

## On the boundaries of Irish prosodic words

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### Abstract

This study uses the facts of Irish lenition, gemination processes and stress placement constraints to refute the theory of the syntax-phonology interface proposed by Truckenbrodt (1999) where it is claimed that the only structure visible to phonology at the interface is that of phrases.

I use these same facts in support of *Match Theory* (Selkirk 2009; *to appear*) which allows a direct 1:1 mapping between syntactic and phonological structure at the word, phrase and clausal levels. Further, I go on to propose strength conditions on the boundaries of prosodic words dependant on whether those words are maximal, or non-maximal recursive word structures.

I conclude that while \*STRUC constraints eliminate redundant word bracketing structure, it does not target recursive word bracketing provided that that bracket contain at least some segmental information. This fact will account for *Geminate Inalterability* (Ní Chosáin 1991; Green 2008) found in Irish coronal clusters as well as secondary stress placement present only in recursive word structure. These facts can only be handled by a theory that allows a direct mapping of all types of syntactic structures to prosodic structure and not just syntactic phrases to phonological phrases.

## 1. Lenition: an introduction

A central debate in Celtic linguistics concerns the placement of the Initial Mutations (IM), specifically, lenition, within the subfields of the science. This uncertainty in the field is perhaps best summarized by Green, (2007: 70) when he states: “The initial consonant mutations of the Celtic languages are of great interest in theoretical linguistics because they appear to be (and are frequently argued to be) phonological processes which take place in morphosyntactic rather than phonological environments.”

A separate, but not unrelated phenomenon in Irish which may lend weight to a phonological treatment of IM, is that of *Coronal Blocking* (CB) (Ní Chosaín 1991; Green 2008). Under normal lenition causing circumstances word-initial coronal consonants undergo decoronalization. Lenition causes /t/ and /s/ to alternate with [h] or Ø and /d/ to alternate with [ɣ] or [j].

We may then observe constructions such as the following:

- (1) /ro/ + /dorəxə/ → [ro ɣorəxə] ‘too dark’  
 (2) /çqilə/ + /dɪnə/ → [çqilə ɣɪnə] ‘all people’

As the above two examples show, lenition occurs at the contact point of two words (further discussion on the exact environment will be addressed below). The affect of CB can be seen when the contact edges of the two words are both coronal consonants. In this circumstance lenition is prevented from occurring, though the environmental conditions for alternation exist.

- (3) /ən/ + /dorəxə/ → [ən dorəxə] ‘very dark’  
 (4) /ʃan/ + /dɪnə/ → [ʃan dɪnə] ‘(an) old person’

Ní Chosaín (1991) analyses this under application as two coronal consonants sharing a single coronal place node. Looking at the above examples this can be illustrated as coronal preservation when lenition fails to apply and coronal place delinking when lenition does occur.

- (5) a. [ro ɣorəxə]    b. [çqilə ɣɪnə]    c. [ən dorəxə]    d. [ʃan dɪnə]  
          | ‡                    | ‡                    V                    V  
          COR                    COR                    COR                    COR

Where the environment for lenition exists, coronals will delink from their primary place node except in instances of *CB*. *CB* occurs when “adjacent coronals share a single place node [and are thereby] immune to [decoronalization] because of geminate inalterability” (Ní Chosaín qtd. in Green 2008: 199).

In the sections that follow, we will take a closer look at the application of *CB* and instances where lenition occurs despite what appears to be a *CB* environment. Evidence from lenition, *CB* and stress application will be used to propose a constraint hierarchy for prosodic parsing in Connemara Irish and illustrate differences in the prosodic structures of constructions where lenition occurs and where it is blocked by *CB*. This study will contrast the predictions made by two theories: Truckenbrodt’s (1999) *WRAP-XP* and Selkirk’s (2009; to appear) *Match Theory* (MT). This paper seeks to answer the following question: does the evidence from Irish prosodic word structure offer evidence in support of one theory of the phonology-syntax interface or the other? I will ultimately argue that the stress patterns and rules of lenition/*CB* provide evidence to refute the theory of the interface proposed by Truckenbrodt and support Selkirk’s MT. By

