To appear in: H. Kardela and B. Szymanek `Festschrift for Prof. E. Gussmann from his friends and colleagues', Lublin: KUL.

2+2=3

Stress in Munster Irish*

Grażyna Rowicka
Leiden University / HIL
Dept. of Linguistics
e-mail: Rowicka@rullet.LeidenUniv.nl

Unlike the other dialects of Modern Irish, Munster Irish1 has developed a complex quantity-sensitive stress system. In this paper I will argue that many intricacies of the system can be untangled when assuming a *trimoraic foot* as the basic foot type of Munster Irish. Foot trimoraicity results from its double-branching. I will propose an analysis within the framework of Optimality Theory developed by Prince and Smolensky (1993) (henceforth: PS) and McCarthy and Prince (1993a, b) (henceforth: MPa and MPb), which affords new insights into the foot structure of Munster Irish.

The paper is organised as follows. First I present the basic facts concerning the stress system of Munster Irish (§ 1.1) and introduce the theoretical approach applied in this study (§ 1.2). In § 2 I develop the analysis. I begin in § 2.1 with some evidence in favour of a trimoraic foot in Munster Irish. In § 2.2 the structure of a doubly-branching foot is discussed. § 2.3 presents an OT analysis of the foot structure and main stress assignment in Munster Irish. § 2.4 I point out some predictions which follow from the analysis proposed in this paper and adduce some more evidence in its favour. § 3 sums up the findings of the previous sections.

---

* An earlier version of this paper has been written for a 1994 HIL course on stress in Optimality Theory, independently of the article by Gussmann (1994). I consider it a remarkable coincidence that, despite the different theoretical frameworks adopted, the analyses proposed in both studies share a number of affinities. The present paper does not aspire to cover the stress facts of Munster Irish in such an exhaustive way as Gussmann's, but rather concentrates on the insights and predictions offered by the framework of Optimality Theory.

1 Munster is the southernmost province of Ireland.

1. Introduction

1.1 The stress facts of Munster Irish

Stress assignment in Munster Irish is generally insensitive to the morphological complexity of words, i.e. it treats underived and derived words (including compounds) on a par (see Ó Siadhail 1989). Only syllables containing a long vowel or a diphthong count as heavy. Consonants in the coda do not contribute to syllable weight.2 Moreover, vowels resulting from epenthesis between a sonorant and a non-homorganic consonant generally behave the same as underlying ones (see Ó Siadhail 1989). The patterns of primary and secondary stress are given below and illustrated with examples.3

(1) Words of two syllables:

a)	**L**l	solas	[sól∂s]	`light'
b)	l**H**	garsún	[garsú:n]	`boy'
c)	**H**l	cúram	[kú:r∂m]	`care'
d)	h**H**	díomhaoin	[dʲi:ví:nʲ]	`idle'

2 Complications such as the apparent influence of /ax/ sequences on stress will not be considered in this paper. Doherty (1991) observes that syllables containing /ax/ may attract stress, but only in the second position of the word. He suggests that this bizarre behaviour is related to the high sonority of the vowel /a/. Moreover, certain affixes are said to violate the predicted patterns by attracting stress and some others by avoiding stress. Gussmann (1994) points out that these deviations involve only a handful of examples which may be treated as lexical exceptions.

3 Examples in this paper are taken from Breatnach (1947), Ó Cuív (1944) and (1947), mostly after Doherty (1991), largely preserving the original orthography and transcription. (1o) and (6a,b) are due to Gussmann 1994). Note that in Irish orthography accent marks represent underlying long vowels, whereas in phonetic transcription they mark stress. Unlike in the original, transcriptions in this paper include the (default) initial primary stress as well as the secondary stress assigned according to the description given in Ó Cuív (1944:67). Non-initial secondary stress is said to be optional (see Ó Cuív 1944 and Ó Sé 1989).

Words of three syllables:

e)	**L**ll	anagal	[án∂g∂l]	`corrupt matter'
f)	L**H**	moltachán	[mòlh∂xU̇ːn]	`wether'
g)	l**H**l	frithálamh	[frʲihU̇ːl∂v]	`entertain'
h)	l**H**h	cruinniúcháin	[kriŋú:xá:nʲ]	`(political) meetings'
i)	**H**ll	tiodhlacadh	[tʲ'∂il∂k∂]	`gift'
j)	**H**lH	ughdardhás	[ú:d∂r`á:s]	`authority'
k)	h**H**l	réasúnta	[re:sú:nt∂]	`reasonable'
l)	h**H**h	máirnéulaíocht	[má:rnʲé:li:xt]	`navigation'

