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Some Effects of the Weight-to-Stress Principle and Grouping Harmony in the Goidelic Languages*

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Grouping Harmony (GH) and the Weight-to-Stress Principle (WSP) (Prince 1990) together predict that stressed elements should tend to lengthen and that unstressed elements should tend to shorten. In addition, it is predicted that in a trochaic system, a sequence (H L) should tend to become (L L), since (L L) makes a better trochee than (H L). Besides these quantitative consequences of the WSP and GH, one might expect to find accentual consequences; thus, a sequence (L H) should receive iambic (i.e. right-prominent) stress, and sequences (L L) and (H L) should receive trochaic (i.e. left-prominent) stress. In this paper I show evidence for all of these predictions from the closely related languages Irish, Scots Gaelic, and Manx, examining free variation, dialectal variation, and historical change in prosodic structure in a constraint-based framework following Optimality Theory (McCarthy & Prince 1993, 1995; Prince & Smolensky 1993).

1. Introduction

Optimality Theory (OT) (McCarthy & Prince 1993a, 1995, Prince & Smolensky 1993, etc.) is a nonderivational approach to linguistics based on the evaluation of the well-formedness of all potential outputs of any given input. This evaluation is based on how well the output candidates conform to a series of ranked constraints.

When exploring such issues as free variation, dialectal variation, and historical change in OT terms, we must seek answers to questions such as: What happens if two (or more) candidates tie on all constraints or sets of unranked constraints? What happens if two dialects have different rankings for the same constraints? How can constraint rankings shift over time? In this paper I shall examine these issues with reference to the Goidelic languages, looking at free variation within a dialect, synchronic variation among the dialects, and the historical changes that resulted in that modern dialectal variation.

1.1 Rhythmic Organization

The Weight-to-Stress Principle (WSP) (Prince 1990) describes the 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) **Weight-to-Stress Principle** (Prince 1990)
If heavy, then stressed.

Contraposition
If unstressed, then light.

* This paper is an older version of chapter 3 of Green (1997b), which deals also with many other aspects of the prosodic phonology of the Goidelic languages. Thanks to Abby Cohn, Draga Zec, and an anonymous reviewer for helpful comments and suggestions. Any mistakes are mine alone.

We therefore expect to see two major effects to enforce compliance with the WSP: stressing of heavy syllables (especially noticeable in a position where the language disfavors stress), and the lightening of unstressed heavy syllables. The WSP has played a major role throughout the history of the Goidelic languages,[1] from before they were recorded down to the present day: both predicted means of compliance with the WSP can be found.

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).

(2) Iambic Quantity (IQ)
In a rhythmic unit [W S], |S| > |W|, preferably.

(3) Trochaic Quantity (TQ)
In a rhythmic unit [S W], |S| = |W|, preferably.

The result of this observation is that iambic systems judge (L 'H) feet to be better-formed than (L 'L) and ('H) feet, while trochaic systems judge ('L L) and ('H) feet to be better-formed than ('H L) feet. Both systems strongly disfavor ('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 $\succ$ H
(The symbol $\succ$ means 'is better than'.)

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

(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 $\mathscr{H}$ of G is defined as the following function: $\mathscr{H}(G) = \frac{|Y|}{|Z|}$.

[1] The Goidelic languages include Old Irish and its modern descendants Irish, Scots Gaelic, and Manx. Irish is divided into three major dialects: Munster, Connacht, and Ulster. One variety of Connacht Irish, that spoken in East Mayo, has such a different prosodic structure from the other dialects that I must consider it separately and speak here of four dialects of Irish: Munster, Connacht, Ulster, and East Mayo. The various dialects of Scots Gaelic and Manx are apparently uniform in their metrical behavior and so will not be distinguished here.

We can now calculate the harmony $\mathscr{H}$ of each type of foot.

(6)	Foot type (X + Y)	|X| = Moras in X	|Y| = Moras in Y	$\frac{\|Y\|}{\|Z\|} = \mathscr{H}$
a.	L + H	1	2	2/1 = 2
b.	L + L, H (= μ + μ)	1	1	1/1 = 1
c.	H + L	2	1	1/2 = 0.5
d.	L	1	0	0/1 = 0

The greater the value of $\mathscr{H}$, the better formed the foot.

Empirical evidence that ('L L) makes a better trochee than ('H L), as predicted by GH, can be found in Ulster Irish, as we shall see in § 3.1.

1.2 The prosodic 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: loss of a coda consonant produced compensatory lengthening of a preceding vowel (see § 2.2), and the minimum word was bimoraic (either CVV or CVC), subminimal words being extended by vowel lengthening (see § 2.3).

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 1996) and of epenthesis (Ní Chiosáin 1999).[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 loanwords are from English and French, which also disallow CV content words. Nevertheless, there are a few in Modern Irish: [ťe] 'hot', [ba] 'cows'. Some dialects have more because they have lost certain final consonants: [ma] 'good' (< [mah]), [pu] 'puff' (< [puh]), [mo] 'manner' (< [moɣ]), etc. Thus, we may safely say 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. All we know 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 we may be quite certain that ['mak] 'son' had the structure ['H], we cannot determine what the structure of ['markax] '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

[2] But see § 3.4 for some heavy CVC syllables in East Mayo Irish.

late Old Irish or early Middle Irish. The only consonants that remained weight-bearing were the fortis sonorants [L N m] (see below), when at the end of a phonological phrase in East Mayo Irish (see § 3.2.2).

Before we get to the data, let me give a note on transcription: [N L R] denote "fortis" sonorants that are longer and more tensely articulated than "lenis" [n l r]. Fortis and lenis sonorants are probably distinguished by some feature such as [tense]. In initial consonant mutations, fortis sonorants are parallel to stops and lenis sonorants are parallel to fricatives. [m] is also a fortis sonorant, and is mutated to the nasalized fricative [ṽ]. An acute accent (´) over a consonant indicates palatalization ([–back]). A consonant not marked with (´) is velarized ([+back]). [ṽ] is a nasalized voiced labial fricative. The phonemes /I/ and /E/ are respectively high and mid short vowel phonemes of Modern Irish that are underspecified for [back], which they acquire from neighboring (usually following) consonants. Thus, [i] and [u] are not contrastive phonemes in Irish, nor are [e] and [o]. Among the long vowels, however, /iː/, /uː/, /eː/, and /oː/ (as well as /aː/) are all phonemes.

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

(7)	[('L L) L] in Goidelic		
a.	Old Irish	(.'ḱe.Nɨ.)ɣ́e.	'merchant'
b.	Modern Irish	(.'ma.rə.)gə.	'market'
c.	Manx	(.'fo.la.)xə.	'hiding'
d.	Gaelic	(.'a.Ńa.)ləx.	'ignorant'

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

(8)	[('H) L] in Goidelic		
a.	Old Irish	(.'ḱeː.)ńe.	'as long as'
b.	Modern Irish	(.'oː.)ləs.	'knowledge'
c.	Manx	(.'oː.)ləs.	'a charm'
d.	Gaelic	(.'jɔː.)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.

