A Note on Diphthongization before Tense Sonorants in Irish: An Articulatory Explanation.

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0. Introduction

The well-studied phenomenon of vowel lengthening before tense sonorants in Modern Irish (Ó Siadhail 1989, Ó Siadhail and Wigger 1975, Ó Baoill 1979), exemplified in (1), is now well understood as a compensatory process (see for example Ní Chiosain 1991). Tense or long sonorants (L, L', R', N, N', m) trigger vowel lengthening and/or diphthongization. What is not clear about this phenomenon is the phonological motivation for the diphthonization that appears in many dialects.

1) *Short vowel*   *Long Vowel/diphthong*
    crannaíocha 'wooded'   [kraNi:xɛ]   crann 'tree' [kroun]
    polladh 'perforation'   [poLɛ]   poll 'hole '[pouL]

In this short paper, I present an articulatory explanation of this diphthongization. I claim this shift in vowel quality is a direct physiological result of the articulation of the tense consonant. I claim that if tense sonorants involve an advanced tongue root, a natural consequence is that the body of the tongue is forced upwards in the mouth. This results in both the vowel being raised in the diphthong, and the alveopalatal articulation of these consonants described in Ní Chasaide (1995), Ó Murchú (1985) and An tSiúr Annuntiata agus án tAthair Ó Huallacháin (1989) (as opposed to dental/alveolar articulation of the lax sonorants).

This short paper is organized as follows. In section 1, a brief description of the phenomenon is presented. In section 2, I discuss the lengthening aspect of the phenomenon, presenting Ní Chiosáin's (1991) autosegmental analysis in terms of consonant degemination followed by compensatory lengthening of the vowel. Finally in section 3, I discuss the articulatory basis for the vowel raising component of the diphthongization and relate the vowel height effect directly to the underlying featural structure of the consonant using evidence from dialect variation and from various phonetic descriptions of the phenomenon.

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1. Background

1.2 A brief description of the phenomenon.

Tense consonants in Irish, trigger either the lengthening or diphthonization of the preceding vowel in stressed syllables when consonant appears either word finally (2a) or before another consonant (2b). When the tense consonant appears before a vowel, the vowel remains short (2c). Data from Ó Sé (1995)

2) a) [fi:L[1]]   *fill*   'bend (V)'
    b) [fi:Lte]   *fillte*   'bent (A)'
    c) [fiLə]   *filleadh*   'bend (N)'

A similar example from Ní Chiosáin is seen in (3):

3) a) [g'l'ɑ:N]   *gleann*   'valley' (nominative)
    b) [g'l'ɑ:Ntə]   *gleannta*   'valleys'
    c) [g'l'ɑNə]   *gleanna*   'valley' (genitive)

For the most part, in all dialects, /R/ triggers only lengthening, and never diphthongization (4). This is unsurprising, given the fact that the /R/ ~ /r/ distinction is most restricted in distribution dialectally, and appears to be disappearing in the language.

4)   /baR/   [ba:r]   *barr*   'top' (Conamara)

Similarly /m/ and /m'/ only trigger lengthening. In the account I give below in section 3, this follows straightforwardly, as these sonorants don't involve a lingual articulation at all, so tongue position features which might affect vowel quality wouldn't necessarily be present.

Not all vowels undergo lengthening, and which vowels under undergo diphthongization seems to be highly dialect sensitive. For example it is highly extensive in Munster (Corca Dhuibhne etc) as described by Ó Sé (1995), Ua Súilleabháin (1994) and Sjoestedt-Jonval (1938). By contrast, the more northerly dialects have lengthening but no diphthongization. For a survey of the dialectal variation on this point, see Ó Baoill (1979), Ó Siadhail (1989), and O'Rahilly (1932). Much of my data is taken from Ó Siadhail (1989), Ní Chiosán (1991) and Ó Sé (1994).