Words of four syllables:

m)	**L**lll	anamacha	[án∂m∂x∂]	`souls'
n)	**L**llH	patalachán	[p'U̇al∂x`á:n]	`plump creature'
o)	Hl**H**l	fógrófar	[fò:g∂ró:f∂r]	`will be announced'

where l - light syllable
L - light syllable with secondary stress
L - light syllable with primary stress
h - heavy syllable
H - heavy syllable with secondary stress
H - heavy syllable with primary stress
[á] - vowel with primary stress
[à] - vowel with secondary stress

On the basis of disyllabic words it can be concluded that heavy syllables attract stress (cf. (1)b and (c)). Stress is initial in words of light syllables only, but non-initial in words of heavy syllables only. These generalisations are also true with respect to longer words. The stress on the initial light syllable instead of the heavy one in `lllh' words (cf. (1)n) may suggest that stress assignment is restricted to the first three syllables.

Different stress placement in words containing light and heavy syllables suggests that the system is weight-sensitive. Initial stress in sequences of light syllables points to left-headed, i.e. trochaic, foot structure. However, Munster Irish stress does not yield to a straightforward analysis in terms of

bimoraic trochees and the initial End Rule (Prince 1983), which would predict incorrectly initial stress in (1)d, (f), (k) and (l). To account for these patterns, Doherty (1991) has suggested word-initial foot extrametricality on the condition that the extrametrical foot is *directly* followed by another foot. The condition on extrametricality protects initial stress in the words in (1)j and (n) parsed as (h)l(h) and (ll)l(h). However, the analysis runs into another problem: initial stress in (1)i and (m) can only be derived without extrametricality. Doherty's way out is to postulate that extrametricality is inapplicable because these words contain only one foot each: (h)ll and (ll)ll. Light syllables in non-initial position within the word are not parsed into feet.

To sum up, an analysis of Munster Irish stress in terms of bimoraic trochees necessitates such ad hoc mechanisms as foot extrametricality conditioned by strict foot adjacency and a ban on footifying light syllables non-initially within the word.4 Still, it predicts incorrectly initial stress in (1)o, whose pattern has been left out of Doherty's (1991) study.

In this paper I will propose an alternative account of the Munster Irish stress facts within the framework of Optimality Theory, an account which does not necessitate language-specific theoretical innovations. It makes appeal to general prosodic well-formedness conditions whose role in other languages has been well-documented in the OT literature. Two new constraints are proposed which, however, are analogical to those which have already been well-established. The basic tenets of the framework are presented below.

1.2 The framework

The framework adopted in this paper is that of Optimality Theory, as presented in PS and MPa and MPb. This approach focuses on well-formedness conditions governing the output of the phonological component (and the grammar in general), rather than on rules modifying its input. What differentiates it from other frameworks developed in this spirit is the view that well-formedness constraints do not have to be surface-true. The selected outputs of the phonological component may violate some constraints, provided that they are still `optimal'. Optimality involves best satisfaction of a *hierarchy* of constraints which may sometimes be in conflict.

4 Doherty (1991) also considers and rejects an alternative account in terms of iambic feet.

The set of possible well-formedness constraints is part of Universal Grammar, which also contains the functions Gen(erate) and Eval(uate). The former generates a large set of candidate outputs for each given input which are then evaluated by the function Eval with respect to the system of well-formedness constraints. Any two possible outputs are compared and such evaluation defines the degree of relative success of each candidate with respect to the others. Constraints are hierarchically arranged. Low-ranked ones can be violated in an optimal output in order to satisfy higher-ranked ones, but not vice versa. Individual grammars are constructed by imposing a language-specific ranking on the universally given set of possible well-formedness constraints. Constraints may also differ cross-linguistically in the setting of certain parameters.

The fundamentals of Optimality Theory are thus the following (after MPa):

(2) 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 candidate analyses, which are evaluated by the constraint hierarchy, are admitted by very general considerations of structural well-formedness; there are no specific rules or repair strategies with specific structural descriptions or structural changes or with connections to specific constraints.

d. Parallelism

Best-satisfaction of the constraint hierarchy is computed over the whole hierarchy and the whole candidate set.

The analysis presented in this paper crucially hinges on these aspects of Optimality Theory. The notation used in the constraint tableaux evaluating various candidate outputs is explained in the appendix to this paper.

2. Analysis

2.1 Ternary feet in Munster Irish

Previous analyses of Munster Irish have generally taken initial stress to be default. However, this conclusion seems controversial if words with sequences of equally stressable elements, namely heavy syllables, are considered. Their behaviour suggests that primary stress is preferably non-initial and, if also possible, non-final (cf. (1)h, (k) and (l)). Primary stress is found word-initially only in cases where the word begins with a heavy syllable followed by a light one (cf. (1)i, (j), or with three light syllables (cf. (1)e, (m) and (n). The sequences of `hl' and `lll' apparently have some stress-attracting properties.