(9)	[('L L) σ σ …] in Goidelic		
a.	Old Irish	('.Ŕe.ṽu.)ð́iɣ́.θ́e.	'placed before'
		*('.Ŕe.ṽu.)(ˌð́iɣ́.θ́e.)	
b.	Modern Irish	('.a.ńəḿ.)ńə.xə.	'names'
		*('.a.ńəḿ.)(ˌńa.xə.)	
c.	Gaelic	('.ã.nã.)mə.xəɣ.	'mention' (v.n.)
		*('.ã.nã.)(ˌma.xəɣ.)	

In OT terms, this can be attributed to the constraints ALL-FT-LEFT and PARSE-σ.

(10) **ALL-FT-LEFT** (McCarthy & Prince 1994; cf. also McCarthy & Prince 1993b and Cohn & McCarthy 1998)
Align(Ft,L;PrWd,L)
The left edge of every foot is aligned with the left edge of some PrWd.

(11) **PARSE-σ**
Syllables are parsed into feet.

The ranking of ALL-FT-LEFT above PARSE-σ means that only one foot is built, at the left edge of a word, even when there is room for more than one foot.

(12)

/Ŕeṽuð́iγ́θ́e/	ALL-FT-LEFT	PARSE-σ
('.Ŕe.ṽu.)(ˌð́iγ́.θ́e.)	σ ! σ	
☞ ('.Ŕe.ṽu.)ð́iγ́.θ́e.		**

ALL-FT-LEFT comes into conflict with WSP (13) 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.

(13) **WSP** (McCarthy and Prince 1993a, 154; Hung 1994)
A heavy syllable is stressed.

As discussed by Prince (1990), Kager (1992, 1993ab), and others, there are various strategies to resolve this conflict. In this paper I shall be examining the various strategies used by the Goidelic languages in the course of their historical development. In § 2 I look at the historical changes in prosodic structure that happened between Proto-Insular Celtic and Early Modern Irish, and in § 3 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.

2. From Proto-Insular Celtic to Early Modern Irish

2.1 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.[3] 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.[4]

[3] Proto-Insular Celtic is the branch of Celtic ancestral to both the Goidelic languages and the Brittonic languages (Welsh, Cornish, and Breton).

[4] Some exceptions to initial stress are these: 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. Also, in all modern Goidelic dialects, there are a handful of words (mostly adverbs) whose first syllable contains an unstressable [ə] and which therefore stress the second syllable.

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 *['gaba:mes] 'take' (1 pl. subjunctive, conjunct form[5]), which became ['gavaṽ] in Old Irish.

Kiparsky (1968) has argued that phonological change happens when an "imperfectly learned" child grammar survives into adulthood and is adopted by a wider speech community. As Gnanadesikan (1995) points out, child phonology uniformly ranks phonological constraints (e.g. WSP) above faithfulness constraints (e.g. MAX(μ)). Usually, children successfully promote the faithfulness constraints above the phonological ones, but occasionally, as happened here, the PHONO ≫ FAITH ranking remains and becomes a regular feature of the adult grammar.

Therefore, at some point in the prehistory of Irish, the unstressed short vowel was presumably the surface allophone of an underlying long vowel. We may suppose that at that point, the constraints ALL-FT-LEFT (10) and WSP (13) outranked MAX(μ) (14).

(14) **MAX(μ)**
Every mora of the input must have a correspondent in the output.

The rankings ALL-FT-LEFT ≫ MAX(μ) and WSP ≫ MAX(μ) meant that if an input (underlying) form had a noninitial long vowel, the optimal output (surface) form would have stress on the initial syllable and shorten the unstressed long vowel.

(15) Proto-Insular Celtic: WSP ≫ MAX(μ)

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

At some point, the short vowel in such forms was reinterpreted as an underlying short vowel, because attested Old Irish has noninitial long vowels, but not in ['gavaṽ]. Once this happened, speakers could no longer retrieve the ranking WSP ≫ MAX(μ), so that when new noninitial long vowels entered the language, they were free to build a new ranking.

2.2 New noninitial long vowels: MAX(μ) ≫ WSP in Old Irish

Indeed, the ranking of WSP and MAX(μ) was 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. *['skʷetlon] 'story' > O.Ir. ['śḱe:l]) and unstressed syllables (e.g. *['kenetlon] 'kindred' > O.Ir. ['ḱeńe:l]).[6] Another example is the diminutive suffix [-a:n]

[5] 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 (1997a) for *-mes* as the 1 pl. conjunct ending.

[6] The consonant cluster is still found in the Middle Welsh equivalents of these words: [xwedəl]

< *[-agnos] (cf. the Old Irish personal name ['broka: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 (['Lo.aθar] > ['Lo:θar] 'basin') and in unstressed syllables (['erxo.ad] > ['erxo: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. Welsh [-aug]), as in ['f́e:so:g] 'beard', and [-i:n] (borrowed from Latin *-īnus*), very common in personal names like ['pa:dɨǵi:n] '(little) Patrick'. Loanwords like ['o:ro:d́] 'prayer' < Latin *ōrātiō* and ['aLto:ŕ] 'altar' < Latin *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 era.

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

	Old Irish	Middle Irish	Early Mod. Irish	Gloss
a.	'iḿṕɨðe	'iḿṕəjə	'iḿṕi:	'entreaty'
b.	'śḱe:lɨɣ́e	'śḱe:ləjə	'śḱe:li:	'storyteller'
c.	'bunaðas	'bunəɣəs	'bunu:s	'origin'
d.	'd́eχ́ńevar	'd́eχ́ńəwər	'd́eχ́ńu:r	'ten persons'
e.	'toŔt́av̄ɨĺ	'toRt'əwəĺ	'toRt́u:ĺ	'bulky'

In addition, loanwords from Anglo-Norman[7] such as [bud́e:l] 'bottle' have noninitial long vowels. Words like these had final stress in Anglo-Norman and so may have had irregular final stress in Middle Irish as well (thus [bu'd́e:l]), but among the modern dialects only Manx treats (L H) words of Anglo-Norman origin differently from those of native origin.

By the beginning of the Early Modern Irish (EMI) period (the latest point from which all modern Goidelic languages can be derived: Jackson 1951) therefore, there were many words from a variety of sources with noninitial long vowels.

(17) Words with noninitial long vowels in EMI

a.	'ḱińe:l	< O.Ir. 'ḱeńe:l	< PIC *'kenetlon	'kindred'
b.	'aLto:ŕ	< O.Ir. 'aLto:ŕ	< Latin al'ta:ria	'altar'
c.	'ḱaNi:ḿ	< M.Ir. 'ḱaNəjəḿ	< O.Ir. 'ḱeNɨɣ́iḿ	'I buy'
d.	'bud́e:l or bu'd́e:l	< Anglo-Norman bu'te:ĺ		'bottle'

The forms in (17a–c), as well as (17d) 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 the ranking of WSP and MAX(μ) had been reversed: the ranking was now MAX(μ) ≫ WSP; the high rank of ALL-FT-L remained unchanged.

and [kenedəl] with secondary epenthetic [ə].

