

FLORIAN BREIT

WELSH MUTATION AND STRICT MODULARITY

WELSH MUTATION
&
STRICT MODULARITY

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Florian Breit: *Welsh Mutation and Strict Modularity*

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For the greater glory of God,
and in memory of Uncle Peter,
who taught me the importance of love,
the meaning of sorrow,
and the struggles of happiness.

Declaration

I, Florian Breit, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

London, 13th August 2019

.....
Florian Breit

Abstract

The generative view of the language faculty is premised on the modularity of mind. In its most restrictive form, *strict modularity*, this predicts that phonological processes cannot be sensitive to syntactic information and vice versa. Initial Consonant Mutation in languages such as Welsh appear to falsify the strict modularity hypothesis in relation to the morphosyntax–phonology interface. This is because mutation involves the triggering of a phonologically regular process in a morphosyntactically determined environment.

Consider the Welsh data in (1):

- (1) /kaθ/ ‘cat’
 (a) [i χaθ] ‘her cat’
 (b) [i kaθ] ‘his cat’

The plosive–fricative alternation in (1) cannot be purely phonological in nature, because the phonological environment in (1a) and (1b) is identical. The only differentiating factor is the gender of the possessive pronoun. This is problematic because it appears as though the phonology must make reference to information proper to morphosyntax.

Virtually all preceding accounts of Welsh mutation violate strict modularity. These accounts employ ad-hoc diacritics to mark mutation environments in the morphosyntax. In most accounts, the diacritics are assumed to persist across the interface into phonology, where they can trigger phonological processes. Alternatively, it has been suggested that the diacritics trigger some form of suppletion on the mutation target. However, approaches in the latter category also necessarily appeal to phonology in a manner not compatible with strict modularity.

In this thesis I propose a new model of Welsh mutation, combining the floating feature approach of Lieber (1983) with phonologically conditioned allomorphy within a Distributed Morphology framework. I show that Welsh mutation can be accounted for successfully in this way without violating strict modularity. The account is more restrictive and makes better predictions, in particular predicting that variation is trigger-dependent. I develop the first in-depth analysis of items that are exceptionally immutable, proposing that they begin with an empty CV-sequence, a structure independently motivated by weight in Welsh and initial sC(C)-sequences in Irish.

Impact Statement

In Initial Consonant Mutation (ICM), the first consonant of a word changes according to its grammatical context. For example, in Welsh [kaθ] ‘cat’ changes to [i̯^haθ] following the first person possessive (e.g. [və i̯^haθ] ‘my cat’). Grammatically triggered phonological alternations such as this are challenging for current theories of linguistic knowledge because they are built on the assumption of a modular cognitive system. Modularity implies that phonological alternations cannot be conditioned by non-phonological information, while grammar cannot manipulate phonological forms. Yet, ICM in Welsh appears to involve precisely such a cross-modular inter-dependency.

The research presented here shows that ICM in Welsh can be accounted for wholly within a well-behaved modular model of linguistic competence. It shows that ICM can be successfully analysed as a phenomenon where a partial phonological specification, a *floating feature*, is inserted at the left edge of words that show such alternations. The floating feature is then merged with the initial consonant, giving rise to the alternation. Because the floating feature is the regular realisation of a grammatical object, no violation of modularity is involved. This theory is a clear advance over previous analyses of ICM, which rely on devices that are incompatible with modularity, such as ad-hoc diacritic features or phonological readjustment rules.

Until now, ICM has presented one of the most persistent challenges to the view that phonology and syntax are represented by independent modules within a speaker’s mental faculty of language. The analysis proposed here puts linguists in a stronger position to present language as an example of a cognitive system that is organised in a fully modular fashion.

Acknowledgments

First and foremost I must express my deepest gratitude to John Harris. Not only has John been an absolutely fantastic supervisor, but as I learned after getting run over on the first day of my PhD, he also has an excellent bedside manner. Given all the trials and tribulations along the way, I couldn't imagine having seen this through without the great commitment and care John has shown me. His help, guidance, comments, and especially his often innocuous-seeming questions, have been instrumental not only in keeping me going but in getting me to continuously refine my thinking and my writing. The latter, especially, has frequently been a rather unpleasant sight. As Thoreau put it on the inside cover of his 1854 journal:

My faults are:—

Paradoxes,—saying just the opposite,—a style which may be imitated.

Ingenious.

Playing with words,—getting the laugh,—not always simple, strong and broad.

Using current phrases and maxims, when I should speak for myself.

Not always earnest.

“In short,” “in fact,” “alas!,” &c.

Want of conciseness.

I am confident though that it would be much worse without your patience and persistence. Thank you John.

Andrew Nevins has been the ideal supervisory complement to John. It has been great fun to bounce my sometimes rather odd and naive ideas off of Andrew and discursively work out the story I was trying to tell and the context that it fit in. Andrew has also been of great help in learning to appreciate the insights of different theoretical approaches to various issues and so helped me become a bit more open minded and to think about the bigger picture in addition to my pre-existing obsession with theoretical detail.¹ Not insignificantly, Andrew has motivated me to get through the writing process by promising to brew me some gluten free beer when I'm done. Thanks Andrew, and I'm looking forward to that.

¹ Dirk Bury also deserves some credit in this regard, having taught me early on that there's always something to be learned from other approaches, no matter how much they might differ from our personal outlook.

“Omnia tempus habent et suis spatiis transeunt universa sub caelo.”

—Eccls 3:1

I am further indebted to Jamie White for extended discussion and extensive comments on much of what is now Chs. 4 and 6. He has helped significantly improve the exposition and clarity of the material contained there. Thanks also for putting up with what could at times have been described as a theoretical attitude problem on my part.

Half way through my second year, I got to go to the Welsh Summer School in Bangor and Pwllheli. It was really great to reconnect with many of my former Welsh teachers there, and I am grateful to them all for helping me both with the myriad strange questions I asked of them and with finding participants to take part in various recording sessions. In conjunction with this visit, I got to spend two wonderful months at the School of Linguistics & English Language at Bangor University. Not only did they let me use their library, desks and recording booth, but they also provided me with a plentitude of great discussions and ideas; Eirini even dragged me along to choir practice a few times to ensure I kept a healthy work–life balance while I was there.² *Diolch i chi i gyd, a diolch yn arbennig i Eirini Sanoudaki, Marco Tamburelli, Peredur Webb-Davies, Sarah Cooper, Christopher Shank ac Elwyn Hughes.*

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I couldn't have got through this whole thing without a whole bunch of lovely people here at UCL and across the street at SOAS. They have readily furnished me with many extended discussions, all sorts of advice both academic and civic, about as much distraction as I wanted (perhaps

² A lesson I should remember more often, perhaps.

more, even),³ and when times were particularly tough even with hugs and a shoulder to cry on. Thank you Connor Youngberg, Jonnie and Lena Blott, Bruno Fernandes, Elizabeth Eden, Nick Neasom, Monik Charette, Andrew Clark, Faith Chiu, Greg and Natalia Williamson, Giulio Dulcinati, Patrick Elliott, Zoë Belk, Jiří Kašpar, Caterina Paolazzi, Shanti Ulfsbjorninn, Emilia Molimpakis, Han-Byul Song, Wing-Yee Chow, Albert Lee, Jonny McIntosh, Ebany Dohle, Irene Symeonidou, and also the recent additions from upstairs Giulia Borghini and Chengxia Wang. Thanks especially for those who hooked me up with outside food and reading material during my confinement at UCH!