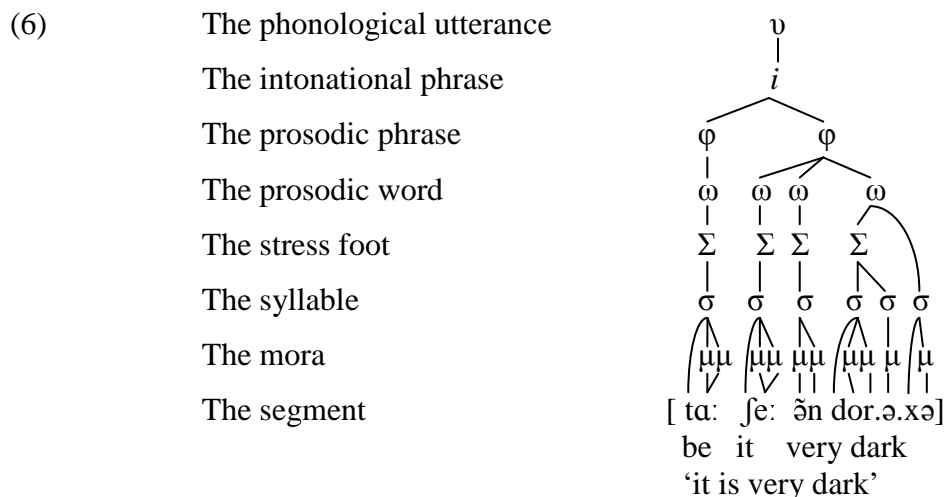
supplying a phonological environment provided by phonological constraints, I will also add further evidence to support the idea of IM as a phonological process reinforcing the claims of the Windsor (2010 *et seq.*) CORONALSECOND analysis as outlined in sections 2.3 and 4.

## 2. Background

### 2.1. Prosodic hierarchy

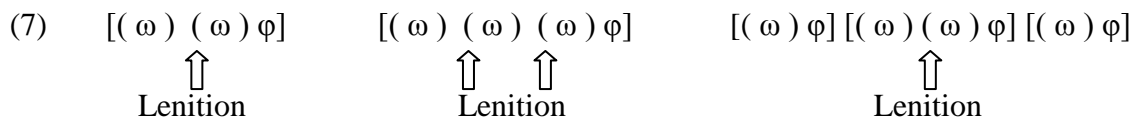
In this analysis, I will adopt the prosodic hierarchy model of Nespor and Vogel (2007)<sup>1</sup>.

The prosodic hierarchy I assume is as follows:

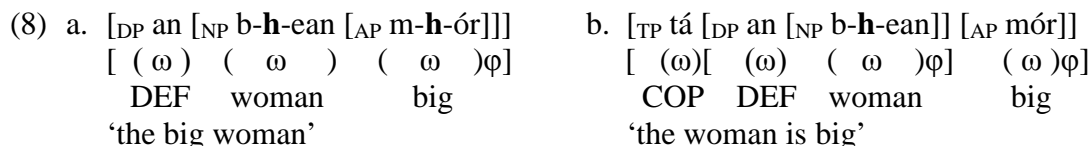


### 2.2. Phonological environment for lenition

Previous work (Carnie 1991; Windsor 2010a; b) has claimed that the phonological environment for lenition in Irish is anywhere two or more prosodic words are parsed into a single prosodic phrase. In these models, every word beyond the first in a prosodic phrase receives lenition at its left edge.



By assuming a 1:1 mapping from syntax to phonology to determine prosodic words and phrases and then using the words and phrases provided by the syntactic SPELLOUT to look for lenition environments (LE), we can capture the difference in Irish between adjectival modification<sup>2</sup> and copular sentences:



<sup>1</sup> Though it may be argued that the Clitic Group (C) is active in the prosodic structure of Irish, the present analysis is not concerned with this level and it will therefore be omitted. I leave discussion of the role of the Clitic Group in Irish for future research.

<sup>2</sup> Note: orthographic <h> denotes lenition anywhere it appears as the second letter in a word.

As depicted above in (8a), when the the adjective *mór* ‘big’ is modifying the noun *bean* ‘woman’ it is a member of the maximal projection DP and therefore is parsed as a member of the DP phonological phrase. It then receives lenition as the third phonological word in that phrase. However, when the AP dominates DP in a copular construction (8b), it is no longer a member of the same maximal projection and so at the interface, it is parsed into its own phonological phrase and no longer exists in an environment for lenition. However, lenition sometimes fails to apply despite the existence of the proper LE. These instances are a result of the CB phenomenon (Ní Chosáin 1991) as outlined in section 1 and will be highlighted once more in the following section.

### 2.3. CORONALSECOND

Whether a given researcher believes that Irish lenition is the result of grammatical rules or phonological constraints, it is generally accepted that there is a rigid system which governs the application of IM and is predictable in its application. In many instances where lenition is expected it will fail to apply if the final consonant of the word causing mutation and the first consonant of the word to be mutated are both coronal. This is because both consonants share a single place node and then resist weakening because of geminate inalterability as discussed in section 1.