Compare the stress patterns given in (1)n and (f) above and repeated below as (3)a and (b).

(3)	a)	**L**llH	patalachán	[pʊ̈al∂x`á:n]	
`plump creature'					
	b)	Ll**H**	moltachán	[mòlh∂xʊ̈:n]	`wether'

In both cases the initial light syllable and the heavy syllable bear prominence, which indicates that they are heads of feet. However, in (3)a primary stress falls on the first foot of the word while in (b) it falls on the second. Given a bimoraic trochee as the foot type, as assumed by Doherty (1991), both words contain two identical feet (ll) and (h), with the third light syllable in (3)a left unparsed. The difference in primary stress assignment remains a puzzle.

On the other hand, if a *trimoraic* trochee is adopted as the basic foot type in Munster Irish, the word in (3)a consists of a trimoraic foot followed by a bimoraic one: (lll)(h). The stress-attracting property of the first foot is its trimoraicity, as opposed to the bimoraicity of the second foot. The same holds for `hl' sequences footified into trimoraic trochees. Furthermore, if a word contains more than one trimoraic foot, e.g. (hl)(hl) (cf. (1)o), the non-initial foot receives primary stress. Under such an analysis, primary stress assignment in Munster Irish can be described in terms of the following algorithm:

→ Create trimoraic or, if not possible, bimoraic feet within the word;
→ Put main stress on a trimoraic foot, if possible;
→ Stress a non-initial foot, if possible;
→ If possible, stress a non-final foot of the word.

Given such an algorithm words given in (1) above have the prosodic structure shown in the respective right-hand columns below. Syllables predicted to bear primary stress are underlined.

(4)	a)	**L**l	(l̲l)	i)	**H**ll	(h̲l)l
	b)	l**H**	l(h̲)	j)	**H**lH	(h̲l)(h)
	c)	**H**l	(h̲l)	k)	h**H**l	(h)(h̲l)
	d)	h**H**	(h)(h̲)	l)	h**H**h	(h)(h̲)(h)
	e)	**L**ll	(l̲ll)	m)	**L**lll	(l̲ll)l
	f)	Ll**H**	(ll)(h̲)	n)	**L**llH	(l̲ll)(h)
	g)	l**H**l	l(h̲l)	o)	Hl**H**l	(hl)(h̲l)
	h)	l**H**h	l(h̲)(h)			

As can be seen, the predicted location of primary stress corresponds in all cases to the actual stress placement. Moreover, the heads (i.e. the left-most syllables) of other feet coincide with the location of secondary stress, except for those cases (with heavy syllable sequences) where a stress clash would result.

Thus, an analysis adopting a trimoraic trochee as the basic foot type in Munster Irish accounts correctly for all the facts presented in (1). It also makes further predictions with respect to the location of main stress. It anticipates that a trimoraic foot will be stressed, no matter whether it is within or outside the `three syllable window' postulated in the literature. Consider some hypothetical sequences of light and heavy syllables given in the left-hand column below. The present account predicts for them the foot structure and main stress location given in the middle column. For comparison, the foot structure and stress pattern predicted by Doherty's (1991) analysis are given in the right-hand column:

(5)		present analysis	Doherty's analysis
a.	llhhl	(ll)(h)(<u>h</u>l)	(ll)(<u>h</u>)(h)l
b.	lllhl	(lll)(<u>h</u>l)	(<u>l</u>l)l(h)l
c.	hhhhl	(h)(h)(h)(<u>h</u>l)	(h)(<u>h</u>)(h)(h)l

As can be seen above, the predictions following from the present analysis and that of Doherty's differ crucially.

Words with the relevant structure are missing from the data considered in most studies of Munster Irish stress. In this respect Gussmann (1994) constitutes a noteworthy exception. Consider some examples which he brings to light (following the source, secondary stress is not marked):

(6)					
a.	llh**H**l	imigéiniúla	[imige:nʲú:lə]	`distant-NOM-PL'
b.	lll**H**l	eadargála	[ádərgʊ̈:lə]	`mediation-GEN-SG'

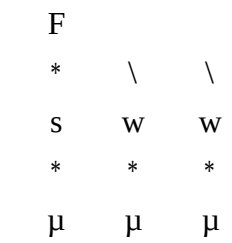
The words above are of the structure considered in (5)a and (b) above. It is immediately clear that they confirm the predictions of the present analysis and not that of Doherty's.