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

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

/ḱińe:l/	ALL-FT-L	MAX(μ)	WSP
('.ḱi.ńel.)		* !	
.ḱi(.'ńe:l.)	σ !		
☞ ('.ḱi.ńe:l.)			*

2.3 Monomoraic words: the ranking of FTBIN and DEP(μ)

A prediction made by GH, 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 lengthened 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. The constraint FTBIN (19) demands binarity of feet.

(19) **FTBIN** (moraic) (McCarthy and Prince 1993a, 43)
Feet are binary at the moraic level.

When FTBIN outranks DEP(μ) (20), which prohibits the lengthening of underlying short vowels, underlying (L) words surface with lengthened vowels and become (H).

(20) **DEP(μ)**
Every mora of the output must have a correspondent in the input.

This phenomenon is found in Old Irish. As shown in (21a–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 (21c).

(21) s-subjunctives in Old Irish

	1 pl.	3 pl.	3 sg.	Gloss
a.	'ful-s-av̄	'ful-s-ad	'ful	'support'
b.	'tai-s-av̄	'tai-s-ad	'tai	'come'
c.	'ǵe-s-av̄	'ǵe-s-ad	'ǵe:	'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 (22b) does not concern us here.)

(22) Velar-stem nouns in Old Irish

	Dat. pl.	Acc. sg.	Nom. sg.	Gloss
a.	'Ŕi:ɣ-ɨv́	'Ŕi:ɣ́	'Ŕi:	'king'
b.	'b́ŕeɣ-ɨv́	'b́ŕiɣ́	'b́ŕi:	'hill'

The lengthening in forms like ['ǵe:] and ['b́ŕi:] is attributable to the ranking FTBIN ≫ DEP(μ).

(23)

		Candidates	FTBIN	DEP(μ)
a.	/ǵe/	(.ǵe.)	* !	
		☞ (.ǵe:.)		*
b.	/b́ŕi/	(.b́ŕi.)	* !	
		☞ (.b́ŕi:.)		*

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

As mentioned in § 1.3, monomoraic words are allowed in Modern Irish, where CVC syllables pattern with CV syllables and can therefore be assumed to be light.

(24) (L) words in Modern Irish

a. ˈt́ax 'house'

b. ˈt́e 'hot'

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

(25)

		Candidates	DEP(μ)	FTBIN
a.	/t́ax/	☞ ('.t́ax.)		*
		('.t́a:x.)	* !	
b.	/t́E/	☞ ('.t́e.)		*
		('.t́e:.)	* !	

The question of how constraint rankings change over time is a very interesting one, and a very difficult one. At some point, the ranking of FTBIN and DEP(μ) may not have been recoverable by speakers: Old Irish had very few words like /ǵe/ and /b́ŕi/ to begin with; some were lost by paradigm leveling (e.g. /ǵe/, which was an irregular subjunctive to the verb root [guð́]- 'pray', was eventually replaced by the regular form ['guð́ə] > Modern Irish ['gi:]), others were reinterpreted with an underlying long vowel (e.g. /b́ŕi/, which was /b́ŕi:/ by Early Modern Irish). Once the old ranking was no longer learnable to later speakers, they were free to build a new 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. The modern Goidelic languages

The modern Goidelic languages handle the WSP violations of Early Modern Irish in several different ways. In Ulster and Scots Gaelic, the Old Irish ranking MAX(μ) ≫ WSP was reversed resulting in the shortening of unstressed long vowels. In Munster and East Mayo, ALL-FT-L ≫ WSP was reversed, shifting stress to the heavy syllable. Manx is more complicated, as it passes through two distinct stages of development. Connacht tolerates the WSP violations and does nothing to change the Old Irish ranking.[8] We shall discuss each of these techniques in turn.

3.1 *WSP ≫ MAX(μ) in Ulster and Scots Gaelic*

In Ulster Irish and Scots Gaelic, EMI unstressed heavy vowels were shortened. As we shall see, this is attributable to the reranking of the phonological constraint WSP above the faithfulness constraint MAX(μ), as predicted by the theory that phonological change derives from the PHONO ≫ FAITH ranking of child grammar.

3.1.1 Ulster

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] (26d–e).

(26) Shortening of unstressed long vowels in Ulster (Hughes 1994, 626–7)

	Ulster	EMI	Gloss
a.	ˈkaĺiń	ˈkaĺi:ń	'girl'
b.	ˈa:v́eś	ˈa:v́e:ś	'exaggeration'
c.	ˈamədan	ˈamədaːn	'fool'
d.	ˈf́aNag ~ ˈf́aNɔg	ˈf́aNo:g	'crow'
e.	ˈḱɔ:Ltaŕ ~ ˈḱɔ:Ltɔŕ	ˈḱo:Lto:ŕ	'musician'
f .	ˈgalun	ˈgalu:n	'gallon'

Describing the variety of Ulster Irish spoken in Torr, Sommerfelt (1921, 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]."[9]

This shortening may be explained by proposing that Ulster has restored the ranking WSP, ALL-FT-L ≫ MAX(μ) that was current early in Proto-Goidelic, as we saw above in (15). This ranking means that the optimal candidate is the one in which an unstressed long vowel is shortened.

(27)

/kaĺi:ń/	ALL-FT-L	WSP	MAX(μ)
('.ka.ĺi:ń.)		* !	
☞ ('.ka.ĺiń.)			*
.ka.('ĺi:ń.)	σ !		

This is a classic example of a phonological constraint (WSP) coming to outrank a faithfulness constraint (MAX(μ)), as happens in child phonology. For whatever reason, this "incorrect" ranking became predominant and eventually became the correct ranking in the dialect. What the speakers did, in effect, was apply the contraposition of the Weight-to-Stress Principle, "If unstressed, then light" (see (1)) to their language.

As mentioned above, GH predicts that (H L) trochees should tend to become

[8] The province of Leinster is now entirely English-speaking, but evidence from place-names in County Wicklow (de hÓir 1969) and Irish loanwords in the English of County Laois (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 noninitial heavy syllables.

[9] See Ó Dochartaigh (1987, 19 ff.) for a discussion of vowel shortening in Ulster.

(L L) trochees, because (L L) trochees are better-formed than (H L) ones; the phenomenon is known as trochaic shortening. This prediction is borne out in an apparently optional 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 (1958–69). 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. The phenomenon is especially prevalent along the northern coast of County Donegal.