To date, two separate accounts (Green 2008; Windsor 2010 *et seq.*) have been given to bring CB into an Optimality theoretic framework (Prince & Smolensky 2004). Green (2008: 205) proposes the constraint CORONAL HOMORGANICITY (CORHOM) which states that “In  $\omega(\dots C_i C_j \dots)$ , if  $C_i$  is coronal, then  $C_j$  is coronal.” To account for the overwhelming number of word internal clusters that do not force a consonant to become coronal after a preceding adjacent coronal (i.e., *calc* ‘chalk’ [kalk] or *rascalach* ‘coarse material’ [raskəɫax]) Green ranks CORHOM below FAITH (place). What this is meant to capture is that CORHOM does not force non-coronal consonants to become coronal in a cluster, but it does prevent lenition of coronals when preceded by another coronal (recall lenition of coronals is delinking from the primary place specification as discussed in section 1). Green’s proposed constraint, however, deals with word internal coronal clusters but as we have seen the correct LE is at the boundary between two prosodic words within a given prosodic phrase.

In order to capture the non-word-internal nature of Irish lenition, but to retain the driving idea behind CB as outlined by Ní Chosáin (1991), Windsor (2010a; b) proposes the constraint CORONALSECOND: preserve the coronal place specification of the second consonant in a cluster. If the second consonant in a cluster is not underlyingly a coronal, there is no violation (as Green tried to capture with his FAITH (place) constraint). This constraint also captures the cross-linguistic tendency where coronals are more common as the second member of a consonant cluster than other places of articulation<sup>3</sup> (see Windsor 2010c or Flynn 2010 for discussion). Most importantly, this constraint does not rely on word-internal clusters and accounts for the fact that constructions such as *an dorcha* ‘very dark’  $[(\text{ən})_\omega (\text{d} \text{or} \text{ə} \text{x} \text{ə})_\omega]_\phi$  are two separate words governed by a single phrase and yet CB prevents lenition from occurring.

However, even CORONALSECOND seems to have underapplication problems because of exceptional circumstances where lenition occurs normally. These are discussed below.

<sup>3</sup> apt, blade, glass, attempt, tabs, capsule, actor, action

[æpt, blaid, glæs, ətɛmpt, tæbz, kæpsul, æktɪ, ækfɪ] \*[mɛtp] \*[mɛtk] \*[mɛtf]

#### 2.4. The underapplication of CB

Despite the large majority of constructions which conform to the constraints that govern lenition in the proper LE, or the lack of lenition in CB environments, there are exceptions to these generalizations which also need to be explained. Green (2008: 200-1) identifies several constructions where the contact edges of the two prosodic words are each coronal and yet lenition of the second member surfaces normally in blatant violation of the CORONALSECOND / CORHOM constraint:

- (9) /[(<sup>f</sup>or<sup>i</sup>an)ω (dɔɪ<sup>i</sup>ə)ω]φ/ → [[(<sup>f</sup>or<sup>i</sup>an)ω (ɣɔɪ<sup>i</sup>ə)ω]φ] ‘(the) Derry team’  
 (10) /[(b<sup>w</sup>ɪd<sup>i</sup>ɪl)ω (su:)ω]φ/ → [[(b<sup>w</sup>ɪd<sup>i</sup>ɪl)ω (hu:)ω]φ] ‘a bottle of juice’

The analysis that Green (2008) provides for these forms is that because they are two separate phonological words CB does not apply. This is because the domain of the CB phenomenon is not between phonological words, but in what Green analyzes as recursive phonological words. Returning to the examples of CB given in (3), (4). (repeated below in (11, 12)) the new representation that Green argues for is:

- (11) /ə<sup>n</sup>/ + /dɔɪ<sup>r</sup>əxə/ → [((ə<sup>n</sup>)ω (dɔɪ<sup>r</sup>əxə)ω)ω]φ ‘very dark’  
 (12) /ʃan/ + /dɪnə/ → [((ʃan)ω (dɪnə)ω)ω]φ ‘(an) old person’

If this analysis is correct, it could potentially be very problematic for the Windsor (2010 *et seq.*) analysis in that the assumed environment for lenition would be incorrect as we see word-internal as well as between-word lenition.

To investigate the true nature of constructions wherein lenition occurs normally despite the contact edges of the prosodic words being coronal and the construction in which CB prevents lenition we will have to understand potentially different stress cues to each construction, as well as revisit the interface between syntax and prosody to either confirm or refute Selkirk’s *Match Theory*/Truckenbrodt’s *WRAP-XP theory*.

### 3. The possible solutions

The fact is, Green is correct when he points out several instances which show the underapplication of CB constraints and any theory that is going to try to constrain Irish lenitions will have to be able to explain the application of both lenition and CB, as well as the underapplication of each. In this section I present two theories of the syntax-phonology interface and the predictions that each would make for constraining Irish IM.

#### 3.1. Truckenbrodt (1999) and WRAP-XP

One of the important claims for the Truckenbrodt theory of the phonology-syntax interface is that at the interface, only syntactic phrases are visible to phonology (Truckenbrodt 1999: 235). After phonological phrases are built at the interface by WRAP-XP, the phonology must construct its own words based on its own constraints and reference only phonological material.