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[1] I transcribe the length triggering sonorants here using the standard capital notations (L,R,N etc -- m is considered tense as well but is not transcribed with a capital). However, in the Corca Dhuibhne dialect described by Ó Sé, there is no overt phonetic difference in pronunciation between tense and lax sonorants. Like Ó Siadhail (1989), I do this because I assume they are underlyingly present, even when not pronounced as such.

Ó Siadhail (1989) reports that high vowels[2] almost universally just lengthen (5):

5)   /k'iL'/   [k'i:L]   *cill*   'graveyard'

The exception are in the Ring and Clare dialects, where diphthongization appears with underlying high vowels (6). Ó Siadhail claims that these forms actually involve vowel lowering, followed by subsequent application of the diphthongization that applies to mid and low vowels.

6)   /k'iL'/   [k'aiL']   *cill*   'graveyard' (Claire)

Mid vowels diphthongize in both Conamara and Munster Irish. With the resulting diphthongs being realized as [au] in front of broad [+back] consonants, and [ai] in front of slender [-back] ones.[3]

7)   a)   /poL/   [pauL]   *poll*   'hole'
      b)   /peL'/   [paiL]   *poill*   'holls'

While a few words with low vowels show diphthongization in Conamara, low-vowel diphthongization is primarily limited to Munster.

8)   /gaN/   [gaun]   *gann*   'scarce'   (Munster)
                            [gɑ:n]   (Conamara)

To summarize, tense consonants (including /R/) trigger a lengthening of the preceding vowel in most dialects. /R/, /R'/, /m/ and /m'/ seem to trigger lengthening but never diphthongization. High vowels are exempt from diphthongization as well. The further south one goes the greater chance that this lengthening is realized as diphthongization. In Conamara, mid vowels diphthongize. In Munster, both mid and low vowels under go the process. The lengthening and diphthongization is present when the sonorant is either word final or precedes a consonant. It does not occur when the sonorant precedes a vowel.

1.1 A few words on the origin of the phenomenon.

There are really two issues of interest in this process. First, we have the question of what triggers the lengthening part of this phenomenon. Second, we must address the question of what constitutes the phonological motivation for the quality change in these vowels. We can address this questions both from a

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[2] I adopt here the underlying inventories of Ní Chiosáin (1991). She claims that short vowels in Irish only show distinctions of height, the front/back distinction is predictable from the quality of the surrounding consonants (that is broad, [+back] consonants trigger [+back] short vowels and slender [-back] consonants result in [-back] short vowels.

[3] In Ring & Muskerry these can alternately surface as [ei] and [ou] (Ó Siadhail 1989).

diachronic and synchronic point of view. Before turning to an analysis of diphthongization, a few words on the possible origins of the phenomenon are in order.

By the Old Irish period, the language appears to have been in the process of losing a contrast between geminate[4] (long) consonants and single or short consonants (Thurneysen 1980). Among sonorants, the historical geminate/short contrast is retained in the distinction between tense and lax consonants (O'Rahilly 1932) (similar to the way in which the contrast between modern intervocalic fricatives and stops reflects the archaic distinction between single consonants and geminates and consonant clusters, and the way in which lax consonants constitute the lenited variant of tense consonants in many dialects). The geminate origin of these tense consonants is reflected in the modern spellings (which of course have been regularized to represent even cases that were not historically geminates) of tense consonants *<rr>, <nn>, <ll>* etc.[5] in medial & final positions. As will be seen in the next section, the geminate nature of these elements is also reflected in the compensatory lengthening they trigger.

Williams (1984) observes that it isn't at all clear when diphthongization and lengthening first appeared in Irish. Poetry from the late 16th century (well into the Modern Irish period) is the first place it is well attested. However, the effects of lengthening in these compensatory environments are well attested so we might presume an earlier origin which results from degemination. The fact that lengthening is found in all dialects, but diphthongization shows a more limited geographic distribution suggests that the diphthongizaiton is a relatively recent phenomenon. Since it is found most extensively in the dialect (Munster) that doesn't show a difference in the actual articulation of tense and lax sonorants, we might even speculate that the diphthongization is a result or residual effect of the loss of this distinction, as is hypothesized below in section 3.