(28) Trochaic shortening in Ulster

a.	/ḿe:raka:n/	ˈḿerəkan ~ ˈḿe:rəkan	‘thimble’
b.	/t́i:f´I/	ˈt́if´ə ~ ˈt́i:f´ə	‘will see’
c.	/fi:ĺɔ:g/	ˈfiĺəg ~ ˈfi:ĺəg	‘seagull’

These contrast with underlying (L L) and (L L L) words that never show long vowels, such as [ˈLɔftə] ‘loft’ and [ˈkɔrəgəs] ‘Lent’. To explain this phenomenon, we need first to discuss some constraints regarding footing. Trochaic Quantity (abbreviated TroQ) (29) specifies that (ˈL L) and (ˈH) are better-formed moraic trochees than (ˈH L).

(29) **TroQ** (Prince 1990, Zec 1999)
In a rhythmic unit (S W), |S| = |W| (where |X| stands for the size of X measured in moras).

The phenomenon of trochaic shortening seems to be due to the relative ranking of TroQ, Parse-σ, and Max(μ). As shown for [ˈt́if´ə ~ ˈt́i:f´ə] ‘will see’ in the tableau in (30), which simply shows which constraints the candidates violate and does not evaluate the candidates, (ˈ.t́i.f´ə.) (30a) meets both TroQ and Parse-σ, but at the expense of a Max(μ) violation. The candidate (ˈ.t́i:.f´ə.) (30b) meets both Max(μ) and Parse-σ, but violates TroQ; and (ˈ.t́i:.)f´ə (30c) meets Max(μ) and TroQ but violates Parse-σ.

(30)

	/t́i:f´I/	TroQ	Parse-σ	Max(μ)
a.	(ˈ.t́i.f´ə.)	√	√	*
b.	(ˈ.t́i:.f´ə.)	*	√	√
c.	(ˈ.t́i:.)f´ə.	√	*	√

As mentioned above, trochaic shortening in Ulster is apparently optional, as both [ˈt́i:f´ə] and [ˈt́if´ə] are attested. But when [ˈt́i:f´ə] occurs, we have no way of deciding between (30b) and (30c), 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.)

When the ranking is Parse-σ ≫ Max(μ), the candidate with trochaic shortening is optimal.

(31)

/t́i:f´I/	TroQ	Parse-σ	Max(μ)
☞ (ˈ.t́i.f´ə.)			*
(ˈ.t́i:.f´ə.)	* !		
(ˈ.t́i:.)f´ə.		* !	

When the ranking is reversed, the unshortened candidate is optimal.

(32)

/t́i:f´I/	TroQ	Max(μ)	Parse-σ
(ˈ.t́i.f´ə.)		* !	
(ˈ.t́i:.f´ə.)	* !		
☞ (.t́i:).f´ə.			*

The other examples given in (28) work the same way: [(ˈ.ḿe.rə.)kan. ~ (ˈ.ḿe:.)rə.kan.], [(.ˈfi.ĺəg.) ~ (.ˈfi:.)ĺəg.]. Both of these forms also show shortening of a noninitial long vowel in the typical Ulster manner discussed above.

At first glance, it might seem appealing to analyze this free variation as a result of the nonranking of Max(μ) and Parse-σ.

(33)

	/t́i:f´I/	TroQ	Max(μ)	Parse-σ
a.	☞ (.t́i.f´ə.)			*
b.	(.t́i:.f´ə.)	* !		
c.	☞ (.t́i:.)f´ə.		*	

Under this analysis, we might say that since (33a) and (c) tie on all constraints, both are optimal, and the speaker is given a free choice of candidates. However, the traditional OT view is that when two or more candidates tie in number of violations (including zero) of any constraint, or any set of unranked constraints, the tie is broken by a lower constraint.

(34)

Candidates	K	L
X	*	* !
☞ Y	*	

(35)

Candidates	K	L	M
X	*		* !
☞ Y		*	

For this reason, the analysis in (33) is dangerous: there is almost certain to be some low-ranking constraint that (33a) meets but (33c) violates (or vice versa), that would allow Eval to pick one as optimal. For example, there may be a low ranked constraint All-Ft-R.

(36) **All-Ft-R**
Align(Ft,R;PrWd,R)
The right edge of every foot is aligned with the right edge of a prosodic word.

This constraint is not usually competitive in Irish, but it would become so if two candidates needed it as a tie-breaker. Given the analysis in (33), ALL-FT-R would thus decide in favor of [('.ti.f′ə.)], and [('.ti:.)f′ə]. would never be allowed.

(37)

/ti:f′I/	TROQ	MAX(μ)	PARSE-σ	ALL-FT-R
☞ ('.ti.f′ə.)		*		
('.ti:.f′ə.)	* !			
('.ti:.)f′ə			*	* !

For this reason, I argue that free variation is best analyzed not by leaving two crucial constraints unranked, but rather by allowing variation in constraint ranking within a dialect. Thus both MAX(μ) ≫ PARSE-σ and PARSE-σ ≫ MAX(μ) are grammatical rankings in Ulster Irish, but at any time one must dominate the other.

3.1.2 Scots Gaelic

In Scots Gaelic (hereafter simply Gaelic), all unstressed formerly long vowels have been reduced to short [a].

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

	Gaelic	EMI	Gloss
a.	'aran	'ara:n	‘bread’
b.	'kʰɔ̃i.at	'kov̄e:d	‘guard’
c.	'kʰɔśaxk	'kośi:xt	‘walking’
d.	'kʰuNarst	'koNtu:Rt'	‘danger’
e.	'ɯŃak	'fiŃo: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] implies 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, Gaelic does shorten underlying long vowels when they are unstressed at the phrase level.

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

a.	'ka:rək	‘garden’	karə 'mo:r	‘big garden’[10]
b.	'fa:ĺ	‘spade’	faĺ 'vɔ:ńə	‘peat spade’
c.	'rɛ:t	‘road’	rɛt 'karit́	‘shortcut’
d.	'mɛ:N	‘middle’	mɛN əN 'tã̄vri	‘Midsummer’

[10] The loss of the final [k] is probably a phonetic effect of rapid speech.

This shortening too can be explained by the ranking WSP ≫ MAX(μ). The stress pattern at the phrase level seems to be RIGHTMOST(NP) (40); the tableau in (41) illustrates the ranking RIGHTMOST(NP), WSP ≫ MAX(μ) for [rɛt 'karit́] ‘shortcut’ (39c).

(40) **RIGHTMOST(NP)**
The rightmost prosodic word in a complex NP receives main phrasal stress.

(41)

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

This indicates that although the unstressed vowel in the words in (38) 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.

3.2 WSP ≫ ALL-FT-L in Munster, East Mayo, and Manx

The second way that the WSP violations or EMI were resolved in its daughter dialects was by reversing the ranking of ALL-FT-L and WSP, which had the effect of shifting stress to the noninitial long vowel. This happened in Munster, East Mayo, and Manx.