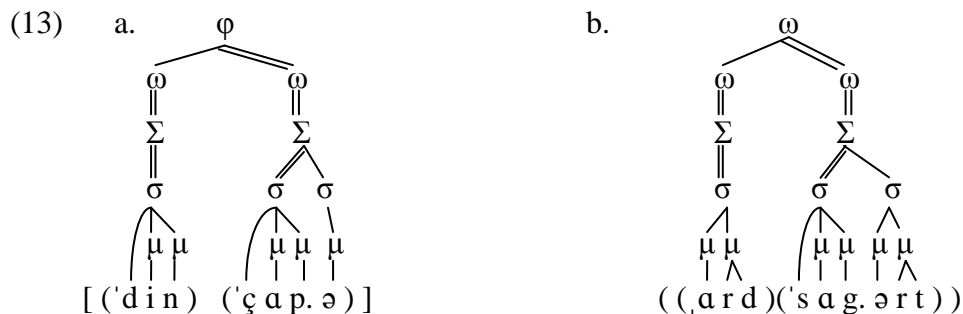
What this means for Irish is that the syntax will influence the building of phonological phrases but that phonological words will be built according to phonological constraints that do not rely on syntactic structure at all. But can phonology build its own word structures which will account for recursive words which exhibit CB effects and non-recursive words that show normal

lenition patterns? The question then becomes, what makes an item phonologically heavy enough to exist as a word on its own as opposed to being part of a recursive word?

Based on the four forms discussed above ((9-12) repeated below), a potential explanation is that when a lexically specified word does not create a phonologically well-formed foot, it must be grouped recursively into the following prosodic word. This observation would hold true if we surmise that coda consonants do not add moraic weight to a syllable so that in (9)  $[[[(f^jor^j\text{an})\omega (\gamma oir^j\text{ə})\omega]\phi]]$ , each word is made up of two syllables and is therefore capable of making a well-formed foot structure. In (10)  $[[[(b^w\text{id}^j\text{il})\omega (hu:\text{ə})\omega]\phi]]$  ‘bottle’ contains two syllables which will form a foot and ‘juice’ contains a phonemic long vowel which will carry two mora and satisfy a  $\Sigma$ -Bin constraint that requires either two mora or two syllables to create a foot and hence a prosodic word. In both examples (11) and (12)  $[[[(\text{ən})\omega (\text{dor}\text{ə}\text{x}\text{ə})\omega)\omega]\phi]$  and  $[[[(\text{f}\text{an})\omega (\text{d}\text{in}\text{ə})\omega)\omega]\phi]$  respectively), the right-most words contain at least two syllables and therefore creates a foot, but the first syllable that combines with each of the host words to create the recursive words do not contain two syllables, nor do they contain two mora and therefore cannot make a well-formed foot. This being the case, they must be parsed recursively into the assumed recursive word structure. This analysis makes two predictions:

- I. That prosodic words in Irish will never be both mono-syllabic and mono-moraic.
- II. That the initial syllable in a recursive word structure will never be footed/ stressed.

Unfortunately, neither of these predictions will hold true. Ní Chosáin (1991: chapter 4) gives a clear description of the Irish syllabic template as being bi-moraic where coda consonants may contribute weight to the syllable and in fact may violate ONSET in some instances to achieve bi-moraic structure. This being the case, we would have to come up with a story to account for why the structure given below in (13a) for *dion shiopa* ‘(the) roof of the store’ receives moraic weight from its coda and a recursive structure such as *ard sagart* ‘high priest’ given in (13b) would not.



The structures above show that there are in fact mono-syllabic words containing phonemic short vowels that can make up a phonological word and as far as phonological weight is concerned, there is no difference between structures parsed as individual or as recursive words. Further evidence that this is indeed the correct parsing of the recursive word structure comes from stress placement. Green (2008: 199) states that what he calls left-headed compounds (as in (14a)) have a secondary-primary stress pattern, whereas right-headed non-compounds (as in (14b)) have a primary-primary stress pattern. The example Green uses to illustrate this crucial difference is the minimal pair *ceann cait* which, depending on stress patterning, can mean either ‘long-eared owl’ (Asio Otus) or ‘head of a cat.’

- (14)    a. ((kʰan)ω ('katʰ)ω)ω                  b. [(('kʰan)ω ('katʰ)ω]φ  
             head      cat                                  head      cat.GEN  
             ‘long-eared owl’                                  ‘head of a cat’

The fact that this recursive word structure does receive stress at all demonstrates that it is indeed footed.

The remarkable phonological similarities below the word level counter both of the predictions made by the *WRAP-XP theory* which suggests there is something other than strictly phonological constraints that reference certain phonological constructions to build words. So if phonology is sensitive to something other than weight to build a word, perhaps it depends on syntactic structure, which Selkirk's (2009; *to appear*) MT will be able to account for and in fact predicts.