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If the above paragraph isn't a metaphor for my journey through education as a whole then I don't know. If it weren't for a few distinct individuals over the last twenty years or so, I would have never finished school, certainly wouldn't have ever gotten good enough grades to go to university, and even then wouldn't ever have thought about actually being in a position to go and do that. So, here's to you Herr Hasel, Frau Ruschen, Herr Schwarzkopf, Herr Hilke, and Herr Klingel. Thanks for believing in me when I didn't, and thanks for seeing right through the façade. Guess I stuck it out right till the end, after all...

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Behind every PhD student, there is a PhD family.⁵ I've been doubly blessed in this regard since returning to London five years ago. First, I've grown much closer to my parents and my siblings in spite of the distance. Second, I found a new extended family in my church, who fed me when I was hungry, comforted me when I was down, loved me when I was lonely, and gave me a home when I only had shelter. Thank you to all my brothers and sisters at St Gabriel's in Archway, and my peeps at Ogle

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⁴ No grudges though, life's just too short.

⁵ The so-called *Phamilia Discipuli*.

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Acronyms

| | |
|------|--|
| 1 | First person |
| 2 | Second person |
| 3 | Third person |
| 1SG | First person singular |
| 2SG | Second person singular |
| 3SG | Third person singular |
| 3SGF | Third person singular feminine |
| 3SGM | Third person singular masculine |
| 1PL | First person plural |
| 2PL | Second person plural |
| 3PL | Third person plural |
| a | Adjectival categoriser |
| aP | Adjectival categoriser phrase |
| ADJ | Adjective |
| A | Adjective, The element A (coronality, lowness) |
| AdvP | Adverbial Phrase |
| AP | Adjective Phrase |
| ATR | Advanced Tongue Root |
| AFF | Affirmative |
| ACC | Accusative |

| | |
|--------|--|
| Agr | Agreement |
| AgrS | Subject Agreement |
| AgrSP | Subject Agreement Phrase |
| AM | Aspirate Mutation |
| ASP | Aspiration diacritic (Kibre, 1997) |
| AUX | Auxiliary |
| C | Complementiser, Consonant |
| C/I | Conceptual-Intentional System |
| CP | Complementiser Phrase |
| CESS | Cessative aspect |
| CF | Counterfactual |
| COMP | Complementiser |
| concat | The phonological concatenation function (Kaye, 1995) |
| COND | Conditional |
| D | Determiner |
| DEF | Definite |
| DEM | Demonstrative |
| Dem | Demonstrative |
| DET | Determiner |
| DM | Distributed Morphology |
| DP | Determiner Phrase |
| DS | Deep Structure |
| ECL | Eclipsis diacritic (Green, 2007) |
| ECP | Empty Category Principle |
| ET | Element Theory |
| EQTV | Equative |
| F | Feminine |
| FEN | Final Empty Nucleus |
| GEN | Genitive |
| GP | Government Phonology |
| H | The element H (aspiration, frication, high tone) |
| {H} | Pre-vocalic aspiration diacritic (Pyatt, 1997) |
| I | Inflection, The element I (palatality, frontness) |
| ICM | Initial Consonant Mutation |
| IMP | Imperative |
| INT | Interrogative |
| INTEN | Intentional (aspect) |
| INT | Intensifier |
| IPFV | Imperfective aspect |
| PRSP | Prospective aspect |
| L | The element L (voicing, nasality, low tone) |
| L | Lenition diacritic (Roberts, 1998, 2005) |
| {L} | Lenition diacritic (Pyatt, 1997) |
| LEN | Lenition diacritic (Kibre, 1997) |

| | |
|----------------|---|
| LF | Logical Form |
| LIM | Diacritic blocking Soft Mutation on liquids (Kibre, 1997) |
| LSM | Limited Soft Mutation |
| L ₂ | Second or secondary language |
| Ⓜ | Mutation-blocking diacritic |
| M | Masculine |
| {M} | Mixed mutation diacritic (Pyatt, 1997) |
| MAXIO | Maximise Input-Output Correspondence |
| MM | Mixed Mutation |
| MS | Morphological Structure |
| N | Noun, Nucleus |
| n | Nominal categoriser |
| {N} | Nasalisation diacritic (Pyatt, 1997) |
| NAS | Nasalisation diacritic (Kibre, 1997) |
| NEG | Negation, Negative |
| NM | Nasal Mutation |
| NOM | Nominative |
| NP | Noun Phrase |
| nP | Nominal categoriser Phrase |
| num | Numeral |
| numP | Numeral Phrase |
| Num | Number |
| NumP | Number Phrase |
| O | Onset |
| OT | Optimality Theory |
| P | Preposition |
| PASS | Passive |
| pc | Personal communication |
| Pers | Person |
| PersP | Person Phrase |
| PF | Phonetic Form |
| PIC | Phase Impenetrability Condition |
| PL | Plural |
| PoA | Place of Articulation |
| POSS | Possessive |
| PP | Preposition Phrase |
| PRED | Predicative |
| PRS | Present |
| PST | Past |
| PVA | Pre-Vocalic Aspiration |
| Φ | Prosodic phrase boundary |
| φ | The phi-features; comprising person, number and gender |
| φ | The phonological evaluation function (Kaye, 1995) |
| R | Rhyme |

| | |
|-----------|---|
| RAD | Diacritic marking radical forms (Green, 2006, 2007) |
| REFL | Reflexive |
| REL | Relative |
| {s} | Spirantisation diacritic (Pyatt, 1997) |
| SG | Singular |
| SM | Soft Mutation |
| S/M | Sensory-Motor System |
| SOHC | Single Optional Headedness Condition |
| SPE | The Sound Pattern of English (Chomsky and Halle, 1968) |
| Spec | Specifier; Spec,XP is the Specifier of XP |
| SS | Surface Structure |
| σ | Syllable (constituent) |
| Σ | Foot (constituent) |
| Σ' | Superfoot (constituent) |
| T | Tense |
| TP | Tense Phrase |
| U | The element U (labiality, roundness) |
| voc | Vocative |
| v | Little v (the head of the vP shell), Verbal categoriser |
| vP | The vP shell (cf. Chomsky, 1995) |
| V | Verb, Vowel |
| VI | Vocabulary Insertion |
| VP | Verb Phrase |
| VSO | Verb–Subject–Object |
| WFS | Word Formation Strategy |
| XP | Maximal Projection |
| XPTH | XP Trigger Hypothesis (cf. Tallerman, 2009) |
| {z} | Default (non mutation triggering) diacritic (Pyatt, 1997) |
| ω | Prosodic Word (constituent) |
| × | A slot on the skeletal tier |
| ? | The element ? (stopness, glottalisation) |
| # | Word boundary marker (Chomsky and Halle, 1968) |

Introduction

1.1 SETTING THE SCENE

The generative view of the language faculty is premised on modularity of mind. In its strongest version, *strict modularity*, this implies that syntactic computation makes no reference whatsoever to phonology, and vice-versa, that phonological computation makes no reference whatsoever to syntax.