2.2 A doubly-branching foot

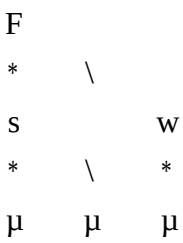
A foot dominating three moras may be viewed as having flat structure, with one strong branch and two weak ones. However, it has also been proposed in the literature (see Dresher and Lahiri 1991, and Rice 1992) that foot ternarity may result from its double-branchingness. A foot of this type dominates two branches, one strong and one weak, of which the strong branch itself also dominates two elements. The two structural possibilities are represented below:

(7) *Trimoraic feet*

a. flat



b. doubly-branching



where `μ' - mora

In what follows I will argue for a doubly-branching structure for trimoraic feet in Munster Irish.

2.3 An OT account

2.3.1 Foot structure

Within OT the foot structure of a language follows from the language-specific way in which universal constraints on foot well-formedness are ranked. Left-headedness within the foot is required by RHTYPE = TROCHEE (PS). This constraint does not itself demand branching within the foot, but only rules out right-headed feet. Branchingness is due to another constraint, well-documented cross-linguistically (see, e.g. Prince 1980, McCarthy and Prince 1986, Kager 1989, Hayes 1991 as well as PS). In the OT literature the following formulation of FOOT BINARITY has been adopted:

(8) *FTBIN*

Feet must be binary under syllabic or moraic analysis.

Crucially, this constraint requires *branching of the foot node itself* 5, and not anywhere within the foot. RHTYPE and FTBIN together will favour binary left-headed feet over other foot types.

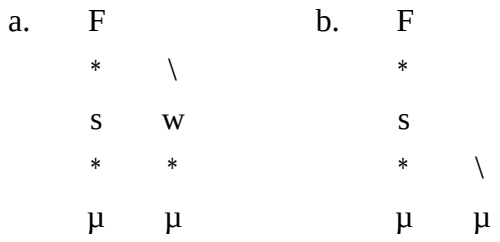
To derive *ternary* feet, another constraint must occupy a high position in the hierarchy, which will demand branching within the *head* of the foot. It can be formulated as follows:

(9) *HEADBIN* (cf. *HeadBranch* in van der Hulst 1994)6
The head of the foot must be branching.

In order to satisfy both FTBIN and HEADBIN feet have to be doubly-brancing: at the level of the foot head and at the level of the foot node itself. This results in ternary foot structure.

FTBIN and HEADBIN may sometimes be in conflict. If there are only two moras available, they can either be parsed as a branching foot with a non-branching head, or as a non-branching foot with a branching head. Both parsing are represented in (10)a and (b), respectively:

(10)



The tableau in (11) below evaluates both parsings with respect to the two relevant constraints. As shown in the tableau, a different candidate parsing will be selected depending on the relative ranking of HEADBIN and FTBIN. The ranking FTBIN >> HEADBIN will favour the parsing represented in

5 To be precise, FTBIN in this formulation rules out not only degenerate feet, but also unbounded feet and ternary feet with flat structure as represented in (7)a above. I will not address here the issue of whether this is desirable in all cases, or whether a more general formulation should instead be adopted. See, e.g. van der Hulst (1994) where branching is demanded, rather than specifically binarity. Moreover, in Rowicka (1994) I argue for two separate FTBIN constraints which require binarity at the syllabic and the moraic level of analysis. However, for the purposes of the present analysis this division is insignificant.

6 According to OT, where *all* constraints are assumed to be present in *all* languages, HEADBIN is also supposed to be present in the constraint hierarchies of languages which do not allow for ternary feet. As argued by van der Hulst (1994), in such languages HEADBIN is ranked below (and hence `disactivated' by) NOLAPSE which rules out sequences of two unaccented syllables/moras. Hung (1993) postulates another constraint, RHYTHM, which can have the same effect if ranked above HEADBIN. There is independent motivation for a constraint of the type NOLAPSE or RHYTHM.

(10)a, while HEADBIN >> FTBIN will favour that in (10)b. In the tableau below the relevant constraints are not ranked and the winning candidate is not indicated. The actual ranking in Munster Irish will be established below.

(11) *Evaluation tableau for bimoraic feet*

Candidates	HEADBIN	FTBIN
F s w μ μ	*	
F s μ μ		*

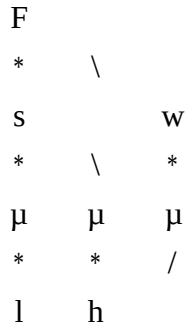
Consider now another constraint which governs parsing into feet. In all the parsings in (4) syllable integrity is respected: moras of heavy syllables are never parsed into different feet in order to achieve the optimal ternary foot structure. For instance, in terms of the number of moras the sequence `hhl' in (4)k is identical to `hlh' in (4)j and can be parsed analogically, with the two moras of the second heavy syllable split up between two feet: (hμ)(μl). However, such a candidate output must bear primary stress on the first heavy syllable since this is the head of a trimoraic foot, while in the selected output stress falls on (the first mora of) the second heavy syllable. The principle which rules out parsings such as (hμ)(μl) can be formulated as the following constraint:

(12) *SYLLABLE INTEGRITY*
Moras of a syllable cannot be divided between different metrical constituents.