2. Compensatory Lengthening

Ó Baoill (1979) and Ní Chiosáin (1991)[6] identify the phenomenon discussed above in section 1 as compensatory. I adopt here, with very little modification, the illuminating analysis of Ní Chiosáin (1991), cast in Moraic Theory (Hyman 1985, McCarthy & Prince 1986).

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[4] Greene (1956) argues that only sonorant geminates (but not obstruents) existed in Old Irish. See also the discussion in Isaacs 1997.

[5] Greene (1966) offers a different explanation for the diagraphic (*<ll>, <rr> , <nn>*) representation of tense consonants. He claims that this was a convention borrowed from Latin orthographic representations of dark and light sonorants. While this is certainly consistent with their modern usage, it doesn't explain the compensatory effects discussed below in section 2. Nor does it explain why the diagraphic forms corresponds to the non-lenited set of sonorants, as predicted by the geminate theory of origin: geminates & sonorants in clusters are resistant to lenition, thus the fact that the tense forms are the non-lenited variants follows straightforwardly.

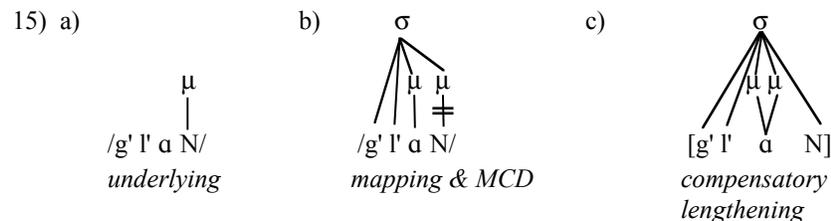[6] For a related length-based analysis of sonorant lenition, see Grijzenhout (1995)

Moraic Theory is an approach to syllable structure based on weight bearing units or morae (μ). Each language has a specific template for syllable structure. Ni Chíosáin proposes that Irish has a maximally bi-moraic template. Morae can enter into the syllable structure from two origins, one is from the template along a particular mapping procedure, the other is from inherent specification. To see how this works, compare the treatment of short and long vowels in Moraic theory. The underlying representation of short vowels contains no mora; long vowels, by contrast, have one inherent mora:

9)   *short vowels*   *long vowels*
                                                     μ
                                                     |
                    V   V

The mapping algorithm for syllables given by Ní Chiosáin is shown in (10), and the template for Irish is given in (11)

10)   a)   all [-cons] segments project a mora
        b)   morae dominating [-cons] segments project a syllable[7]
        c)   map exhuastively to the template.

11)   σ → μ (μ)

When this algorithm is applied to structures like (9) we get two verydifferent syllabic structures:

12)   a)   σ   b)   σ
              /\   /\
             μ \   μ μ \
             | \/
          C V C   C   V   C

In the case of the short vowel (12a), the syllable projects a single mora, which is allowed by the template in (11). Long vowels have an inherent mora, and also project a mora by the mapping algorithm, this results in the bi-moraic structure shown in (12b).

Ní Chiosáin argues that a similar treatment should be given to tense sonorants. These should be treated as long consonants, which have inherent morae.

13)   lax consonants   tense consonants
                                               μ
                                               |
                    /l/   /L/

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[7](10b) requires a small caveat, in that if multiple morae dominate a single vowel, then only one syllable is projected.

For Ní Chiosáin this prosodic distinction is the only difference between so called lax and tense consonants. Although she is not explicit on this point, in her inventories of Irish phonemes she presents no articulatory differences between them. I present a slightly contrasting view below in section (3).