With this highly restrictive view of the interface in mind, consider the Welsh alternations in (1), known as Initial Consonant Mutations (ICMs):

- | | | | | | |
|-----|-----|-------------------------------|-----------|-------------------|-------------|
| (1) | (a) | /kaθ/ | ‘cat’ | /burð/ | ‘table’ |
| | (b) | [və <u>ŋ</u> ^h aθ] | ‘my cat’ | [və <u>m</u> urð] | ‘my table’ |
| | (c) | [də <u>g</u> aθ] | ‘thy cat’ | [də <u>v</u> urð] | ‘thy table’ |
| | (d) | [i <u>x</u> aθ] | ‘her cat’ | [i burð] | ‘her table’ |
| | (e) | [i kaθ] | ‘his cat’ | [i burð] | ‘his table’ |

In (1) we see that the initial consonant of an underlying representation (1a) in Welsh is altered systematically depending on a preceding possessive determiner (the mutated consonant is marked by underlining). If the determiner is **1SG** then the consonant is nasalised, as seen in (1b). If it is **2SG**, the consonant is either voiced (if underlyingly voiceless) or spirantised (if underlyingly voiced), as shown in (1c). If the determiner is **3SGF** it either undergoes spirantisation (if underlyingly voiceless) or no alternation takes place, as seen in (1d). Finally, the **3SGM** determiner, which is otherwise homophonous with the **3SGF** determiner, triggers no alternations at all, as shown by (1e). As is readily apparent from the differential effect of the feminine and masculine **3SG** possessive determiner in (1d) and (1e), the environment conditioning the change cannot be attributed to the phonological shape of the determiner but is closely tied to the morphosyntactic environment.

² From Emerson’s essay *Nature*.

“Nature is always consistent, though she feigns to contravene her own laws. She keeps her laws, and seems to transcend them.”

—Ralph Waldo Emerson²

Although the focus of this work is particularly on Welsh, similar ICM systems are found in all the living Celtic languages (see e.g. Ball and Müller, 1992 for Welsh; Ní Choisáin, 1991 for Irish; Iosad, 2014 for Breton; Broderick, 1984 for Manx; and Thomas, 1992 for Cornish). ICM is also found in many languages outside the Celtic family, such as Fula (Niger-Congo), Nivkh (Isolate), Nias (Austronesian), and others (for a phylogenetically diverse sample see e.g. Iosad, 2010).

ICM systems such as those in Welsh, where a regular and productive phonological change is conditioned by a morphosyntactic environment, present an obvious challenge to the strict modularity hypothesis. Indeed, all of the accounts of Welsh ICM currently available violate strict modularity in some way or other. In this thesis I attempt to show that an account of Welsh ICM fully compliant with strict modularity is in fact feasible, and that it makes stronger and better empirical predictions than current non-modular accounts, which are often inherently unable to make relevant predictions at all.

While past accounts of Welsh mutation (and Celtic mutations more broadly) have proposed to analyse them as synchronic, phonologically active processes, the most recent analyses (Stewart, 2004; Green, 2006, 2007; Hannahs, 2013a,b) all make proposals that remove from the phonological module any responsibility for implementing these alternations. Instead Green (2006, 2007) proposes that the various alternating forms of such words are lexically listed in their entirety (e.g. the entry for *ci* ‘dog’ would comprise the forms /ki:, gi:, ɨ^hi:, χi:/), and morphosyntax then subcategorises for the appropriate form. His main reason is that mutations, being triggered by morphosyntactic rather than phonological environments, cannot be accounted for purely by the interaction of universal markedness constraints and thus must be placed squarely in the remit of morphological alternations. This appears to be supported by the fact that the different mutation patterns exhibit a high degree of variation and irregularity, and that the phonological alternations they trigger seem, at least under most traditional analyses, relatively arbitrary in that different changes are applied to different natural classes even in the same environment, as we have seen in (1) above.

Hannahs (2013a,b) takes Green’s proposal and modifies it in such a way that not the entire form of each such item is lexically listed, but that

instead the initial consonant is lexically linked to its various alternants and subcategorised for. For example, *ci* ‘dog’ would be listed as something like /{k, g, ŋ^h, ʒ}i:/, with each of the initial alternants associated with a particular subcategorisation frame. One of [Hannahs’](#) primary criticisms of [Green’s](#) account is that it fails to account for the fact that mutations are productive. For instance they are readily applied to many borrowings and neologisms, as well as to the affricates /tʃ, dʒ/ which feature only in recent loans from English and are not present in the native consonant inventory.

One of the issues with [Hannahs’](#) (2013a; 2013b) proposal, however, is that he has to posit a novel lexico-morphological mechanism of initial-consonant subcategorisation only to account for initial consonant mutations. Exactly how such a process is to be implemented in the morphological and phonological components is not quite clear. If the multiple associations of each initial consonant are part of the mentally stored phonological representations of each segment then it is not clear at all why they should apply to borrowings and neologisms, or why mutations should in fact be extended to apply to new segment types altogether. If on the other hand we understand these associations to be cut loose and generalised away from individual phonological forms, then the account cannot explain why some words (mainly function words, proper names, and very recent borrowings—especially those beginning with /g/) do not take part in mutation. Implementationally, the proposal may ultimately be equivalent to assuming either that every potential target of mutation is stored without its initial consonant, which itself functions something like a prefix applicable in the correct subcategorisation frame, or that the morphological subcategorisation process directly manipulates the phonological string of the target item before insertion. The former is surely empirically difficult to implement or justify (for one, how should we decide which items should receive the “prefix” and which should not?). The latter is highly problematic if we subscribe to strict modularity—a view, one should point out, to which at least [Green](#) (2006, 2007) seems to be sympathetic.

This being as it may, one of the major empirical problems with both these types of subcategorisation account is that they place the burden of variation on the target forms rather than the triggers. However, while

there is an extremely small proportion of items which show some form of a clearly subcategorised lexicalised mutation (for instance *blynedd* /blənɛð/ ‘year’ consistently selects the nasal form [mlənɛð] following certain numerals, although most numerals do not trigger that type of mutation), variation in target forms otherwise falls pretty much squarely into a single category: a vocabulary item is either affected by mutation or it is not. What we do not find is that certain vocabulary items are missing out random alternations, e.g. an item which takes part fully in the mutation system except that it does not show the [b~v] alternation seen in (1). Conversely, as I demonstrate in Ch. 4, we find that most of the variation in the Welsh mutation system is trigger-dependent. For instance some triggers cause a defective version of the mutation pattern in (1), known as Soft Mutation, that does not affect /t/ and /tʰ/; some items trigger a mixture of Soft Mutation and another pattern, Aspirate Mutation, which spirantises voiceless plosives; for some speakers Aspirate Mutation is largely lost yet persists in a few triggers; for some speakers Aspirate Mutation only affects /k/ and /p/ or even /k/ alone, while others extend Aspirate Mutation to apply to nasals also. This is all indicative of the fact that the main locus of variation is the mutation trigger, rather than the mutation target.

While traditional rule-based accounts of ICM can deal with such trigger-dependent variation quite readily by adjusting and/or introducing specialised rules to account for each variation, they have to either assume that phonological rules can be sensitive to their morphosyntactic environments (Awbery, 1975; Ball and Müller, 1992) or that morphosyntax can introduce a set of diacritic features which persist into phonological computation and are then able to trigger the specialised mutation rules during phonological derivation (Kibre, 1997; Pyatt, 1997). Neither of these assumptions is compatible with current restrictive models of the morphosyntax–phonology interface (i.e. those assuming strict modularity or some variant thereof).