SYLINT is never violated in Munster Irish in that moras of a heavy syllable are never split up between two feet.

The head and the dependent branch within one foot can also be regarded as `different metrical constituents'. If this interpretation is taken into account, the constraint also disallows dividing tautosyllabic moras between the strong and the weak branch of the same foot. Evidence that SYLINT in this sense is also respected in Munster Irish can be found in the behaviour of `lh' sequences (cf. (1)b, (g) and (h) above). Such a trimoraic sequence could itself constitute a ternary foot, with the head dominating the light syllable and the first mora of the heavy syllable, as shown below:

(13)



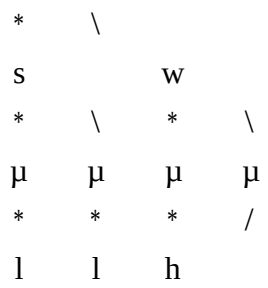
The foot represented above should bear stress on its first mora, i.e. on the light syllable. However, the primary stress on the heavy syllable in (1)b, (g) and (h) shows that parsings such as that in (13) are never selected. Heavy syllables are always included *as a whole* into the foot head, even at the cost of leaving a preceding light syllable unparsed. I conclude that SYLINT in either interpretation is inviolable in Munster Irish.

Given the high ranking of SYLINT, heavy syllables will preferably be parsed into branching heads of non-branching feet (cf. (10)b), irrespective of the ordering between FTBIN and HEADBIN. Evidence for the relative ordering of the latter two constraints can, however, be found in the parsing of light syllable sequences, where SYLINT is redundant. As observed above, if FTBIN dominates HEADBIN, two light syllables will be parsed as in (10)a, i.e. differently from two moras of a single heavy syllable. In a language with such a constraint ordering a sequence `ll' will form a *branching* foot (with a non-branching head), while a heavy syllable will form (the branching head of) a *non-branching* foot, due to SYLINT. One can expect that, given the structural distinction between `ll' feet and `h' feet, the two kinds of feet may behave differently, for instance, in primary stress assignment, since the `h' foot type is in a way degenerate. No such difference is evident in Munster Irish. For instance, `(ll)(h)' words have the same stress pattern as `(h)(h)' words (cf. (4)f and (d). I conclude that in Munster Irish `ll'

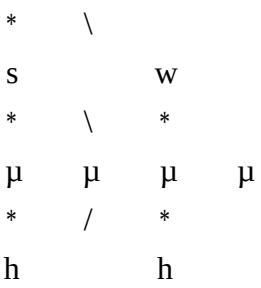
sequences and heavy sylables are parsed the same, namely, as represented in (10)b. Such parsings are selected due to the domination of HEADBIN over FTBIN.

The behaviour of `llh' and `hh' sequences provides evidence for the high ranking of another constraint on foot structure. Such sequences can be parsed as single feet where both the head and the dependent are branching, to the satisfaction of both HEADBIN and FTBIN:

(14) a.



b.



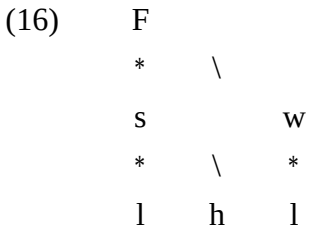
Feet like this, however, should bear stress on their first syllable, which prediction is counterevidenced by the data in (1)f and (d). Apparently, in Munster Irish heavy syllables are never included in the foot as the weak branch. As observed by Hayes (1980), in weight-sensitive systems heavy syllables are usually prohibited from occupying weak metrical positions. PS adopt the following formulation of this principle (cf. also Prince 1990):

(15) *Weight-to-Stress Principle* (WSP)
Heavy syllables are prominent in foot structure and on the grid.

Apart from the dependent foot branch, a ternary foot contains one more weak metrical position, namely the right branch of the foot head. If heavy syllables are allowed in this position, the sequence `lhl' is parsed as a single foot:7

7 Dresher and Lahiri (1991) argue for such feet in Germanic.

(16)



The above structure satisfies both HEADBIN and FTBIN, but it violates WSP since a heavy syllable occupies a weak metrical position. In such a foot stress is predicted to fall on the foot head, i.e. on the first light syllable. However, `lhl' words in Munster Irish are stressed on the heavy syllable instead (see (1)g above). The selected parsing for `lhl' words is not that given in (16). I conclude that in Munster Irish heavy syllables are never parsed in any weak position within the foot, which indicates that WSP is inviolable.