### 3.2. Selkirk (2009) and Match Theory

In addition to phrases, MT states that phonological words are also built from being matched with syntactic words. The relevant 1:1 mapping from syntax to phonology is provided by **MATCHWORD**: a syntactic word ( $X^0$ ) = a prosodic word ( $\omega$ ).

The question now becomes, is there a syntactic structure which will tease apart regularly parsed words from recursive word structures? To answer this question, it is perhaps best to first look at what Green (2008: 199) calls left-headed compounds.

The idea that compound words consist of two prosodic words recursively parsed into a higher dominating prosodic word is well attested in the literature already: Booij (1988), McHugh (1990), McCarthy and Prince (1993a; b) and Ito and Mester (*to appear*). Complimentary to MT, there is a possible construction that will give us the required structure for recursive words.

From a morphological standpoint, a construction like *seanduiue*  $[(((\text{[an]}\omega) (\text{d}\text{in}\text{ə})\omega)\omega)\phi]$  ‘(an) old person’ would be created by a morphological compounding rule whereby two free morphemes are combined to make one lexical compound (Green 2008; Windsor 2010 *et seq.*). If this is the case, the constraint  $\text{LX} \approx \text{PR}$  ( $\text{MCAT}_{(\text{free})}$ ) (Prince & Smolensky, 2004: 51) would state that there is a 1:1 mapping between free morphemes and prosodic words. Combining this constraint with Selkirk’s MATCH WORD constraint we would achieve a structure whereby both *sean* ‘old’ and *duine* ‘person’ as free morphemes would each receive their own phonological words. After word building in the morphology, the compound as a whole would be interpreted by the syntax as  $[\text{NP } \text{N } \text{seanduiue}]$  which would also be realized phonologically as a prosodic word by MATCHWORD, thus achieving the required recursive prosodic structure,  $[(((\text{[an]}\omega) (\text{d}\text{in}\text{ə})\omega)\omega)\phi]$ .

On the other side of the equation, phrases which do not show recursive word structure i.e., *dion shiopa* [(din)ω (çapə)ω]φ ‘roof of the shop,’ do not have morphologically complex free components so both the morphology and the syntax would each treat them as single word components in a phrase.

These constraints, which differ from Truckenbrodt's theory because they allow prosody to reference more than syntactic phrases, give us the correct structure for both the recursive left-headed compounds and the non-recursive right-headed non-compounds (in Green's categorization). However, there is still one further construction which must be addressed. Green categorizes both left-headed compounds and left-headed non-compounds together under one umbrella because, he argues, both exhibit recursive word structure and the secondary-primary

stress pattern. We must ask though, can the constraints that we have outlined to disambiguate recursive from non-recursive structure capture this third distinction as well?

The third type of structure is left-headed non-compounds. These non-compounds are two separate syntactic words (Green 2008), which, importantly have no internal free morphological structure to create recursive words internally. These are constructions such as *an trá* ‘the beach’ or *an tairbh* ‘the bull(gen).’ Based on stress and lenition patterns, Green assigns these constructions recursive word structure as well. The point here is not to argue that structure, but to address whether the structure is well motivated under MT.

According to Duffield (1995) and Windsor (2010d), the nominals in an Irish DP come to be syntactically organized as an article and noun incorporated together (Baker, 1988) in a complex syntactic head. This incorporation would give *an trá* ‘the beach’ this structure:

$$(15) \quad [_{DP} n^{\circ} n^{\circ} \text{ an } N^{\circ} \text{ trá } [_{NP} t [_{NP} t ]]]$$

The SPELLOUT of this structure (using Selkirk’s MATCH WORD constraint) would see the noun head ( $N^{\circ}$ ) as a syntactic word as well as the little-n head ( $n^{\circ}$ ). This gives us the phonological structure of (an)ω (trá)ω. However, because this complex structure occupies one syntactic head in Spec DP, the phonology also interprets the branching terminal node to be a syntactic word as well. This recursivity in the syntax is interpreted by MATCH WORD and gives us the structure ((an)ω (trá)ω)ω allowing for the advocated recursive word structure that was also seen in compounds. Likewise, this accounts for the similar stress pattern that we shall see is found in both and is the reason Green categorizes the two constructions as the same.

Before turning our attention to what this means for the CORONALSECOND analysis and for the specific domain of lenition, it is necessary to demonstrate that while the \*STRUC constraint eliminates redundant word boundaries, it does not eliminate word boundaries of those words parsed recursively into a higher prosodic word. This will be the topic of the next section.

### 3.3. Word-internal word boundaries and \*STRUC

The question we should ask is, what reason do we have to suspect that word-internal brackets would remain (or be created at all) in the output of Irish compounds and left-headed non-compounds? We have motivated how they are created, but why should they be maintained, especially in the face of constraints like \*STRUC which is responsible for removing redundant bracketing (Truckenbrodt 1999: 228; Prince & Smolensky 2004: 30). The evidence for maintaining these internal brackets will come from phonotactics, stress allocation and prosodic structure below the word, as well as lenition/CB application.