Green (2007), for instance, operating within the framework of Optimality Theory (OT), makes arguments which derive essentially the same strictly modular conclusions as Kaye (1995), namely that phonological computation operates only on purely phonological objects by way of ranking purely phonological constraints. Consequently, Green’s system allows neither

for special phonological adjustment rules sensitive to a morphosyntactic environment, nor for the introduction of some non-phonological diacritic feature to trigger such adjustments³—everything that phonology does has to be phonological processing of phonological information. This situation is in fact one of the primary motivations behind Green's (2006; 2007) account: if these architectural assumptions are correct, then Celtic ICMs simply cannot be synchronic (morpho-)phonological processes as they would require an architecture violating the assumption of strict modularity. For Green, the logical conclusion of this is that mutations must be entirely outside of phonology.

A somewhat different account of mutations has been proposed by Lieber (1983, 1987). Working in an autosegmental framework, Lieber suggests that mutations are implemented as floating features at the right edge of triggers. Whether that floating material is integrated into the target's leftmost segment depends on whether it is already specified for that feature or not. If the target is underspecified for the feature introduced by the trigger then it is absorbed; otherwise it remains unlinked and is not phonetically interpreted. While Lieber's account works well for the simpler mutation systems found in some non-Celtic languages, it has been shown to fail to account for all the facts of Welsh ICM. One of the major problems of her account of the Welsh system is that it demands that the same target segment is in one instance specified for some feature, yet in another instance underspecified for the exact same feature (for various other problems with her proposal see Ball and Müller, 1992; Kibre, 1997). For example, Lieber (1983, pp. 173–175) suggests that Soft Mutation is implemented by a floating feature bundle comprised of [+cont, +voi], causing the voicing of voiceless stops and the spirantisation of voiced stops and /m/. Voiceless plosives are specified for [–cont] and so only accept the feature [+voi], while voiced stops are underspecified for [±cont] and so accept the feature [+cont]. However, Aspirate Mutation causes the spirantisation of exactly those same voiceless plosives. Consequently under Aspirate Mutation these segments have to absorb the feature [+cont], meaning they must be underspecified for [±cont], in direct conflict with the demands of Soft Mutation. While her proposal accounts for the phon-

³ Yet, in fact, Green's (2006; 2007) account is not compatible with strict modularity, and crucially depends on modularity-violating diacritic features. I will address this issue in Ch. 5.

ological regularity and productivity of mutations and can be considered compatible with a constrained view of the morphosyntax–phonology interface, it is ultimately unable to model the complexities of the Welsh system.

The central question raised by the juxtaposition of Welsh ICM and strict modularity then is this: Is there a feasible account of Welsh ICM, which accounts for the phonological regularity and productivity of mutations, places the locus of variation on the trigger as demanded for by the empirical evidence, yet is compatible with a constrained model of the morphosyntax–phonology interface in which the morphological component cannot directly manipulate phonological objects, morphosyntactic information is invisible to phonology and phonology operates on phonological objects only? If the answer to this question is negative, as might appear to be the case from previous work, then Welsh ICM may well lead us to falsify and reject the strict modularity hypothesis. To the contrary, however, I will argue in this thesis that such an account is in fact feasible. I will put forward a new floating element account, not dissimilar in its broad conception to Lieber (1983, 1987), but tied much more closely to the Welsh phonological system overall and enriched further by extensive phonologically conditioned allomorphy within triggers. Not only is this account fully compatible with the strict modularity hypothesis, but I show that it also makes predictions that fit the empirical record better than currently available non-modular accounts.

1.2 OUTLINE OF THE THESIS

The thesis is structured as follows: Chapter 2 introduces the principal assumptions about architecture and modularity that drive the work presented here, followed by a more detailed exposition of the theoretical assumptions I make about the morphological and phonological components. This is followed by a brief overview of the Welsh language in Ch. 3. There I first give some general background on the phylogeny, distribution and essential syntactic parameters of the language, before then turning to a more detailed overview of the mutation system followed by an in-depth analysis of the Welsh consonant system. The chapter finishes with a concise analysis of the Welsh metrical system, which I will later draw on

in Ch. 7. Chapter 4 presents an in-depth survey of the Welsh mutation system, discussing the various patterns and their triggers, variation and morphosyntactic conditions for mutation. This forms the essential body of empirical facts any theory of Welsh ICM must account for. Informed by the architectural considerations in Ch. 2 and the survey of mutations in Ch. 4, I then discuss in some depth previous accounts of Welsh mutation, focusing particularly on issues they raise with regard to modularity and empirical adequacy. Chapters 6 and 7 then put forth a new account of the Welsh mutation system. Ch. 6 focuses on an introduction to the basic concepts and workings of the floating element account and shows how each mutation pattern is implemented. It also shows how this system fits well with the observed patterns of variation in the system and ends in a detailed analysis of parts of the Welsh complementiser system and nominal projection, which shows that the proposed system is not only capable of accounting for the surface data but allows for a detailed and insightful analysis of many intricate phenomena that diacritic accounts merely tend to gloss over. Ch. 7 on the other hand solely addresses the issue of immutability, i.e. the observation that some lexical items in Welsh consistently resist any mutation. This issue has never been addressed in any detail in the previous literature, and is shown here to form an insightful part of the system which the floating element account makes very strong predictions about. Chapter 8 concludes the thesis in with a brief assessment of the major themes that have featured throughout, affirming that Welsh ICM appears to be compatible with the strict modularity hypothesis and suggesting possible avenues for further research.

2

Theoretical background

2.1 INTRODUCTION

Chapter 1 introduced the basic issue addressed in this thesis: whether the phenomenon of Welsh ICM can be accounted for within the parameters dictated by a restrictive, modular architecture in which different computational components of the grammar cannot directly interact with one another. In this chapter I will set out the particular architectural assumptions I make. In §2.2, I give a brief overview of the Y-model of grammar and, informed by this, set out the basic rationale and implications of the strict modularity hypothesis. This is followed by an exposition of the theoretical framework I assume to characterise the morphological and phonological components of the grammar, Distributed Morphology in §2.3 and Government Phonology in §2.4. While the material presented there very much represents the standard version of those frameworks, §2.3.3 specifically argues for a more restrictive version of Distributed Morphology without the phonological readjustment component, on the grounds that such a component is not compatible with the modularity assumptions argued for in §2.2.2.

“I have thus a tight shingled and plastered house, ten feet wide by fifteen long, and eight-feet posts, with a garret and a closet, a large window on each side, two trap doors, one door at the end, and a brick fireplace opposite. The exact cost of my house, paying the usual price for such materials as I used, but not counting the work, all of which was done by myself, was as follows; and I give the details because very few are able to tell exactly what their houses cost, and fewer still, if any, the separate cost of the various materials which compose them: [...] \$28.12.”