The way in which moraic consonants get inserted into the syllable structure adds a slight complication to the mapping algorithm in (10). Ní Chosáin claims that only sonorants are allowed to bear morae. Somewhat stipulatively, she claims that sonorant consonants in Irish are never actually allowed to surface with an attached mora. This is effected by means of the rule of Moraic Consonant Delinking (MCD):

14) *Moraic Consonant Delinking(MCD)*

$$\mu$$
$$\mathbin{\text{\textdoublebarwedge}}$$
$$C$$

The result of the rule in (14) is that any syllable containing a tensed sonorant will also contain a floating mora. It is this mora that triggers the compensatory lengthening of the vowel. Consider the following derivation of *gleann* 'glen' [g'l'ɑ:N] taken from Ní Chiosáin (1991)

15) a)   b)   σ   c)   σ

            μ   μ μ   μ μ
            |
     /g' l' ɑ N/   /g' l' ɑ N/   [g' l'   ɑ   N]
      underlying   *mapping & MCD*   *compensatory*
                                                    lengthening

(15a) shows the underlying representation of this word, with the inherent mora. (15b) shows both the result of mapping to the template and the application of the MCD rule. Finally (15c) shows the resultant linking of this mora to the vowel, and subsequent resyllabificiation, which results in vowel lengthening. Syllables without moraic consonants will, obviously, not result in any vowel lengthening.

Let us now consider what happens in a form where the underlying nasal is not entirely tautosyllabic with the vowel that precedes it. This is the situation where the tense consonant precedes a vowel, and thus is ambisyllabic. An example, again taken directly from Ní Chiosáin (1991), is the genitive of the word for 'valley' [g'l'aNə][8] *gleanna*:

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[8] I have slightly modified Ní Chiosáin's transcription here to make it consistent with Ó Siadhail (1989).

16)   a)   b)   σ   σ

                μ   μ μ   μ

        /g' l' a N ə/   [g' l' a   N   ə]
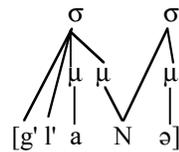
The rule of MCD does not apply in this form because the structural description for this rule specifies only one association line dominating the consonant. In (16b), there are two association lines, so the rule does not apply, thus there is no floating mora and no compensatory lengthening.

Ní Choisáin thus provides a very elegant account of the lengthening component of the phenomenon in question. What is lacking is an explanation for why in some dialects diphthongization rather than mere lengthening is triggered. It is this question that I turn to in the next section.

3. Diphthongization

3.1 Analysis

As noted above in section 1, the diphthongization component of this phenomenon is more limited both in terms of what segments it applies to, and in terms of which dialects it appears in. I think, in part because of this, an explanation for the raising of the second part of the vowel has not been readily forthcoming. It is a well attested fact that the front/back quality of these lengthened short vowels is predictable from the underlying quality of the consonants that surround it. However, why a long sonorant should affect the height of the vowel is much more mysterious. There is no obvious articulatory explanation for this fact. It is this question I turn to now.

One surprising fact that, to my knowledge, no author has commented on is the complementarity between the diphthongization of the vowel, and an overt difference in pronunciation in the tense/lax vowel. Dialects which exhibit diphthongization (such as Corca Dhuibhne and other Munster dialects; as well as Conamara Irish) seem to be precisely the set of dialects without a modern surface tense/lax distinction in sonorants. Those dialects, primarily in Ulster, with such a distinction (see for example Lucas 1979 and Hamilton 1974) exhibit only lengthening, not diphthonization.

It seems to me that this complementarity is a striking argument in favor of the phenomena being related to one another. In particular, I claim that diphthongization of vowels is a direct result of two interrelated factors. First, I claim that there is a distinction between dialects with overt expression of tense sonorants and those without it. In particular, I claim that dialects with the tense/lax distinction have an "Advanced Tongue Root" [+ATR] feature[9] attached