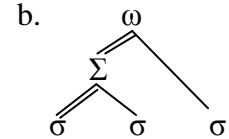
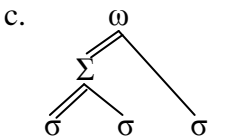
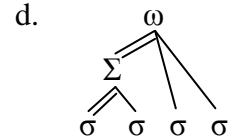
The first piece of evidence for maintaining word-internal brackets comes from a phonotactic analysis. In a corpus study of the Linguistic Atlas and Survey of Irish Dialects (Wagner 1981)<sup>4</sup>, I searched for any words containing adjacent coronal consonants (regardless of syllable boundary). In this survey, several forms such as [tɫɯ] ‘tongs,’ [baurd] ‘table,’ and [ʂĩɲ.ə] ‘snoring’ were found. However, one generalization can be taken from this data: there are no instances of adjacent coronals in Irish words which do not have one member as [+sonorant] except when separated by a word boundary. While many of the recursive structures ([ʃan dɪnə] ‘(an) old person’ or [ən trɔ:] ‘the beach’) do have the unrestricted coronal cluster containing at

<sup>4</sup> Transcriptions have been regularized to IPA.



least one [+sonorant] coronal, recursive word structure provides the only environment in Irish where we can find adjacent [-sonorant] coronals which create a cluster: i.e., [((ard)ω (sagərt)ω)ω]φ ‘high priest.’

Of course, by itself this is weak evidence and so we must also investigate the prosodic structure below the word and look at stress placement to argue for internal word boundaries. To do this, we will examine the stress placement of two, three and four syllable words<sup>5</sup> and contrast this with the stress placement found in recursive word structures. To do this we will look at the word-internal structure of several representative Irish words which are given below<sup>6</sup>:

- 16) a.   
kal.i:n  
‘girl’
- b.   
kʲaŋ. goL. tə  
‘knot’ (verbal noun)
- c.   
xa so: gi:n  
‘jacket’ (diminutive)
- d.   
say ər tər axt  
‘performing the duties of a priest’

The first word (16a) is selected to demonstrate that, despite having a phonemic long vowel and a coda consonant in the second syllable, stress falls on the first syllable of an Irish word, contrary to the weight to stress principle.

This suggests that the constraint RHTYPE=T(rochaic) (Prince & Smolensky 2004: 63-6) is very high-ranking in Irish preferring to maintain a left-headed foot and resyllabify the [l] as a coda in violation of ONSET to satisfy the weight to stress principle (WSP).

The next word to investigate (16b) contains three syllables, the final of which contains schwa and no coda consonant. The presence of the reduced vowel and stress remaining on the first syllable will be taken as evidence that this final syllable is not footed in violation of PARSEσ but satisfying Σ-bin. Three syllable words such as this show the adherence to the constraint ALIGN-L (Σ, L; ω, L), that is that feet in the Irish word are built from left to right and must align with the left edge.

This constraint also holds true if the final syllable of the word is phonologically heavy enough (bi-moraic) to be footed and receive stress as seen in (16c). Again, Irish prefers to violate PARSEσ, but remains faithful to ALIGN-L (Σ, L; ω, L).

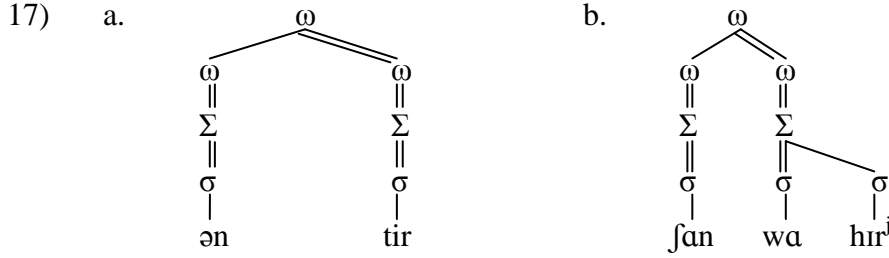
Moving on to four syllable words, this pattern is repeated, where still only the first syllable receives stress even though the two syllables that follow are capable of forming a stress foot. This is demonstrated in (16d).

Given what has been seen about Irish in terms of the constraint ALIGN-L (Σ, L; ω, L) when moving to an investigation of what has been claimed to be recursive word structure, if the internal word brackets were not present, we would expect to find main stress on the initial syllable and no other stress within the word. This, however, is not the case as evidenced by the recursive structures: *an tsaor* ‘very cheap’ and *seanmháthair* ‘grandmother’<sup>7</sup>, represented below in (17a) and (17b) respectively.