—Henry D. Thoreau²

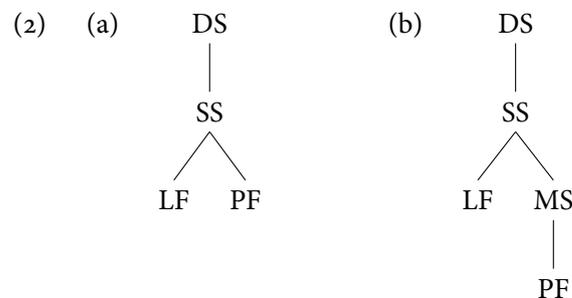
2.2 ARCHITECTURAL ASSUMPTIONS

2.2.1 *The Y-model of grammar*

I assume an overall architecture of grammar along the lines of Distributed Morphology (DM; Halle and Marantz, 1993, 1994). DM adopts the standard Y-model familiar from Government & Binding Theory (Chomsky, 1981) and the Minimalist Program (Chomsky, 1993, 1995), where syntax

² From *Walden*, Chapter 1.

draws on a set of formatives ($[\pm\text{feminine}]$, $[\pm\text{past}]$, A, N, and so forth) at the level of Deep Structure (DS) and assembles these into hierarchical representations at the level of Surface Structure (SS). The SS level is what has traditionally been assumed to feed Logical Form (LF) and Phonetic Form (PF), as shown in (2a). Chomsky (1993, 1995) seeks to abandon the syntax-internal levels of DS and SS. Instead, he proposes that relevant syntactic operations may take place whenever the conditions for them are met. Under this view, the specific conditions that were previously associated with the different levels emerge from interface requirements at LF and PF. I will retain the labels for simplicity here, but in fact assume a story more in line with Chomsky's (1993; 1995) proposal. DM adds to the established arrangement an intermediate linguistic level of Morphological Structure (MS), mediating between SS and PF, as shown in (2b).



The level of MS essentially manifests the post-syntactic spellout process. In DM this consists of two parts. The first is procedural and involves further operations such as merger, fusion and fission of syntactic terminals in preparation for translation at PF. The second is the interface proper and involves the translation of the morphosyntactic representations at SS/MS into the phonological objects proper to the PF level. Translation is essentially what Jackendoff (1997) refers to as SS-PF and SS-LF correspondence rules: conditional statements that translate morphosyntactic terminals into phonological (or semantic) formatives; in DM the translation process at the interface is termed Vocabulary Insertion (VI). It should be noted that, while the post-syntactic operations taking place at MS appear to be unique to the post-syntactic branch feeding PF, the translation procedure (VI) is exactly the same at the interface with LF as it is at the interface with PF.

The linguistic levels correspond to a set of modules: representational-computational systems which construct and manipulate representations

at the various levels. Each module consists of a set of representational pieces and computational procedures specific to that module. Thus, syntax contains representational pieces in the form of syntactic features and hierarchical relations, and procedures such as *merge* and *agree* that operate on these pieces. Semantics contains a meta-language and procedures specific to the processing of meaning. Phonology contains representational pieces such as onsets, nuclei, melodic features, various types of relations between these, and procedures such as feature (de)composition, projection, &c.

It is standardly assumed that semantics feeds the Conceptual-Intentional System (C/I) and that phonology feeds the Sensory-Motor System (S/M). Departing from this, I assume that phonology does not serve to derive a level of representation that can directly interface with S/M, but rather that phonology feeds a separate phonetics module which involves the actual (re)construction of sensorimotor-level information in the sense of [Lenneberg \(1967\)](#), with a translational interface between phonology and phonetics of the same kind as we have it at LF and PF. While the exact details of this will not bear much on the issues discussed later in this work, it implies that there is not necessarily an exact and universal one-to-one mapping between phonological atoms and their phonetic interpretation, a notion I will appeal to when discussing the representation of the Welsh consonants in §3.6. For further discussion of the issues involved and specific proposals on how post-phonological spellout might be implemented I refer the reader to [Hale and Reiss \(2008\)](#), [Scheer \(2014b\)](#) and [Volenec and Reiss \(2017\)](#).

2.2.2 *Strict Modularity*

Although the idea of a modular organisation of the mind is much older, current theorising around modularity is largely based on [Fodor's \(1983\)](#) seminal *The Modularity of Mind*. [Fodor \(1983\)](#) proposes that the mind consists essentially of central systems, a number of input systems, and a number of transducers. Transducers are the interfaces with the external physical realm. For example, the stimulation of retinal cells when hit by light of an appropriate wavelength must be transduced into an appropriate neural signal that can be processed by a mental input system. Input systems are the relatively low-level mechanisms that process the inform-

ation delivered by the transducers, and they include the visual system and the language faculty. The input systems in turn interface with the central systems, which may be thought of as the more generalised high-level cognitive faculties. One of Fodor's (1983) central claims is that the organisation of input systems is consistently modular, while the central systems may or may not be.

Fodor (1983, cf. esp. pp. 37 & 101) characterises modules as computational systems that typically possess the following properties: domain-specificity, obligatory processing, informational encapsulation, high-speed, restricted access, neural specificity, autonomy, and being non-assembled. I will not try to give a full definition or characterisation of each property here, as they are not equally relevant to my aims and ample discussion can easily be found elsewhere. The three principal properties I am interested in are: domain-specificity, informational encapsulation, and restricted access.

Domain-specificity means that the module processes only a specific type of information, e.g. speech sounds, but does not respond to information of a different type. That is, if confronted with stimuli in the form of colouration, or even non-speech sounds (cf. Liberman et al., 1967), the module specific to the processing of speech sounds (phonetics), will not become active and simply ignore the stimulus.

Restricted access means that the representations and processes internal to some module are not accessible to outside processes (or accessible only in a very limited way). For instance, we do not have conscious access to the phonological processing happening when we hear or say some utterance, and we would neither be consciously aware of the representational pieces at play (such as a phonological occlusion feature) nor of the processes taking place (such as the decomposition of some melodic feature in a lenition context). This is what Pylyshyn (1980, 1999) refers to as the cognitive impenetrability of the perceptual system.

Informational encapsulation means that the processing of a module itself is unaffected by processing or representation elsewhere, i.e. in a different module or central system. As such, when we are presented with a black square shape on white ground, we will process this shape as a square, and not as a circle, even if we are aware that the person drawing

it intended for it to be a circle. The knowledge of the intent does not influence the processing of the shape.

In summary, domain-specificity means that the module will only respond to and process a designated type of information and nothing else, restricted access means that other modules cannot access anything inside the module, and information encapsulation means that the module itself does not draw on anything outside the module (other than its input, of course).

Segal (1996) draws a distinction between intentional modules (Coltheart, 1999 calls these knowledge modules) and computational modules. Intentional modules consist primarily of a body of knowledge, perhaps arranged in specific ways, while a computational module is a system that actually provides for the processing of some form of representation. The two categories are not exclusive: Segal (1996) hypothesises that every computational module in fact realises an intentional module. As Segal (1996) points out, Chomsky's original conception of the language faculty's modularity was in terms of an intentional system, and this is sometimes seen as a reason for a relatively weak commitment to certain modular properties. Conversely, there seems to me to be a wider trend toward a computational understanding, and I take the view that we are dealing here with computational modules. While this view informs the way I phrase certain things here and in what follows, it should be made clear that whether we construe them as intentional or computational modules, the properties of domain-specificity, restricted access and informational encapsulation are no less applicable in one context or the other (cf. Segal, 1996, p. 141). That is to say, even if the reader does not share my view that we are talking here of computational modules, this should not be construed as licence to discount the matters concerned.