3.2.1 Munster

In Munster, Early Modern Irish WSP violations like ['boga:n] ‘shell-less egg’ have been resolved by moving the stress to the heavy syllable, a phenomenon known as “forward stress” in the literature (e.g. O’Rahilly 1932, Blankenhorn 1981, Ó Sé 1989). The Munster pronunciation of ‘shell-less egg’ is [bə'ga:n] (Ua Súilleabháin 1994, 481). Just as Ulster applied the contraposition of the WSP, so Munster applied the main statement, “If heavy, then stressed” to their language. This case can be accounted for in OT terms by proposing that WSP was promoted so that it outranked ALL-FT-L; at this point WSP and MAX(μ) became unranked with respect to each other. (The realization of the unstressed short vowel as [ə] is regular and will not concern us here.)

(42)

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

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

(43) Forward stress in Munster

a.	H 'H	d́i:'vi:ń	‘idle’
b.	H 'H L	ba:'do:ŕəxt	‘boating’
c.	H 'H H	ma:r'ńe:li:xt	‘navigation’

Forward stress began with WSP compliance in forms like ['boga:n] > [bo'ga:n]. It was reinforced by Anglo-Norman loanwords like [bo'd́e:l9, 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 ('H H) is no more of a WSP violation than (H 'H) is, but the pattern of (L 'H) words as well as Anglo-Norman (H 'H) words like [ṕŕi:'su:n] 'prison' was extended to native (H H) words, and they became stressed (H 'H): [d́i:'vi:ń]. EMI ('L H L) words like [f́ŕiha:lə] 'feeding' and ('L H H) words like ['ase:nti:xt] 'disagreement' were also shifted to [f́ŕə'ha:lə] and [a'se: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:'do:ŕəxt] and [ma:r'ńe:li:xt] from (43) above. The WSP motivated the shift from ('L L H) to (L L 'H) (e.g. [markə're:r] 'mackerel') as well, and the pattern of stressing the second foot of the word was established.

Forms like these can be explained by proposing that in Munster Irish, a right-headed binary colon,[11] consisting either of two feet or of a foot and a stray syllable, is built at the left edge of the word.

(44) The colon in Munster

PrWd	[×]		[×]
Colon	{ . × }		{ . × }
Ft	. (×)		(×)(×)
a.	bə 'ga:n	b.	d́i: 'vi:ń

PrWd	[×]		[×]
Colon	{ . × }		{ . × }
Ft	(×)(×) .		(×)(×)(×)
c.	ba: 'do: ŕəxt	d.	ma:r 'ńe: 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.[12]

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.

(45) Stressing of noninitial [ax] in Munster

a.	/b́anaxt/	b́ə'naxt	'blessing'
b.	/bakaxa/	bə'kaxə	'lame' (pl.)

[11] A prosodic constituent between the foot and the prosodic word: see Hayes (1995, 119).

[12] This analysis is fully developed in Green (1996, 1997b), which see for further references; I shall not explore a synchronic explanation of Munster stress here, but rather attempt to explain the history of how Munster stress developed.

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.

(46) Noninitial [ax] unstressed

a.	/fa:sax/	'fa:səx	'desert'
b.	/mElhaxa:n/	molhə'xa:n	'wether'
c.	/sasanax/	'sasənəx	'Englishman'

To explain the behavior of /ax/, we 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) syllables with *i* before a nasal are more prominent than other syllables with i. This appears to be true regardless of whether or not the nasal consonant is tautosyllabic with the i. For Munster, I propose that a syllable with *a* before *x* is more prominent than other light syllables.[13] In optimality-theoretic terms, the constraint PKPROM (47) is met when [ax][14] is the head of its foot.

(47) **PKPROM** (Prince & Smolensky 1993, 39)
Peak(X) ≻ Peak(Y) if |X| > |Y|.

In other words, *X* is a better peak than *Y* if the prominence of *X* is greater than the prominence of Y. Since *ax* is more prominent than other light syllables, it makes a better peak than other light syllables. This constraint does not apply if *ax* is left unfooted.

(48) a. ('.fa:.)sax. = 'fa:səx 'desert' (35a)
b. ('.sa.sa.)nax. = 'sasənəx 'Englishman' (35c)

The tableau in (49) shows the ranking PKPROM ≫ FTFORM for [b́ə'naxt] 'blessing' (45a) and [bə'kaxə] 'lame (pl.)' (45b).

(49)

		Candidates	PKPROM	FTFORM
a.	/b́anaxt/	('.b́a.nəxt.)	a !	
		☞ (.b́ə.'naxt.)	ax	*
b.	/bakaxa/	('.ba.kə.)xə.	a !	
		☞ (.bə.'ka.)xə.	ax	*

PKPROM is overridden, however, by a higher-ranking constraint NOCLASH (50).

[13] This special prominence of [ax] is seen also in Ulster, Manx, and certain dialects of Gaelic, where unstressed [ax] is not reduced to [əx]: Ulster ['pɔrtax] 'bog' (Quiggin 1906, 12, Wagner 1959, 189); Manx ['ḱeðax] 'left hand' (Broderick 1984, 256); Kintyre Gaelic ['ḱalax] 'moon' (Holmer 1962, 39), East Sutherland Gaelic ['ɣ́ɔlax] 'moon' (lenited) (Dorian 1978, 165).

[14] I shall be using this notation to indicate [a] before [x]: I emphasize that [x] need not be in the coda.

(50) **NoClash**
Two adjacent syllables should not both be heads of feet.

The effect of NoClash at the phrase level is seen in the tableau in (51), which shows the ranking NoClash ≫ WSP. The phrases illustrated are [ḱiˈṕi:ń] ‘match’ and [ˈḱiṕi:ń ˈd́arəg] ‘red match’ (Ó Siadhail 1989, 31; glosses supplied by D. Ó Sé, p.c.).

(51)	Candidates	NoClash	WSP
a.	[.ˈḱi.ṕi:ń.]		* !
	☞ [.ḱi.ˈṕi:ń.]		
b.	☞ [.ˈḱi.ṕi:ń.] [ˈd́a.rəg.]		*
	[.ḱi.ˈṕi:ń.] [ˈd́a.rəg.]	* !	

As shown in the tableau in (52), NoClash also dominates PkProm. The candidates evaluated in (52) are for [molhəˈxa:n] ‘wether’ (46b). In each candidate, the short vowel that is not reduced to [ə] is the head of the foot, as shown by the grid in (53). In (53b), the foot-head [ha] is in clash with the foot-head [xa:n]; in (53a) there is no clash.

(52)	/mElhaxa:n/	NoClash	PkProm
a.	☞ (.mol.hə.)(ˈxa:n.)		o
b.	(.məl.ha.)(ˈxa:n.)	* !	ax

(53) Metrical structure of the candidates in (52)

	a.	b.
PrWd	[×]	[×]
Ft	(× .) (×)	(. ×) (×)
	L L H	L L H
	mol hə xa:n	* məl ha 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’.