<sup>5</sup> If words containing five or more syllables exist in Irish, they are unknown to me.

<sup>6</sup> Transcriptions are based on the recordings in Ó Conghaile, 1999.

<sup>7</sup> Literally ‘old’ + ‘mother’ which forms a true compound.



Here we distinctively notice word level stress on the first syllable of what Green (2007: 200) calls a proclitic + host recursive word structure which also demonstrates the fact that the first syllable in the recursive word receives secondary stress, while the second syllable (a separate word) receives primary stress. If the word-internal boundaries were deleted, we would expect only one (primary) stress which would appear on the first syllable. Presumably the downgrade of the stress in the first word is due to a \*CLASH constraint which is inactive in non-recursive word structures as ALIGN -L ( $\Sigma$ , L;  $\omega$ , L) outranks PARSE $\sigma$  and normally prevents multiple feet in a single word. However, in a recursive structure, two feet can exist without a violation of the alignment constraint because both feet can still align with the left edge of their individual prosodic words. When these words are recursively parsed, \*CLASH prevents each word from having primary stress, as would be the case if they were parsed directly into a phrase without an intermediate recursive word level as was the case in (14b) [(<sup>1</sup>kʲan) $\omega$  (<sup>1</sup>katʲ) $\omega$ ]φ ‘head of a cat.’

Once again, the existence of two stresses while Irish words normally contain only one stressed syllable –the initial syllable- is evidence that the word-internal boundaries are being retained even when parsed recursively into a higher prosodic word.

The above explanations can be summarized in the following three tableaux which denote: a four syllable non-recursive word structure, a three syllable compound recursive structure and a two (non-recursive) word structure.

18) [(<sup>1</sup>say.ər.tər.əxt) $\omega$ ] ‘performing priestly duties’

say.ər.tər.əxt	ALIGN -L ( $\Sigma$ , L; $\omega$ , L)	$\Sigma$ -BIN	PARSE $\sigma$	*CLASH	MATCH WORD
$\sigma$ ( <sup>1</sup> ( $\sigma\sigma$ ) $\Sigma$ $\sigma\sigma$ ) $\omega$			*		
( <sup>1</sup> ( $\sigma\sigma$ ) $\Sigma$ ( $\sigma\sigma$ ) $\Sigma$ ) $\omega$	*!				
(( $\sigma\sigma$ ) $\Sigma$ ( <sup>1</sup> ( $\sigma\sigma$ ) $\Sigma$ ) $\omega$ )	*!				
( <sup>1</sup> (( $\sigma\sigma$ ) $\Sigma$ $\sigma\sigma$ ) $\Sigma$ ) $\omega$		*!			

19) [(<sup>1</sup>(<sup>1</sup>(<sup>1</sup>sʲan) $\omega$  (<sup>1</sup>wahɪrʲ) $\omega$ ) $\omega$ ] ‘grandmother’

fan.wah.ɪrʲ	ALIGN -L ( $\Sigma$ , L; $\omega$ , L)	$\Sigma$ -BIN	PARSE $\sigma$	*CLASH	MATCH WORD
$\sigma$ (( <sup>1</sup> ( $\sigma$ ) $\Sigma$ ) $\omega$ ( <sup>1</sup> ( $\sigma\sigma$ ) $\Sigma$ ) $\omega$ ) $\omega$					
(( <sup>1</sup> ( $\sigma$ ) $\Sigma$ ) $\omega$ ( <sup>1</sup> ( $\sigma\sigma$ ) $\Sigma$ ) $\omega$ ) $\omega$				*!	
( <sup>1</sup> ( $\sigma$ ) $\Sigma$ ( <sup>1</sup> ( $\sigma\sigma$ ) $\Sigma$ ) $\omega$ )	*!				
( <sup>1</sup> ( $\sigma$ ) $\Sigma$ $\sigma\sigma$ ) $\omega$			*!		

20) [(din)ω (çapə)ω] ‘roof of the shop’

din çap.ə	ALIGN –L (Σ, L; ω, L)	Σ-BIN	PARSEσ	*CLASH	MATCH WORD
(' (σ) <sub>Σ</sub> σσ) <sub>ω</sub>			*!*		*
☞ (' (σ) <sub>Σ</sub> ) <sub>ω</sub> (' (σσ) <sub>Σ</sub> ) <sub>ω</sub>					
(, (σ) <sub>Σ</sub> ' (σσ) <sub>Σ</sub> ) <sub>ω</sub>	*!				
((, (σ) <sub>Σ</sub> ) <sub>ω</sub> (' (σσ) <sub>Σ</sub> ) <sub>ω</sub> ) <sub>ω</sub>					*!

Now that Irish stress placement and recursive word structure is understood, we must realize the consequences that these facts have for the Windsor (2010 *et seq.*) analysis.