As Coltheart (1999) emphasises, despite some researchers' assumptions to the contrary, the characteristic properties given by Fodor (1983) are not definitive properties of every module, but rather properties that are typically associated with them (and Fodor makes this quite clear himself). Apart from domain-specificity, usually seen as the hallmark of a module (cf. e.g. Coltheart, 1999; Segal, 1996), any given module may or may not have any of the remaining properties, and "whether the particular module proposed has any one of these features is simply an empirical

question—and usually a very interesting one” (Coltheart, 1999, p. 119). One of the principal question I am interested in here is to what extent the morphosyntax and phonology modules exhibit the properties of restricted access and informational encapsulation.

Together, the properties of domain-specificity, informational encapsulation and restricted access suggest the following. First, computation in each module proceeds on a set of symbols and structures which are proprietary to that module and unavailable to others. Second, the module does not make reference in any form whatever to information from the outside. Encapsulation prevents it from seeking out this information, while restricted access prevents other modules from feeding it this information. In effect, this combination of properties completely isolates any module that has all of them. Let us call this maximally restrictive scenario *strict modularity*.

Under strictly modular conditions, all information that passes between two modules (say Module A and Module B) must undergo translation from the information type specific to Module A to that of Module B. As Scheer (2012, et alibi) phrases it, the modules speak different (mental) languages. Module B cannot understand anything said or done by Module A unless this information is translated into the symbols proper to Module B, and vice versa.

Under a different scenario, with one or more of these properties missing, we could imagine that a module might not only make use of its domain-specific, proprietary processes and information types, but additionally makes use of some domain-general processes, perhaps with related domain-general information types. Such domain-general information could either enter as part of the input the module receives, or be accessed or fed in during computation. Note however that the information fed to the module would still need to include some module-specific stimulus for it to become active in the first place. Contrasting this to the restrictiveness of the first scenario, we might term this scenario *weak modularity*.

In a weakly modular world, information encoded in domain-specific symbols would still require translation, but any domain-general information types processed by Module A could pass unhindered to Module B at

the interface, or be accessed during the computation of Module B, with minimal to no adjustment.

Given that the language faculty encompasses the processing of several strands of information by separate modules, all toward a unified end, it may very well seem plausible to consider at least the possibility that some of the relevant information types (e.g. a subset of features) are shared between them. If this is the case, then the affected modules must be weak, that is, they must lack either informational encapsulation or restricted access. As usual, in order to tell which hypothesis is tenable, we must falsify its alternative.

The weak modularity hypothesis is however not falsifiable in this case.³ To illustrate this point, we could claim that all information processed by the mind is in principle domain-general but it just so happens that some specific piece of it is never used by any other module than, say, Module B, not even by central systems (a type of accidental gap, so to speak). Even if we were able to monitor the mind of some hypothetical, entirely representative individual throughout their entire lifespan and show that no system whatever other than Module B has ever accessed that piece of information (a practical impossibility, if nothing else), we could still not reject the weak modularity hypothesis, because the fact that no other module has ever accessed it might just be accidental. Unless we find some way to show that that piece of information cannot be domain-general, we then stand no chance of falsifying weak modularity as a hypothesis.

Falsification of strict modularity, on the other hand, is readily tractable. Assuming that we have a theory of the contents of Module A and Module B that is more or less correct, if we find a phenomenon across the interface of the two modules that cannot be accounted for by translation of A-symbols into B-symbols at the interface, then the strict modularity hypothesis must be false. This is because the phenomenon must involve the passing across of some information that has not undergone translation at the interface and this could only happen if one or more of the three properties of strict modularity do not hold. For this reason strict modularity must be the default assumption, to be refuted with some interface phenomenon that cannot be accounted for without violating it.

³ It may well be falsifiable if we invent some new methodology or make massive advances in the understanding of the mind that allow us to more directly observe these properties, or infer them on some basis other than the interaction of two modules.

At present, all tenable accounts of ICM in Welsh appear to be crucially reliant on some mechanism that violates strict modularity, suggesting that ICM may falsify the strict modularity hypothesis. What I set out to do here is to show that this is not in fact the case, and that Welsh ICM can be fully accounted for without recourse to any device that violates strict modularity assumptions.

In terms of the Y-model, strict modularity means that syntax is restricted to the computation of syntactic features and hierarchical syntactic structure, semantics is restricted to the computation of semantic features and meta-language, and phonology is restricted to the computation of phonological features and phonological representations. As Jackendoff (1997, p. 87) points out, under strict modularity conditions, “[...] ‘mixed’ representations should be impossible. Rather, phonological, syntactic, and conceptual representations should be strictly segregated, but coordinated through correspondence rules that constitute the interfaces.” That is, on one side, syntax cannot compute or be sensitive to information proprietary to phonology (such as, say, stress placement or whether a word ends in a consonant). On the other side, phonology cannot compute or be sensitive to information proprietary to syntax (such as whether some string corresponds to a node in the nominal projection or whether its corresponding node has a feature [\pm def]).

Because the PF-branch operations of DM operate on syntactic features and hierarchical syntactic structure, following syntactic principles and using syntactic operations such as head movement, I will assume that its MS-level morphological system is part of a larger syntactic module. I will refer to this “combined” module as *morphosyntax*, and to things related to it as *morphosyntactic*. This is in contrast to my future use of *syntax* and *syntactic*, which I will take to refer to narrow syntax, i.e. that part of syntactic computation that takes place before branching to LF and PF.⁴

The isolatory properties I’ve bundled here under the label of strict modularity are also seen as a property of central interest for the delineation

⁴ I have no intention here to say anything about how morphosyntax may be organised internally, i.e. whether it is in some sense monolithic or decomposed in some type of modular sub-components itself, as one may for instance expect if modules themselves exhibit hierarchical organisation (cf. e.g. Block, 1995; Spector, 2002; and also Colombo, 2013), though this is without doubt an interesting question. Within DM, Arregi and Nevins (2012) have proposed the decomposition of morphosyntax into a number of such serialised (sub-)modules.

of modules by Fodor (2000), in the study of the perceptual system by Pylyshyn (1980, 1999), and specifically in the study of the morphosyntax–phonology interface by Scheer (2012, 2014a,b).

Something on the order of strict modularity has long been assumed in syntax, as embodied for instance in the formulation of the Principle of Phonology-Free Syntax (Zwicky, 1969; Zwicky and Pullum, 1983, 1986; Miller et al., 1997), which precludes any reference whatever to phonological information during syntactic computation. In stark contrast to this syntactic principle, which they hold to be universal and which has been widely adopted, Zwicky (1969) originally proposed that phonology is subject to a “Principle of Superficial Constraints”, which merely limits the access of phonology to “certain (not all) types of information available in superficial syntactic structure” (Zwicky, 1969, p. 411). Zwicky (1969) in fact argues that the strongest version of the Principle of Superficial Constraints one could imagine (presumably something more aptly called the Principle of Syntax-Free Phonology) is untenable from the outset and there doesn’t even appear to be a need to seriously entertain it. Miller et al. (1997, p. 68) similarly suggest that the inverse of the Principle of Phonology-Free Syntax is not tenable. It is widely agreed, they argue, “that the rules of pronunciation can refer to grammatical structure” and “[n]o one, for example, would attempt to state the rules for the strong and weak pronunciations of English auxiliaries [...] without making reference to syntax” (many contemporary phonologists would of course deny that their differentiation is phonological at all). This is symptomatic of the standard view in the field: morphosyntax is strictly modular but phonology is only weakly modular.