(54) [-əxt] ‘-ness’ unstressed

a.	ˈat́əxt	‘strangeness’	Ó hÓgáin (1984, 78)
b.	ˈboxtəxt	‘poorness’[15]	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 [ˈdorəxə] ‘dark’ (or-

[15] Used only in the phrase [dol ə ˈmoxtəxt] ‘getting poorer’, literally ‘going into poorness’; the usual word for ‘poverty’ is [ˈboxtənəs] (D. Ó Sé, p.c.).

thographic *dorcha*) (Dillon and Ó Cróinín 1961, 224), indicating that this vowel too is underlying /E/; nor is stress attracted to the ending of the past impersonal verb form [-əx], as in [ˈkasəx] ‘one turned’ (Ó Siadhail 1989, 31). The ending may be underlyingly /-Ex/, or /-aɣ/ (its historical origin) with final devoicing, or it may be /-ax/ but lexically marked as stressless. If /ax/ is preceded by /h/, forward stress is optional in Muskerry ([ˈlahəx ~ ləˈhax] ‘mire’, [ˈd́ĺihəx ~ d́ĺəˈhax] ‘lawful’), and is not found at all in West Kerry ([ˈfahəx] ‘giant’, [ˈḱahəx] ‘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.

3.2.2 East Mayo

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. East Mayo Irish, like Munster Irish, shows forward stress in words with noninitial long vowels.

(55) Forward stress in East Mayo[16]

a.	(L ˈH)	bɵˈLa:n	‘bullock’	#19
b.	(H ˈH)	ta:ˈĹo:r	‘tailor’	#238
c.	(L L ˈH)	pɵrəˈgo:d	‘purgative’	#362
d.	(L ˈH L)	gəˈba:śt́ə	‘cabbage’	#250

Forward stress in East Mayo can be explained in exactly the same way as in Munster: the promotion of WSP above All-Ft-L.

(56)	/bELa:n/	WSP	Max(μ)	All-Ft-L
	(ˈ.bɵ.La:n.)	* !		
	(ˈ.bɵ.Lan.)		* !	
	☞ .bɵ(ˈ.La:n.)			σ

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 ([+tense]) sonorant [L N m], and (ii) the word occurs at the end of a breath-group, i.e. before a pause.[17] The quality of the stressed short vowel is usually reported as [ə] or [ɵ] (a mid central-to-back, slightly rounded vowel) before unpalatalized consonants, roughly the same phonetic quality as the [ə] of unstressed syllables.[18] 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.

[16] Numbers refer to questionnaire answer numbers in Wagner (1958–69) vol. 3, 351–9.

[17] 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 Wagner (1958–69) usually cites words in isolation, it is difficult to be positive of this.

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

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

	a.	ka'pəL ‖	'horse'	#165
	b.	ka'piĹ ‖	'horses'	#181
	c.	sa'ləN ‖	'salt'	#315
	d.	to:'riŃ ‖	'boundary'	#960
	e.	go'rəm ‖	'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.

(58) ['əL] adjacent to VV

	a.	to:'riŃ ‖	'boundary'	#960
	b.	iə'riŃ ‖	'iron' (gen.)	#607
	c.	e:'drəm ‖	'heavy'	Wagner (1958–69) vol. 1, map 81
	d.	'koĺu xa:'śiĹ ‖	placename	Wagner (1958–69) vol. 3, 363

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

(59) ['əL] in epenthesis

	a.	go'rəm ‖	*gorm*	'blue'	#237
	b.	tə'rəms ‖	*terms*	'terms'	Wagner (1958–69) vol. 3, 362

From these facts, we may make the following deductions: (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:'Ĺo:r] (55b) and [to:'riŃ] (57d), we may say simply 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.[19]

But there is a difference between [əL]-type syllables and syllables with a long vowel: [əL]-type syllables attract stress only before a pause (60a), but not in the middle of a breath-group (60 b–d).

(60) Stress alternation in [əL]-type syllables

	a.	ka'pəL ‖	'horse'	#165
	b.	ḱa'No: ḿe 'kapəL ə'ma:rəx	'I'll buy a horse tomorrow'	#165
	c.	śiń 'kapəL 'd́as	'that's a nice horse'	#168
	d.	ən 'kapəL śo	'this horse'	#179

Syllables with long vowels attract stress even in mid-sentence (cf. [ḱa'No:] 'will buy' in (60b)). I have no explanation for why [əL]-type syllables are heavy before a pause but light in mid-phrase, while syllables with long vowels are always heavy. It is as if fortis

[19] [ax] receives no special prominence in East Mayo: ['b́aNəxt] 'blessing' (#926).

sonorants may be linked to a mora only if that mora occurs finally in the phonological phrase.

(61)
$$\begin{array}{c}\mu \;\;]_{PhonP} \\ | \\ \begin{pmatrix}+son\\+tns\end{pmatrix}\end{array} \qquad\qquad * \begin{array}{c}\mu \;\; \mu_1 \;]_{PhonP} \\ | \\ \begin{pmatrix}+son\\+tns\end{pmatrix}\end{array}$$

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.

It is not unprecedented in 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.

(62) Vowel length alternation in Connacht and Munster

	a.	ǵĺa:n (Connacht), ǵĺaun (Munster)	'valley'
	b.	ǵĺanə (both)	'valley' (gen.)

This pattern contrasts with forms like those in (63), with long vowels throughout, and those in (64), with short vowels throughout.

(63) V: only

	a.	ba:n	'white'
	b.	ba:nə	'white' (pl.)

(64) V only

	a.	glan	'clean'
	b.	glanə	'clean' (pl.)

As it happens, the forms that show the alternation historically had a fortis sonorant, and still do in Ulster and East Mayo ([ǵĺaN] 'valley'). Ní Chiosáin's analysis of the alternation is that in forms like Connacht [ǵĺa: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.

(65) Moraic consonants (after Ní Chiosáin 1991)

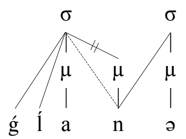
μ μ

ǵ ĺ a n

ǵĺa:n 'valley'

In onset position, e.g. in [ǵĺanə] (62b), where there is no lengthening of the preceding vowel, Ní Chiosáin (1991, 203) says degemination causes the mora to be removed.

(66) Moraic consonants in intervocalic position



ǵĺanə ‘valley’ (gen.)

The intervocalic consonant is thus ambisyllabic, which Ní Chiosáin holds is generally true after short vowels in Irish.

In Ulster and East Mayo [ǵĺaN], there is no delinking and reassociation; rather, the [N] stays moraic.

Fortis sonorants in the codas of noninitial syllables (e.g. in EMI ['kapəL] ‘horse’) are apparently still moraic only in East Mayo, and then only in pause. There is no syllable lengthening in Connacht and Munster ['kapəl], and in Ulster (where the form is ['kapəL]) noninitial heavy syllables are always lightened, as we saw above in § 3.1.