#### 4. Windsor (2010) and CORONALSECOND

Under the CORONALSECOND analysis, one of the crucial claims is that the environment for phonological lenition is anywhere that two prosodic words are parsed into a single prosodic phrase. When this environment is achieved the initial consonant of the second or subsequent word will undergo lenition to its predictable allophone. This generalization fails to capture the fact that the second word in compounds such as *seanmháthair* [[[ʃan)ω ('wahir<sup>j</sup>)ω)ω] ‘grandmother’ also undergo lenition. Given this evidence, we must revise our statement of the lenition environment to capture lenition which happens word-internally as above, as well as across word boundaries in a phrase such as *foireann Dhoire* [[('f<sup>j</sup>or<sup>j</sup>an)ω (ɣoir<sup>j</sup>ə)ω]φ] ‘(the) Derry team.’ In order to do this we must generalize the lenition environment as: when two or more prosodic words are parsed into higher prosodic structure that encompasses each of those prosodic words, lenition occurs at the left edge of the second or subsequent word. This revised generalization will account for both multiple words parsed into a phrase, as well as for recursive word structures.

As for the constraint CORONALSECOND it seems that something more needs to be said in order to account for why CB occurs only in recursive word structures and not between separate words parsed into a prosodic phrase. Returning to the exact definition given for this constraint we can highlight one important stipulation:

CORONALSECOND: preserve the coronal place specification of the second consonant in a cluster. The most important part of this constraint is that it targets only coronal consonants in a consonant cluster. Clearly, when CB fails to apply, it is because the two adjacent coronal consonants do not form a cluster and by Ní Chosáin’s (1991) explanation, do not share a single coronal place node because they are separated by word boundaries. This is the case in forms such as *foireann Dhoire* [[('f<sup>j</sup>or<sup>j</sup>an)ω (ɣoir<sup>j</sup>ə)ω]φ] ‘(the) Derry team’ where the voiced velar fricative that is initial in the second word is underlyingly a /d/. Because the two adjacent coronals are each specified with their own coronal place specification and do not share one, the second is allowed to de-link from its primary place specification node by the rules which govern lenition.

However, when what separates the two coronal consonants are word-internal word boundaries, according to Ní Chosáin (1991) and Green (2008), they are able to form a coronal cluster and then become un-lenitable despite the lenition environment because of *Geminate Inalterability*. Since we have already shown that the word-internal word boundaries still exist within the larger recursive word as evidenced by phonotactics and stress placement, we must say something about these word boundaries that still allow clustering effects. I propose a distinction

between maximal prosodic word boundaries and prosodic word-internal boundaries that I will call strong and weak boundaries.

Non-recursive, or maximal, prosodic word boundaries are classified as strong. They do not allow clustering effects as evidenced by the failure of *Geminate Inalterability* to protect the second coronal of a cluster from leniting. They also do not force a \*CLASH constraint from causing adjacent prosodic words within a single prosodic phrase from undergoing stress reduction to secondary stress. On the other side of the coin, word-internal, or non-maximal, prosodic word boundaries are weak boundaries. They exist for the purposes of allowing secondary stress to occur where the high ranking ALIGN –L ( $\Sigma, L; \omega, L$ ) constraint would normally make this impossible, allowing words built by constraints such as  $LX \approx PR$  (MCAT<sub>(free)</sub>) or MATCHWORD to retain their lexical stress, even if reduced. However, they are weak boundaries in that do not constrain the ability of consonants to share a single place node and allow *Geminate Inalterability* to protect the second coronal of a cluster.

## 5. Conclusion

In the preceding discussion I have used evidence from lenition effects and stress patterning in Irish to largely combat the theory proposed by Truckenbrodt (1999) on the interface between syntax and phonology wherein it was claimed that only syntactic phrase boundaries were visible to phonology at the interface. Using the same evidence, I have given support in favour of *Match Theory* proposed by Selkirk (2009, *to appear*) wherein there is a proposed 1:1 mapping between syntactic and prosodic structure, which is not to say that there cannot be mismatches for other prosodic constraints. The largest argument for MT is based on the ability to predict recursive prosodic words based on morphosyntactic categories and not based on any phonological weight restrictions.

Using the evidence for recursive prosodic words in Irish I have also proposed a categorization of strong versus weak prosodic boundaries and what types of constraints these boundaries are visible to or not. Weak boundaries exist for the purposes of alignment constraints, allowing stress feet to align with their edge, but allow consonant cluster phenomena to treat them as invisible for place node sharing and gemination effects.

Finally, based on the evidence gathered and the proposed theory of weak and strong prosodic word boundaries, I was able to refine the definition of the Irish phonological lenition environment and give further evidence in support of lenition as a phonological phenomenon governed by phonological constraints and taking place in a predictable phonological environment which is influenced, but not strictly governed by the morphosyntax.

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