As I have argued above, I take the view that we must seriously entertain the hypothesis that something like a Principle of Syntax-Free Phonology holds universally. The view I take here is conceptually closely aligned with the outlooks of Scheer (2012) and Jackendoff (1997), who essentially assume what I call strict modularity and see how this determines the forms the grammar can take. My outlook differs in my specific assumptions about the characterisation of the morphosyntactic and phonological components. For instance, I commit to the DM architecture and assume Standard Government Phonology, where Scheer makes no such commitment and assumes Strict CV for the phonological component.

Nonetheless, our goals as they concern the role of modularity in phenomena at the morphosyntax–phonology interface are similar and hopefully commensurate.

2.3 DISTRIBUTED MORPHOLOGY

As already outlined in §2.2, I assume a **DM** architecture of the grammar. In §2.2, I have given a brief outline of how the different modules of the grammar are organised and how they interface with each other. In this section I will very briefly outline some of the central properties of **DM**, especially post-syntactic morphological operations and translation at the interfaces. For more comprehensive overviews see e.g. Halle and Marantz (1993); Harley and Noyer (1999); Siddiqi (2010); Nevins (2016); and Bobaljik (2017).

2.3.1 Lists for a Lexicon

Generative theories have traditionally posited a central lexical component. In such theories, the lexicon contains fully specified lexical items that include all relevant syntactic, semantic and phonological properties. Additionally, it is often assumed that at least some portion of word formation takes place in the lexicon, especially that of a derivational kind; an assumption known as the Lexicalist Hypothesis (cf. e.g. Chomsky, 1970; Jackendoff, 1972) and thoroughly rejected by **DM**. Instead of a central lexical component, the structural information previously associated with items therein is assumed to be distributed across a number of separate lists, drawn upon at different levels of representation.

The *Formative List* consists of bundles of morphosyntactic features such as [+feminine], [D], [+past]; some language-specific morphological features such as the Latin declension class features [I], [II], [IIIa], and so forth; and of *roots*. Following Harley (2014) I will assume that roots are simply indices; they do not themselves contain any syntacticosemantic features and are thus asemitic and atomic units. For instance the root $\sqrt{3158}$ may eventually be spelled out as [fiʃ] at **PF** and receive the interpretation [fish] at **LF**, but the only property relevant during morphosyntactic computation is that $\sqrt{3158}$ is a different root from $\sqrt{3157}$, $\sqrt{3159}$, $\sqrt{271}$, &c.

While Harley (2014) uses purely numerical labels for roots to highlight their indexical nature and Nevins (2016) adopts a combination of spelling and numbers (e.g. $\sqrt{\text{fsh58}}$), I will simply use descriptive English labels for roots, such as $\sqrt{\text{fish}}$, on the understanding that they are indexical in the sense of Harley (2014).

The notion of the root also underlies the distinction of what in DM are called *f-morphemes* and *l-morphemes*. F-morphemes are terminal nodes composed purely of morphosyntactic feature bundles, thus roughly resembling the notion of functional categories; L-morphemes are terminal root nodes with no inherent semantics and relative morphosyntactic inertness, thus roughly resembling the notion of lexical categories.

Syntax draws items from the Formative List to form a numeration, from which it then builds hierarchical structures through successive application of the syntactic merge operation. A principal assumption of DM is that word formation occurs through further operations on the syntactic structure that take place during spellout, after syntax proper, following the motto “syntax all the way down”. Such post-syntactic operations may involve the rearrangement, addition or deletion of terminal nodes or features, something I will turn to shortly. Syntax all the way down goes hand in hand with another central assumption of DM, Late Insertion. Late Insertion means that formatives do not have a fixed semantic interpretation or phonological form during morphosyntax; they only acquire these at the end of spellout when the formatives are translated into symbols appropriate to the respective interface, a process known as Vocabulary Insertion (VI) on the PF branch.

The *Vocabulary List* contains pairings of morphosyntactic formatives and phonological forms. For instance (3) shows the listing of two vocabulary items from the Vocabulary List of English: the pairing of a plural Num head with the regular English plural suffix $/-z/$, and the pairing of the root $\sqrt{\text{fish}}$ with the phonological form $/\text{fi}\text{ʃ}/$.

(3) VOCABULARY LIST (English, excerpt):

- (a) $[\text{Num}, +\text{pl}] \leftrightarrow /-z/$
- (b) $\sqrt{\text{fish}} \leftrightarrow / \text{fi}\text{ʃ} /$

Vocabulary items will frequently overlap in the features they specify. For instance, neglecting Latinate stems, English has at least four exponents of

number: zero for plural on words like *sheep*, *fish*, *deer*, &c., /-ən/ on *ox*,⁵ /-z/ for plural, and zero for singular. Obviously the first three must all minimally refer to the feature bundle [Num, +pl]. Thus, the Vocabulary List of English will contain further items relating to number marking such as those in (4).

- (4) VOCABULARY LIST:
- (a) [Num, +pl] ↔ /-ən/ / ___ {√ox, (...)}
 - (b) [Num, +pl] ↔ ∅ / ___ {√sheep, √fish, √person, ...}
 - (c) [Num, +pl] ↔ /-z/
 - (d) [Num] ↔ ∅

Where several exponents are available for some terminal, as is the case with Num in (4), vocabulary items compete for insertion following the *Subset Principle*, given in (5).

- (5) SUBSET PRINCIPLE (Halle, 1997):

The phonological exponent of a vocabulary item is inserted into a morpheme in the terminal string if the item matches all or a subset of the grammatical features specified in the terminal morpheme.

When several vocabulary items meet the conditions for insertion, the item matching the greatest number of features specified in the terminal morpheme is chosen.

Items (4a) and (4b) are context sensitive, in this case showing sensitivity to the adjacent root. Following the Subset Principle, these two items are inserted specifically when the Num head is specified for [+pl] and they precede an item such as *ox*, *sheep*, or *fish*. In all other cases where Num carries the feature [+pl], (4c) will be inserted and Num will consequently be exponed as /-z/. Finally, item (4d), called the elsewhere item, is inserted for all instances of Num that do not meet one of the more specific conditions of (4a–c). Note that this does not just mean a plain Num head with no other feature content, but it could for instance include a Num node specified [–pl] : given that there is no item specifically for [Num, –pl], (4d) would still be the item matching the greatest number of features on

⁵ For some speakers /-ən/ is also used for the plural of *box* (a desktop computer or server), *vax* (a series of computers manufactured by DEC in the 1970s and 1980s) and more rarely some other technical terms with similar forms (cf. e.g. Crystal, 2006, p. 89).

that terminal and thus end up being inserted (i.e., the Subset Principle implies that vocabulary items may be underspecified).

In the plural example above, $\sqrt{\text{person}}$ in the context of [Num, +pl] should be spelled out as /pi:pəl/, not as /pɜ:sən/+∅. The root $\sqrt{\text{person}}$ must have at least two vocabulary items, as shown in (6).