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[9] The choice of [+ATR] rather than [+high] may appear strange here, however the behavior of diphthongization in Conamara Irish discussed below in section 3.3 shows

to their feature complexes. By contrast, in dialects with diphthongization, I claim this feature is attached to the prosodic mora structure, and not the root node of the vowel. When the mora delinks from the sonorant, it takes the feature with it. Subsequently, when the mora is compensatorily attached to the vowel, the feature becomes attached to that vowel.
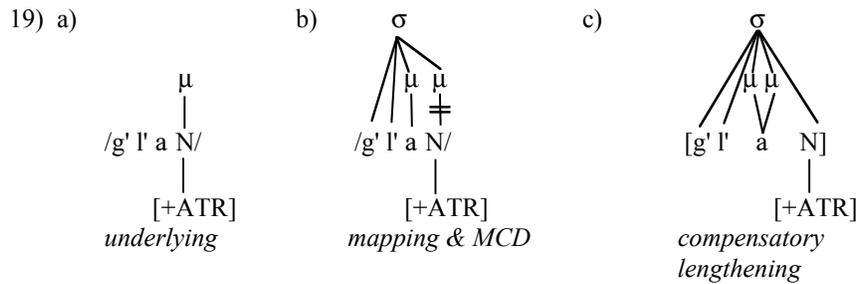
17)   a)   Munster   b)   Ulster

                 μ   μ
               ╱ ╲   │
        [+ATR]   L   L
                  │   ╱ ╲
                 …   [+ATR] …

Another way of phrasing this is that [+ATR] is a floating prosodic feature in Munster Irish, and not in Ulster. The second part of this analysis is in explaining why the [ATR] feature triggers a change in vowel height. This comes from a simple articulatory fact, ATR articulation, where the back of the tongue is advanced forward in the mouth, naturally results in the body of the tongue being forced up. The mass of the tongue muscle is stable, when the root of the tongue is pushed forward there is a necessary corresponding shift of the back of the tongue upwards to compensate as observed in Archangeli and Pulleyblank (1994). This is formalized in the grounding condition in (18b)

18) a)

   b) If [+ATR] then [+High]
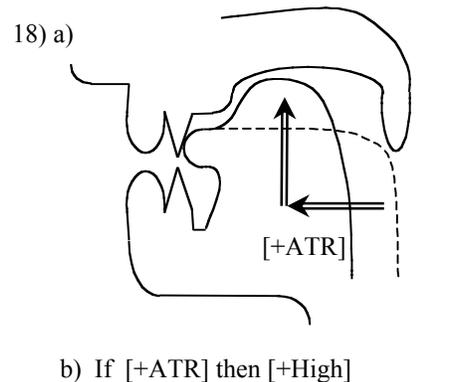
    To see how this works, let's compare the derivation of the *gleann* in Munster vs. Ulster Irish. First consider Ulster Irish, which has lengthening, tense sonorants but no diphthongization:

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that the height of the vowel is not directly correlated to a [high] feature, but is an articulatory consequence of the [ATR] feature.

19) a)   b)   σ   c)   σ

                                  μ μ   μ μ
                                  | ≠   V
          μ   /g' l' a N/   [g' l' a   N]
          |
      /g' l' a N/ |
                                     | [+ATR]
          | [+ATR]
       [+ATR]   *mapping & MCD*   *compensatory*
      underlying   *lengthening*

In Munster Irish, the [+ATR] feature is attached to the mora:

20) a)   b)   σ   c)   σ

                                 μ μ   μ μ
          μ   ≠   V
          | [+ATR] | | | | [+ATR] | | | [+ATR]
      /g' l' a N/   g' l' a N   g' l' a   n

    d)   [g'l'aun]
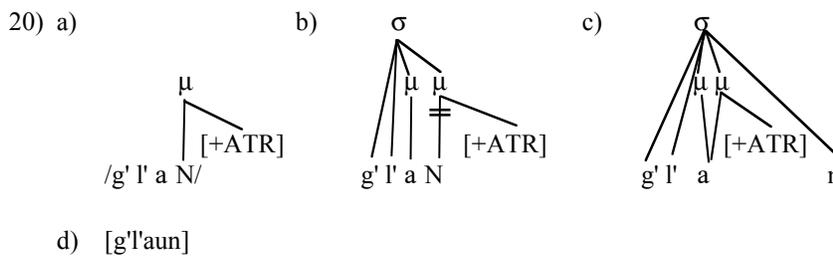
The [+ATR] on the second half of the long vowel (as in 20c), results in a
heightening of the vowel to [u] (again the reason, I posit an [ATR] feature here
instead of a [+high] feature will be clear in section 3.3 below). The reason that
the nasal does not surface with an ATR pronunciation is because the [+ATR]
feature was linked to the mora, and not the root node.