To sum up, the discussion carried out in this section has pointed out the relevance of the following well-formedness constraints for foot structure assignment in Munster Irish:

(17) *Constraint hierarchy governing foot structure in Munster Irish*
RHTYPE = T, SYLINT, WSP, HEADBIN >> FTBIN.

These constraints guarantee that feet in Munster Irish are left-headed and have a branching head. Foot structure respects syllable integrity. Weak positions within the foot may only dominate one mora. Branching feet are preferred to non-branching ones.

In the following section I will concentrate on the constraints responsible for main stress assignment in Munster Irish.

2.3.2 Main stress assignment

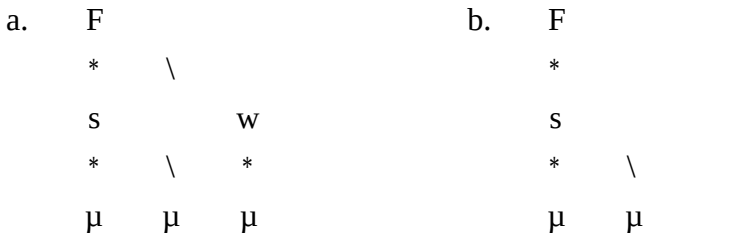
In Munster Irish trimoraic feet attract stress stronger than bimoraic feet. This preference for locating the prominence peak of the word on the foot dominating the greatest number of moras might be attributed to the constraint PEAK-PROMINENCE (PS, after McCarthy and Prince 1986):

(18) *PEAK-PROMINENCE*
Peak (x) ≻ Peak (y) if *x* > *y*

By this constraint, the element *x* is a better peak than *y* if the *intrinsic prominence* of *x* is greater than that of *y*. Greater intrinsic prominence may denote greater metrical weight, as in the analysis of a Hindi dialect that PS present. I suggest, however, that reference to intrinsic prominence may be more suitable in the case of indisputably prominence-driven stress systems analysed in terms of `unbounded' feet. A more straightforward account can be proposed for the stress system of Munster Irish.

Recall that, given the domination of HEADBIN over FTBIN, trimoraic feet are the only ones which branch. Bimoraic feet, on the other hand, have binary heads, but do not branch themselves. Compare the structures below:

(19)



a trimoraic foot a bimoraic foot

I propose to express the preference for a trimoraic foot to bear the word's main stress in terms of a requirement that the *head of the prosodic word* must be branching:

(20) *PWHEAD BIN*
The head of the prosodic word must be branching.

PWHEADBIN, HEADBIN and FTBIN form a family of constraints which demand that elements of prosodic structure be binary.

PWHEADBIN is violated in words which do not contain any trimoraic feet, but only bimoraic ones, e.g. (h)(h) from (4)d. One of the feet must bear main stress, although it does not branch. The violation of PWHEADBIN is forced by the undominated constraints SYLINT and WSP which discard any other foot structure for such words. There is also evidence that in Munster Irish PWHEADBIN

is ranked below HEADBIN. Consider again `llh' words (cf. (4)f). As argued in § 2.3.1, high ranked HEADBIN selects the parsing in which two light syllables are the head of a non-branching foot. Therefore `llh' words contain two non-branching feet. Such outputs violate PWHEADBIN. The latter constraint would select another candidate output where `ll' is a branching foot (with a non-branching head) and the p-word head. This parsing violates HEADBIN. Both candidate outputs of `llh' words are represented in (21)a and (b) respectively. `**F**' (in bold print) indicates the p-word head. Main stress falls on the head of the foot which is the p-word head, i.e. on the heavy syllable in (21)a and on the initial light syllable in (21)b. The stress pattern predicted in (21)b is incorrect. In the selected output (cf. (4)f) the non-branching foot (h) is the p-word head, which indicates that the foot (ll) is not branching either. This gives evidence for the ranking HEADBIN >> PWHEADBIN in Munster Irish.

(21)

a.				b.			
F		**F**		**F**		F	
*		*		*	\	*	
s		s		s	w	s	
*	\	*		*	*	*	
l	l	h		l	l	h	
HEADBIN >> PWHEADBIN				PWHEADBIN >> HEADBIN			

The interaction of WSP, HEADBIN, PWHEADBIN and FTBIN is illustrated in the tableau below for some candidate parsings of `hh' and `llh' words.