We may conclude, therefore, that 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.

3.2.3 Manx

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

(67) (ˈL H) to (ˈL L) in Manx (examples from Broderick 1984 and 1986, 148)

	Middle Irish	Manx	Gloss
a.	ˈb́ega:n	ˈbegan	‘a little’
b.	ˈmuńe:l	ˈmonal	‘neck’
c.	ˈtoNo:g	ˈtonag	‘duck’
d.	ˈfuŃo:g	ˈuńag	‘window’
e.	ˈǵenəwəĺ > ˈǵenu:ĺ	ˈǵenal	‘happy’

But other cases of noninitial stressed vowels show forward stress, like Munster and East Mayo Irish. We find forward stress in old (H! H) words (68), Anglo-Norman (L H!) and (H! H) loanwords (69), and in words with vocalization a voiced fricative (the only examples I can find are of *w* < v) after a consonant (70). 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).

(68) Forward stress in old (ˈH H) words

	Middle Irish	Manx	Gloss
a.	ˈa:RŃe:n	aˈne:n	‘work done at night’
b.	ˈbo:ka:n	boˈge:dn	‘brownie’ (in folklore)
c.	ˈklɯ:xlo:γ	kaˈxle:	‘changing’
d.	ˈkuara:n	kəˈre:n	‘sandal’
e.	ˈfa:ga:ĺ	feˈge:ĺ	‘leaving’
f .	ˈf′e:so:g	feˈze:g	‘beard’

(69) Forward stress in Anglo-Norman words

	Middle Irish	Manx	Gloss
a.	boˈd́e:l	boˈde:ĺ	‘bottle’
b.	ka:ˈba:n	kaˈbe:dn	‘cabin’
c.	koRˈŃe:l	kəˈńe:ĺ	‘corner’
d.	daŃˈśe:r	danˈd́e:r	‘danger’
e.	ṕŕi:ˈsu:n	priˈzu:dn	‘prison’
f.	śeŕˈv́i:ś	śəˈve:ś	‘service’

(70) Forward stress in *Cw* clusters

	Middle Irish	Manx	Gloss
a.	ˈanwaN	aˈnu:n	‘weak’
b.	ˈd́arwad	d́aˈru:d	‘forgetting’
c.	ˈtalwiń	taˈlu:d́ń	‘land’ (gen.)

The development of the Manx stress pattern can be explained as follows. At an early date, Manx promoted TROQ so it dominated MAX(μ) (once again showing a phonological change to a PHONO ≫ FAITH ranking). As shown in the tableau in (71), this had the effect of shortening the long vowel in ['bega:n] (71a); but there was no effect on (H H) words like ['bo:ka:n] (71b), because they did not violate TROQ.

(71) Manx Stage 1: Primary lexicon

		Candidates	TROQ	ALL-FT-L	MAX(μ)	WSP
a.	/bega:n/	(ˈ.be.ga:n.)	* !			*
		.be.(ˈga:n.)		σ !		
		☞ (ˈ.be.gan.)			*	
b.	/bo:ka:n/	☞ (ˈ.bo:.)ka:n.				*
		(ˈ.bo:.)kan.			* !	
		.bo:.(ˈka:n.)		σ !		*

Loanwords like [boˈd́e:l] and [pri:ˈsu:n] belonged to an Anglo-Norman sublexicon in which ALL-FT-R (36) rather than ALL-FT-L was competitive.

(72) Manx Stage 1: Anglo-Norman sublexicon

		Candidates	TROQ	ALL-FT-R	MAX(μ)	WSP
a.	/bod́e:l/	('.bo.d́e:l.)	* !			*
		('.bo.d́el.)			* !	
		☞ .bo.('d́e:l.)				
b.	/pri:su:n/	('.pri:.)su:n.		σ !		*
		('.pri:.)sun.		σ !	*	
		.pri.('su:n.)			* !	
		☞ .pri:.('su:n.)				*

Later, as happened in Gaelic, old ('L H) words like ['b́egan] 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 [bo'd́e:l]. At this point, the *Cw* clusters of (70) above received an epenthetic [ə], and later, the sequence [əwə] contracted to [u:].

(73) C[w]V > C[əwə] > C[u:]
'd́arwad > 'd́arəwəd > 'd́aru:d ‘forgetting’ (68b)

The new (L H) words like ['d́aru:d] took over the forward stress of the Anglo-Norman words, becoming [d́a'ru:d] and the like. Also, the native (H H) words like ['bo:ka:n] took over the Anglo-Norman stress pattern, becoming [bo:'ka:n]. In OT terms, the pattern of having some words ([bo'de:l], [pri:'su:n]) use ALL-FT-R and other words (['d́aru:d], ['bo:ka:n]) use ALL-FT-L was simplified, perhaps gradually, until all words used ALL-FT-R [bo'de:l], [pri:'su:n], [d́a'ru:d], [bo:'ka:n]). There was no effect on [began]-type words, since they were now (L L), but forward stress was established in the other types. Anglo-Norman words were no longer lexical exceptions, but behaved like native words. In addition, WSP came to dominate MAX(μ), so that unstressed long vowels surfaced as short. The tableaux in (74)–(76) illustrate the new situation, which is what held in Manx at the time of its extinction in the early 1970s.

To begin with, words like [began], although (L H) in Middle Irish, were now (L L), and so had initial stress, since the language was trochaic.

(74)

/began/	FTFORM	ALL-FT-R	WSP	MAX(μ)
☞ ('.be.gan.)				
(.be.'gan.)	* !			

Both native and Anglo-Norman (H H) words surfaced as (L 'H) because of ALL-FT-R and because of the ranking of WSP above MAX(μ).

(75) Manx Stage 2: WSP ≫ MAX(μ)

		Candidates	ALL-FT-R	WSP	MAX(μ)
a.	/bo:ka:n/	('.bo:.)ka:n.	σ !	*	
		('.bo:.)kan.	σ !		*
		.bo:.('ka:n.)		* !	
		☞ .bo.('ka:n.)			*
b.	/pri:su:n/	('.pri:.)su:n.	σ !	*	
		('.pri:.)sun.	σ !		*
		.pri:.('su:n.)		* !	
		☞ .pri.('su:n.)			*

Both native (L H) words (the ones in (73) resulting from C[w]V > C[əwə] > C[u:]) and Anglo-Norman (L H) words had final stress, because of WSP and MAX(μ).

(76)

		Candidates	ALL-FT-R	WSP	MAX(μ)
a.	/d́aru:d/	☞ .d́a.('ru:d.)			
		('.d́a.ru:d.)		* !	
		('.d́a.rud.)			* !
b.	/bode:l/	☞ .bo.('de:l.)			
		('.bo.de:l.)		* !	
		('.bo.del.)			* !