     This analysis also straightforwardly explains why high vowels never
diphthongize, they are already high, so the [ATR] feature does not force any
additional raising.

     The analysis here, of course, crucially relies on tense sonorants actually
having [+ATR] articulation. In the next subsection, I discuss the phonetics of
these tense sonorants.

3.2 The Phonetics of 'Tense' Sonorants.

Although there is extensive phonetic analysis of many Irish, this work was
primarily conducted as transcription of native speakers. Little, or no,
instrumental analyses of Irish articulatory phonetics have ever been conducted.
In particular, a clear gap in the literature is seen in the use of modern soft-tissue
imaging tools such as fMRI scans. Turning to the matter at hand, given where
in the mouth ATR articulation occurs (that is, out of view in the pharynx) it is
impossible at this point to verify with total certainty that tense sonorants do
indeed involve an advanced tongue root. I look forward to someone with an
appropriately equipped lab conducting such a verification. This said, there is
certainly attested articulatory evidence that indirectly points towards a [+ATR]
analysis.

Before we get into the details, it should be noted that many phonetic descriptions of Irish dialects totally ignore the question of differences among sonorants (Ó Baoill 1986, Ó Cuív 1924) or treat the distinction as being only one of length[10] (Ní Chiosáin 1991). Even among those that do assume a difference either synchronically or diachronically (such as Breatnach 1947, Ó Siadhail 1989, Ó Cuív 1988, Lucas 1979, Hamilton 1974, Christian Bros. 1905, Stockman 1974 etc), do not specify the nature of the difference between tense and lax sonorants, instead simply labelling them as "Tense" or "Lax". It may be naïve to interpret this terminology as referring to the same phenomena as found in the vowel system of English. However if by chance the there is such a correspondence, then tense sonorants may well be analyzed as [+ATR] much like tense vowels in English. This is of course, only the weakest of possible arguments.

Some works do provide articulatory descriptions of these sonorants. Two works on Irish phonetics are Ó Murchú (1985) and An tSiúr Annuntiata le Muire agus an tAthair Ó Huallacháin (1989). Both of these sources describe three way distinctions between /l'/,/l/, and /L'/ and between /n'/, /n/ and /N'/. These are distinguished in terms of the place of articulation of the sound, and in terms of the amount of tongue coming into contact with the roof of the mouth. Neither of these sources discuss the broad variants (/L,N/), which must also exist (as noted by Ó Siadhail 1989) at least underlyingly in order account for diphthongization and lengthening in forms like *ann* 'in it' [aun] (Munster) ~[a:N] (Ulster) even if they don't surface in any dialect. Dialect studies of Irish vary in the type and number of these sonorants. Ní Chasaide (1995) (see also Ní Chasaide 1979) provides perhaps the most detailed and accurate description of the articulation of these sounds in Ulster (Gaoth Dobhair) Irish. She also posits a 3 way distinction but this time between /l'/, /L'/, and /L/. However, she also notes that researchers within historical times have also posited /l/[11].. A similar three way distinction are made by de Bhaldraithe (1975). De Búrca (1970), Ó Baoill (1996) and Mhac an Fhailigh (1980) show four way distinctions. The following chart describes the places of articulation for each of these sonorants as described by these authors.