(22) *Interaction of WSP and binarity requirements*

Candidates	WSP	HEADBIN	PWHEAD BIN	FTBIN
F s w h h	*!			
F **F** s s ☜ h h			*	**
F **F** s s ☜ l l h			*	**
F F s w s l l h		*!		*
F s w l l h	*!			

For `hh' words the first candidate output is excluded by WSP because it contains a heavy syllable in a weak metrical position. The second candidate wins although it violates some binarity requirements. For `llh' words WSP rules out the third candidate, the second candidate loses with respect to HEADBIN, and the first candidate is selected. The behaviour of words containing only bimoraic feet with respect to primary stress assignment, such as (ll)(h), (h)(h) and (h)(h)(h), indicates the relevance of other constraints on the location of the p-word head. The main stress on the second foot in words of the structure (ll)(h) and (h)(h) shows that the p-word head should not be p-word-initial. On the other hand, the main stress on the medial foot in (h)(h)(h) sequences shows that it should preferably not be p-word-final either. The observation that many languages tend to avoid locating the p-word head at the right edge of the p-word has led to the postulation of the constraint NONFINALITY (PS):

(23) *NONFINALITY*
No head of p-word is final in p-word.

NONFINALITY favours candidate outputs in which primary stress is assigned to a nonfinal foot in the p-word, for instance, to the second foot in the sequence (h)(h)(h). However, in words of only two feet it would incorrectly predict initial stress. The fact that the final, rather than the initial, foot is primarily stressed in (ll)(h) and (h)(h) sequences indicates that NONFINALITY is dominated by a constraint which rules out the p-word-initial location of the p-word head. The constraint in question is then a mirror image of NONFINALITY. I propose to formulate it as follows:

(24) *NONINITIALITY*
No head of p-word is initial in p-word.

The function of NONFINALITY and NONINITIALITY in a constraint-based framework such as OT is analogical to extrametricality in earlier approaches. As in the case of final vs. initial extrametricality, substantial evidence is adduced in the OT literature for NONFINALITY, but not for NONINITIALITY. To my knowledge the latter has not yet in fact been formulated as a constraint. However, the theoretical framework of OT does not rule it out. On the contrary. The well-established constraint NONFINALITY is antagonistic to one of the ALIGN-Right constraints (MPa) which demands that the p-word head occupies the rightmost position within the p-word. Whether a language exhibits final extrametricality effects or not depends, among other factors, on the relative ranking of NONFINALITY and ALIGN-Right. Given that ALIGN-Left (MPa) demands the leftmost location of the p-word head within the p-word, one may anticipate a competing constraint in the system, which is precisely NONINITIALITY. The reason why the impact of the latter constraint is not noted in the literature may be related to the special significance of the left p-word edge and the usually strong position of ALIGN-Left constraints cross-linguistically. However, the stress facts of Munster Irish seem to offer positive evidence in favour of NONINITIALITY.

The effects of NONINITIALITY and NONFINALITY are evident if all feet within the p-word have the same structure, i.e. they are all branching or all non-branching. If there is only one branching foot, it is assigned main stress irrespective of its location within the p-word. This provides evidence for the ranking PWHEADBIN >> NONINITIALITY >> NONFINALITY. The interaction of the three constraints governing primary stress assignment is illustrated in the tableau below:

(25) *Interaction of constraints on primary stress assignment*

Candidates	PWHEAD BIN	NONINITIALITY	NONFINALITY
F **F** h l h	*!		*
F F ☜ h l h		*	
F F h h	*	*!	
F **F** ☜ h h	*		*
F F F h h h	*	*!	
F **F** F ☜ h h h	*		
F F **F** h h h	*		*!

For `hlh' words PWHEADBIN eliminates the candidate output in which a non-branching foot is assigned primary stress in favour of the candidate where a branching foot is stressed. In the case of `hh' words both candidates violate PWHEADBIN. Therefore the selection is done by the lower ranked constraint NONINITIALITY which is only satisfied by the second candidate output. As far as `hhh' words are concerned, all the three candidates score the same regarding PWHEADBIN and NONINITIALITY rules out only the first candidate. The choice between the second and the third candidate is determined by NONFINALITY in favour of the second.

3. Conclusion

In this paper I have developed an OT analysis of stress in Munster Irish. It has been proposed that the basic type of foot in this language is a trimoraic trochee. Foot ternarity results from the fact that the foot has a binary-branching head and it branches itself. Such feet attract main stress. Moreover, main stress is preferably non-initial and, if also possible, non-final within the p-word. It has been argued that these properties of Munster Irish stress system are due to several universal constraints on the well-formedness of prosodic structure. Their ranking in Munster Irish is the following:

(26) *Constraint hierarchy governing foot structure and main stress in Munster Irish*

RHTYPE = T, SYLINT, WSP, HEADBIN >>
FTBIN, PWHEADBIN >>
NONINITIALITY >>
NONFINALITY

An essential premise of OT, as opposed to other constraint-based approaches, is that lower ranked constraints can be violated in the selected outputs in order to satisfy higher-ranked ones. I hope to have demonstrated that this is indeed the case in Munster Irish and thus to have shown the adequacy of the framework of OT in the analysis of the Munster Irish stress system.