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 [bo'ge:dn] from [bo'ka:n] and [pri'zu:dn] from [pri'su:n]. As these changes are not in the realm of prosodic structure, I shall not deal with them here.

3.3 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, East Mayo, and Manx takes place in Connacht, and words like ['il̃a:n] ‘island’ (Ó Máille 1974, 151) continue to violate the WSP. Thus we can propose that in Connacht, as in EMI (cf. (18) above), both MAX(μ) and ALL-FT-L outrank the WSP.

(77)

/Il̃a:n/	ALL-FT-L	MAX(μ)	WSP
☞ ('.i.l̃a:n.)			*
('.i.l̃an.)		* !	
.i('.l̃a:n.)	σ !		

Connacht is thus the only modern Goidelic dialect in which WSP is low-ranking. Some researchers, however, 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).

(78) a > I / _ C_0 a:

	EMI	Modern Connacht	Gloss
a.	ˈkaba:śt́ə	ˈguba:śt́ə	‘cabbage’
b.	ˈana:ĺ	ˈuna:ĺ	‘breath’
c.	ˈskada:n	ˈskuda:n	‘herring’
d.	ˈb́aRa:n	ˈb́ira:n	‘nuisance’
e.	ˈĹada:n	ˈĹida:n	‘bur of a teasel’

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 [gəˈba:śt́ə], [əˈna:ĺ], [skəˈda:n], [b́əˈra:n], [Ĺəˈda:n]). Under this analysis, Connacht followed the vocalism of Munster, but retained initial stress, hence [ˈgəba:śt́ə], 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 [ˈana:ĺ] > [ˈuna:ĺ]. Hence, the forms in (78) cannot be used to support the hypothesis of one-time forward stress in Connacht.

The second bit evidence for forward stress in Connacht comes from forms like [ˈkla:śt́ə] ‘college’, which appears to be in free variation with [ˈkola:śt́ə]. Ó Siadhail explains this as having gone through a stress shift ([ˈkola:śt́ə] > [kəˈla:śt́ə]) and subsequent deletion of the pretonic vowel ([kəˈla:śt́ə] > [ˈkla:śt́ə]). This does not happen in words with consonants that would make illicit onsets: [ˈskuda:n], *[skda:n] ‘herring’ (78c).

But the fact that both variants [ˈkola:śt́ə] and [ˈkla:śt́ə] have initial stress shows that ALL-FT-L remains high-ranking in Connacht. The constraint relevant for the difference between the two forms is DEP(segment), which prohibits removal of a segment from the input. In [ˈkola:śt́ə], DEP(segment) outranks WSP, so that no sound may be removed in order to achieve stress on a heavy syllable. In [ˈkla:śt́ə] the ranking is WSP ≫ DEP(segment), so that a heavy syllable may move to the left edge of the word and be stressed.

(79)

/kEla:śt́a/	ALL-FT-L	DEP(seg)	WSP
☞ (ˈ.ko.la:ś.)t́ə.			*
.kə.(ˈla:ś.)t́ə.	σ !		
(ˈ.kla:ś.)t́ə.		* !	

(80)

/kEla:śt́a/	ALL-FT-L	WSP	DEP(seg)
(ˈ.ko.la:ś.)t́ə.		* !	
.kə.(ˈla:ś.)t́ə.	σ !		
☞ (ˈ.kla:ś.)t́ə.			*

Once again, free variation is best not explained by leaving the two constraints unranked, as that would leave open the possibility of a low-ranked constraint deciding between the

two candidates.

Presumably in words like [ˈskuda:n] a higher ranking constraint on acceptable onset sequences (call it ONSSON) blocked *[ˈskda:n].

(81)

/skIda:n/	ONSSON	ALL-FT-L	WSP	DEP(seg)
☞ (ˈ.sku.da:n.)			*	
.skə(ˈ.da:n.)		σ !		
(ˈ.skda: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.

4. Conclusions

Kager (1992) observes the avoidance of (L H) trochees in many languages and defines the following reparation strategies: SKIPPING (i.e. (L ˈH) rather than (ˈL 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 (ˈL H) becomes (ˈL 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.

We have seen that most of the historical changes in prosodic structure may be attributed to the various rerankings of three constraints: WSP, ALL-FT-L, and MAX(μ). In Proto-Insular Celtic, MAX(μ) was ranked below the others.

(82) Proto-Insular Celtic WSP ≫ MAX(μ) cf. (15)
ALL-FT-L ≫ MAX(μ)

In Old Irish, MAX(μ) had been promoted above WSP, allowing unstressed long vowels.

(83) Old Irish MAX(μ) ≫ WSP cf. (18)
ALL-FT-L ≫ WSP

In Modern Irish, the various dialects diverged in their rankings of these constraints. Ulster and Gaelic reverted to the Proto-Insular Celtic ranking.

(84) Ulster, Gaelic WSP ≫ MAX(μ) cf. (27)
ALL-FT-L ≫ MAX(μ)

In Munster and East Mayo, ALL-FT-L was demoted below the other two constraints, resulting in noninitial stress in words with noninitial heavy syllables.

(85)	Munster, East Mayo	WSP, MAX(μ) ≫ ALL-FT-L	cf. (42), (56)

In early Manx, the first change was that 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. Later in Manx, ALL-FT-R was used in all words, and WSP dominated MAX(μ). This resulted in noninitial stress in words with noninitial heavy syllables, and the shortening of unstressed long vowels.

(86)	Manx (early)	ALL-FT-L ≫ MAX(μ) ≫ WSP (native)	cf. (71)
		ALL-FT-R ≫ MAX(μ) ≫ WSP (Ang.-N.)	cf. (72)
	Manx (late)	WSP ≫ MAX(μ)	cf. (74)–(76)
		ALL-FT-L ≫ MAX(μ)	

In Connacht, the Old Irish ranking remained.

(87)	Connacht	MAX(μ) ≫ WSP	cf. (77)
		ALL-FT-L ≫ WSP	

Just as historical change can be attributed to constraint re-ranking, we have seen that free variation within a dialect ([t́i:f´ə ~ t́if´ə] in Ulster; ['kola:śt́ə ~ 'kla:śt́ə] in Connacht) can be attributed to alternate constraint rankings. Free variation is best not explained as due to nonranking of two relevant constraints, as OT predicts that a low-ranked constraint would always pick one to the exclusion of the other.

In addition, we have seen how Grouping Harmony's prediction that (L L) is a better trochee than (H L) is borne out in the Ulster shortening of stressed long vowels before light syllables. Over time, the child grammar's PHONO ≫ FAITH ranking can become institutionalized in a speech community, resulting a phonological change. If the old output is no longer retrievable, a new input form is made. If as a result the old ranking is inaccessible for a time, new forms (due to either sound change or borrowing) may be subjected to a new constraint ranking. This would seem to be the nature of historical phonology when viewed from a constraint-based point of view.

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