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[10] Ó Murchú's (1989) description of tense sonorants in the East Perthshire dialect of Scots Gaelic (which is closely related to Irish), also describes the distinction only in terms of length)

[11] Such as Quiggin (1906), Sommerfelt (1922) and Ó Searcaigh (1925)

21)

	/l, n/	/l', n'/	/L, N/	/L', N'/
A & Ó H.	alveolar (back of the tongue raised (/u/ quality)	alveolar (front (lamina) of the tongue raised (/i/ quality)	---	palatal-alveolar, with the tip of the tongue touching the lower teeth
Ó Murchu	dental	alveolar	---	palatal
Ní Chasaide	(velarized alveolar*)	palatalized alveolar	velarized dental	palatalized alveopalatal
de Bhaldraithe	---	palatalized alveolar	velarized dental	palatal
de Búrca	velarized alveolar	palatalized alveolar	dental (close to interdental)	source says palatalized alveolar (but articulatory description is of palatal
Mhac an Fhailigh	velarized post-alveolar	palatalized alveolar	velarized dental	alveopalatal
Ó Baoill[12]	tip of the tongue against the "ridge of the teeth"[13], with the back of the tongue raised towards the velum	tip of the tongue against the "ridge of the teeth", with the front of the tongue pressed towards the palate.	front of the tongue against the upper teeth	front of the tongue against the lower teeth and against the "ridge of the teeth"

*merged with velarized dental

This is quite a mess. Let us consider what unifying themes emerge: The slender lax consonants /l', n'/ seem to be quite clearly alveolar in articulation with a /i/ like quality to the sound. Broad consonants (of both lax and tense sort) seem to involve either dental or alveolar articulation with a raised tongue back, resulting in a /u/ quality to the sounds. It is not at all clear what the difference between these broad tense and lax vowels are, since researchers don't seem to agree on which ones are actually realized in the language. One thing that can be observed about Ní Chasaide's and de Bhaldraithe's descriptions is that they are fully consistent with a high tongue body or back (giving a combination of a [+back] [+high] secondary articulation) with the tongue tip anchoring the articulation at the teeth. Finally, the overwhelming trend in the description of slender tense sonorants /L', N'/ is that they involve some kind of palatal articulation with contact on the roof of the mouth stretching from the alveolar ridge to the palate with the entire body of the tongue.

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[12] Ó Baoill's description, in Irish, reads as follows (Carnie added the phonetic symbols, italics are Ó Baoill's) "Le *ll* (/L/) agus *nn* (/N/) a dhéanamh cuirtear *tosach na teanga* ar fad in éadan na bhfiacla uachtaracha nuair is consain leathana iad, agus in éadan na bhfiacla íochtaracha agus iomaire na bhfiacla nuair is consain chaola iad. Le *l* agus *n* a rá cuirtear *barr na teanga* in éadan iomaire na bhfiacla. Ar ndóigh chomh maith le suíomh bharr nó thosach na teanga ardaítear cúl na teanga i dtreo an charbaíll nuair si consain chaola a bhíonn á rá…" (p 15)

[13] I take this to mean the alveolar ridge.

This latter description is consistent with two hypotheses about the featural content of tense consonants. One is the account give above in section 3.1, where an ATR feature is present and as an ancillary effect forces the tongue body up (22). This is seen most clearly in An tSiúr Annuntiata le Muire agus an tAthair Ó Huallacháin (1989)'s description of a balled up tongue pressed against the whole front of the mouth, with the tongue tip touching the lower teeth.

22)
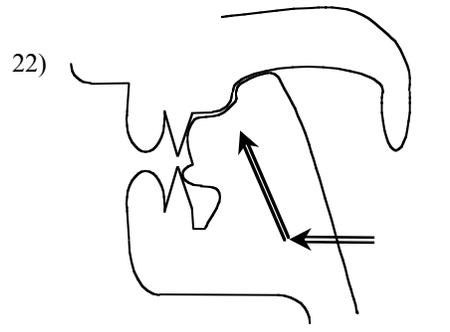
Alternately one might simply hypothesize a [+high] feature instead of ATR triggering some ancillary raising. This [+high] would result in diphthongization in Munster, and a palatal articulation of the sonorant in Ulster. There is a good reason, however, to think that the ATR analysis is preferable. This evidence comes from the behaviour of diphongization in Conamara Irish.