Appendix: constraint tableau notation

*	Constraint violation.
!	Fatal violation - candidate loses against at least one other candidate.
<>	Unparsed material.
Dotted line	Constraints not crucially ordered.
Shading	Constraint plays no role in the evaluation of the candidate.
☜	The optimal candidate.

Acknowledgements

I would like to thank Eithne Carlin, Colin Ewen, Harry van der Hulst, Edmund Gussmann, Krisztina Polgárdi, Ruben van de Vijver, Jeroen van de Weijer and the anonymous reviewer for their comments on an earlier version of this paper. I am the only one to blame, of course.

References

de Bhaldraithe, T. (ed.). (1959). *English-Irish Dictionary*. Dublin, OiFig an tSoláthair.

Breatnach, Risteard B. (1947). *The Irish of Ring Co. Waterford*. Dublin, Dublin Institute for Advanced Studies.

Dinneen, P.S. (ed.). 1927). *Foclóir Gaedhilge agus Béarla: An Irish-English Dictionary*. Dublin, the Irish Texts Society.

Doherty, C. (1991). Munster Irish Stress. In *Phonology at Santa Cruz*, vol. 2, 19-32.

Dresher, B.E. and A. Lahiri (1991). The Germanic Foot: Metrical Coherence in Old English. *Linguistic Inquiry* 22, 251-86.

Gussmann, E. (1994). Putting Your Best Foot Forward. Ms, Catholic University of Lublin.

Hayes, B. (1980). A Metrical Theory of Stress Rules. PhD diss., MIT, Cambridge, MA.

Hayes, B. (1991). Metrical Stress Theory: Principles and Case Studies. Ms, UCLA.

Hulst, H.G. van der (1994). Notes on Foot Typology and Optimality Theory. Ms, Holland Institute of Generative Linguistics, Leiden and the Netherlands Institute for Advanced Science, Wassenaar.

Hung, H. (1993). The Rhythmic and Prosodic Organization of Edge Constituents. PhD diss., Brandeis University, Waltham.

Kager, R. (1989). *A Metrical Theory of Stress and Destressing in English and Dutch*. Dordrecht, Foris.

McCarthy, J.J. and A.S. Prince (1986). *Prosodic Morphology*. Samizdat, Amherst and Waltham, MA.

McCarthy, J.J. and A.S. Prince (1993a). Generalized Alignment. *Yearbook of Morphology*, 79-153.

McCarthy, J.J. and A.S. Prince (1993b). Prosodic Morphology I. Ms, University of Massachusetts at Amherst and Rutgers University. [Forthcoming MIT Press.]

Ó Cuív, Brian (1944). *The Irish of West Muskerry, Co. Cork. A Phonetic Study*. Dublin, Dublin Institute for Advanced Studies.

Ó Cuív, Brian (1947). *Cnósach Focal ó Bhaile Bhúirne i gCunndae Chorcaí*. Dublin, Institiúid Árd-Léighinn Bhaile Atha Chliath, Baile Atha Cliath.

Ó Dónail, N. (1977). *Foclóir Gaeilge-Béarla*. Dublin, OiFig an tSoláthair.

Ó Sé, D. (1989). Contributions to the Study of Word Stress in Irish. *Ériu* XL, 147-78.

Ó Siadhail, M. (1989). *Modern Irish. Grammatical Structure and Dialectal Variation*. Cambridge, University Press Cambridge.

Prince, A.S. (1983). Relating to the Grid. *Linguistic Inquiry* 14, 19-100.

Prince, A.S. and P. Smolensky (1993). Optimality Theory: Constraint Interaction in Generative Grammar. Ms, Rutgers University, New Brunswick and University of Colorado, Boulder. [Forthcoming MIT Press.]

Rice, C. (1992). Binarity and Ternarity in Metrical Theory: Parametric Extensions. PhD diss., University of Texas, Austin.

Rowicka, G.J. (1994). Prosodic Optimality and Prefixation in Polish. Paper presented at the Prosodic Morphology Workshop in Utrecht. To appear in the Proceedings.

Vijver, R. van de (1994). Main Stress in Munster Irish. A Case of Non-Morphological Reduplication. Ms, Free University Amsterdam.