before *h'* in Donegal (examples from Wagner 1959)

	EMI	Donegal	Gloss
a.	mah'	maih	'good'
b.	kah'əy	kaihu	'one threw'

No other palatalized consonant causes this change; perhaps the fact that *h'* has no primary place of articulation made the secondary [–back] place feature unstable, allowing it to manifest itself as *i*.⁴ The diphthongi-

³ This happens only in polysyllabic words, as *h* disappears after long vowels in monosyllabic words (e.g. /bla:h/ *bla:* 'flower': Quiggin 1906, 70)

⁴ My thanks to Draga Zec for this suggestion.

zation applied to no other vowel than *a*, perhaps because the nonlow vowels were already “close enough” to *i*. I know of no way to test whether this *ai* is monomoraic or bimoraic; in light of the deletion of *h* after long vowels mentioned in fn. 3, monomoraic is perhaps more likely.

This dissertation has provided a foundation for the study of sound change and paradigmatic leveling in OT terms, and has presented a unified analysis of the prosodic structure of the Goidelic languages. Nevertheless, still more work is to be done in this area, as we have seen.

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Abbreviations

ARÉ	Acadamh Ríoga na hÉireann [Royal Irish Academy]
BÁC	Baile Átha Cliath [Dublin]
BB	Ó Briain & Ó Cuív (1947)
<i>BLS</i>	<i>Proceedings of the Berkeley Linguistics Society</i>
CD	Ó hÓgáin (1984)
CF	de Bhaldraithe (1945)
CFD	de Bhaldraithe (1953)
CI	Holmer (1962a)
<i>CLS</i>	<i>Papers from the Regional Meeting of the Chicago Linguistic Society</i>
DIAS	Dublin Institute for Advanced Studies
DOC	Dillon & Ó Cróinín (1961)
Er	Mhac an Fhailigh (1968)
<i>FP</i>	Ó Liatháin & Nic Mhaoláin (1986)
GUD	Mac Gill-Fhinnein (1966)
HLSM3	Broderick (1986)
IALBÁC	Institiúid Ard-Léinn Bhaile Átha Cliath [Dublin Institute for Advanced Studies]
Ky	Sjoestedt (1931)
L	Loth (1913)
LA, <i>LASID</i>	Wagner (1958–66)
<i>LI</i>	<i>Linguistic Inquiry</i>
Mk	Ó Cuív (1944)
NC	Ní Chiosáin (1991)
<i>NELS</i>	<i>Proceedings of the Annual Meeting of the North East Linguistic Society</i>
<i>NLLT</i>	<i>Natural Language and Linguistic Theory</i>
<i>NTS</i>	<i>Norsk Tidsskrift for Sprogvidenskap</i>
QUB	The Queen’s University of Belfast
Rg	R. B. Breatnach (1947)
RIA	Royal Irish Academy
Rm	Ó Máille (1974)
S	Sommerfelt (1927)
SCD	R. B. Breatnach (1961)

- SGS *Scottish Gaelic Studies*
 SILL Studies in Irish Language and Literature, Department of Celtic, The
 Queen's University of Belfast
 Ty Hamilton (1974)
 Ur E. Evans (1969)
 WCCFL *Proceedings of the West Coast Conference on Formal Lin-
 guistics*
 ZCP *Zeitschrift für Celtische Philologie*

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