3.3 Diphthongization in Conamara Irish: Evidence for ATR

As noted above two possible analyses for the diphthongization exist: one where [ATR] is the relevant feature, and the vowel height is the natural consequence of this articulatory gesture. The other, is that a simple [+high] feature triggers the alternation. On the surface, the [+high] hypothesis seems simpler and is certainly consistent with the attested articulatory descriptions of tense sonorants. However, there is fairly straight forward evidence from the behaviour of the Conamara dialect[14] allows us to distinguish among these hypotheses.

In Conamara Irish, only mid vowels show diphthongization:

23)	a)	/fiL/	[fi:l]	*fill*	bend
	b)	/poL/	[paul]	*poll*	hole
	c)	/g'l'aN/	[g'l'ɑːn]	*gleann*	valley

This is a fairly surprising result. Why should low vowels be exempt from the process? We might think that an answer to this question lies in the

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[14] I use the term Conamara here as a blanket term for all the dialects on the Conamara Peninsula. However, not all these dialects behave this way. For example, Cois Fhairrge as described by de Bhaldraithe (1975) has a distinction among sonorants and doesn't (at least as far as I can tell from his description) have diphthongization.

incompatibility between [+high] and [+low], which presumably violates some universal constraint on feature co-occurrence:

24)   *[+high, +low]

If this were the case, however, we would *also* expect low vowels in Munster Irish to be immune to the phenomenon -- contra to fact. This suggests the relevant feature involved is not [+high], and the non-diphothongization of Conamara Irish low vowels finds an alternative source. In an ideal situation we would like to attribute this difference to some other phonological property of Conamara that is not found in Munster.

One feature of Conamara Irish, not regularly found in Munster is a rule of long vowel backing (Ó Siadhail 1989). Underlyingly long low vowels & low vowels that have been lengthened compensatorily (in contrast to ones that have been lengthened by certain late lengthening processes) are articulated further back in the mouth:

25)   a: → ɑ:

Consider now the articulation of such low back vowels. They are inherently incompatible with an ATR articulation-- not because of height, but because of backness. ATR involves advancing the tongue root (and thus the tongue body) frontwards, low back vowels by show the opposite effect.

26)
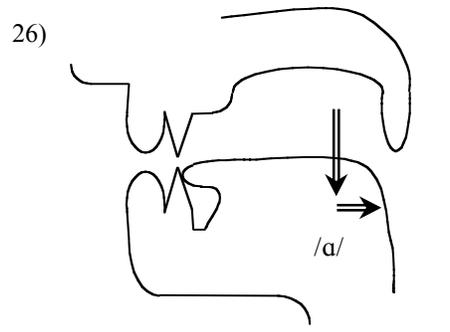
We can formalize this in the following well-formedness statement:

27) *[+Low, +back, +ATR]

If this is the case, then the ATR component of the lengthening process is neutralized by (26). Notice that this analysis requires [ATR] not [high] since there is nothing articulatorily incompatible between [+back] and [+high], indeed Irish has [+back, +high] vowels like [u]. Moreover, it allows us to derive the unexpected behavior of Conamara low vowels from an independent property of this dialect, the low vowel backing rule.

4. Conclusion

In this short paper, I have argued that diphthongization in front of tense sonorants in Modern Irish dialects is due to an ancillary effect of an [ATR] feature on those Tense sonorants. Depending upon the dialect, this [ATR] feature is either realized as a high alveopalatal articulation of the sonorant or in the raising on the second mora of a compensatorily lengthened segment. The differences among dialects have two causes. Conamara and Munster Irish in contrast with Ulster Irish, treat the [ATR] feature as a prosodic feature, associated with Morae. This explains why Munster and Conamara Irish have diphthongization but Ulster exhibits tense articulation among the sonorants. The differences between Munster and Conamara follow from the fact that the latter dialect has a vowel backing rule for low vowels, and a [+low, +back] articulation is incompatible with an ATR gesture.

What is obviously missing from this account is instrumental evidence for ATR gestures in southern Irish diphthongs, and Ulster sonorants. I hope that with the recent proliferation of such new technologies as fMRI and other soft-tissue imaging, that confirmation or refutation of this hypothesis will soon be forthcoming.

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