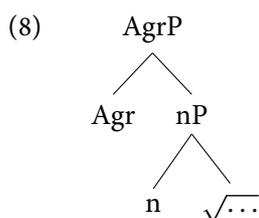
- (6) VOCABULARY LIST:
- (a) $\sqrt{\text{person}} \leftrightarrow /pi:pəl/ / [\text{Num, +pl} \text{ ___ }]$
 - (b) $\sqrt{\text{person}} \leftrightarrow /pɜ:sən/$

The entries in (6) encode the suppletive behaviour of $\sqrt{\text{person}}$, inserting /pi:pəl/ in place of the root where the adjacent Num head is specified [+pl] and inserting /pɜ:sən/ in every other case. However, (6) is somewhat unsatisfactory analytically, as it accounts neither for the individuating plural use of *persons* in contexts such as “persons unknown”, “persons of interest”, “missing persons”, &c., nor for the use of *people* in verbal uses of the root $\sqrt{\text{person}}$ such as “to people the world” (meaning something akin to “to populate the world”). Arregi and Nevins (2014) thus propose that the differentiation between the two exponents is brought about by an additional SEP head, situated between Num and n. SEP is what gives the individuating reading of *person* both in the singular and the plural *persons*, while *people* is a type of pluralia tantum. Under this analysis /pi:pəl/ can be treated as the elsewhere item (thus also selected when categorised by v), while /pɜ:sən/ occurs in the context of SEP.

In (4a–b) we saw that vocabulary items can be contextually conditioned by morphosyntactic information, such as an adjacent root, or in (6a) an adjacent terminal/feature bundle. Vocabulary items can also be conditioned by phonological context. Korean is well known for the many instances of phonologically conditioned allomorphy in its suffixal system (see e.g. Sung, 2005; Kim, 2006). For instance, the nominative suffix has two allomorphs, /-ka/ and /-i/; the former is attached to vowel-final stems, the latter to consonant-final stems, as shown in (7) (data from Sung, 2005, p. 47).

- (7) /cip/ ‘house’ → [cipi] ‘house.NOM’
 /c^ha/ ‘car’ → [c^haga] ‘car.NOM’

Let us assume that case in the nominal system of Korean is realised by an Agr projection inserted above nP, as shown in (8).



The Korean nominal suffix alternation can now be accounted for with the phonologically conditioned vocabulary items in (9).

- (9) VOCABULARY LIST:
- (a) [Agr, nom] ↔ /-ka/ / V ____
 - (b) [Agr, nom] ↔ /-i/

VI proceeds cyclicly bottom-up, that is, from the most deeply embedded terminal (typically a root) outward. This means that the root in (8) is inserted first, either as a consonant-final item such as /cip/ or a vowel-final item such as /c^ha/. This is followed by insertion of the categoriser **n** (with a zero exponent in this case) and then the **Agr** head. Thus, at the point where **Agr** undergoes insertion, the phonological shape of the root has already been determined, and where this is vowel final (9a) will be inserted. In all other cases (9b), functioning here as the elsewhere item, will be inserted (the /k/ in the post-vocalic allomorph subsequently undergoes intervocalic voicing to derive surface [c^haga]). As Bobaljik (2000) concluded, cyclic bottom-up VI predicts that phonologically conditioned allomorphy can only be inward-sensitive, i.e. whenever a node is inserted, it can only refer to phonological properties of other nodes that have already be inserted. Outward-sensitive phonologically conditioned allomorphy, such as say a suppletive root /fu:/~/ba:/ conditioned by whether a c-commanding determiner is vowel or consonant final, should be impossible.

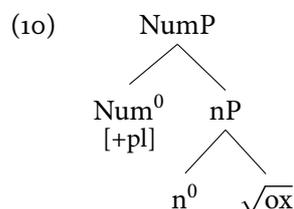
Finally, the *Encyclopædic List* is the analogue to the Vocabulary List on the LF branch, that is it contains information about the semantic interpretation of terminals. Traditionally it has often been assumed that the Encyclopædic List only contains idiosyncratic semantic information, called *idioms* in DM, such as $\sqrt{\text{kick}}$ being interpreted as something like $\llbracket \text{die} \rrbracket$ in the context of $\sqrt{\text{bucket}}$ —we can see this as a case of *allosemy* analogous to PF root suppletion such as *person~people* or *bad~worse*. A notable consequences of Harley's (2014) indexical theory of roots worth

pointing out is that every root must be an idiom, i.e. all roots acquire their semantic content at the end of processing on the LF branch. Whether allosemy applies as readily to f-morphemes as to l-morphemes is debated. I will not discuss details of the Encyclopædic List or LF-exponence in any more depth here, since these issues are not of much relevance to the work undertaken below.

2.3.2 Morphological Operations

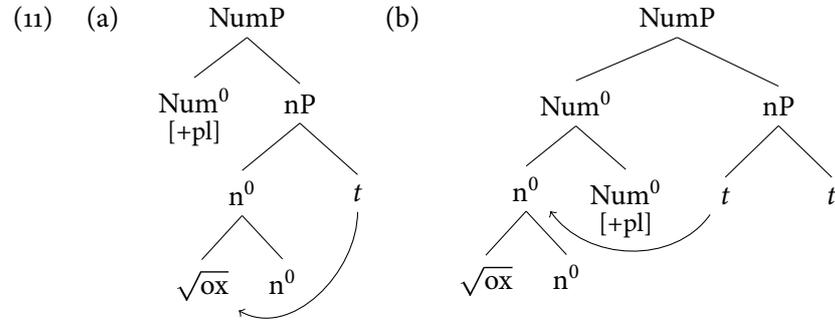
As a realisational theory of morphology, every exponent in DM must correspond to a feature or feature complex on a terminal node in the morphosyntactic structure. We've already seen one way DM can account for certain mismatches between the structure produced by syntax proper and its exponents, namely through zero exponence, typically in combination with suppletion at adjacent nodes. The syntax all the way down paradigm adopted by DM however also offers another possibility: post-syntactic (i.e. following syntax proper) operations on the terminals themselves.

Head movement is one of the operations that can take place both in syntax proper and post-syntactically. Under head movement a head Y^0 in a structure $[_{XP}X^0 [_{YP}Y^0]]$ moves up and is adjoined to its immediately c-commanding head X^0 , creating a structure of the form $[_{XP}X^0+Y^0]$. Head movement is crucially implicated in the formation of the *M-word* domain (the “morphological word domain”). The *M-word* is defined as the domain of an X^0 projection that is itself not immediately dominated by another X^0 projection. In the English plural example entertained above, we have so far simply listed exponents for roots and for a c-commanding Num head without looking at the structure involved. Syntactically, a form such as *oxen* will have the structure in (10).

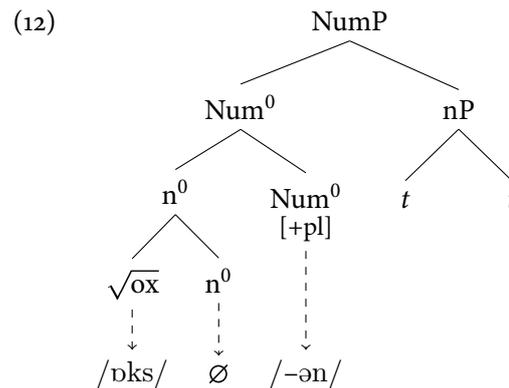


Clearly, Num and $\sqrt{\text{ox}}$ in (10) do not form an M-word. However, a defining property of affixes is that they are part of a complex M-word domain

rather than constituting independent M-words. Post-syntactically, there are two instances of head movement that apply to (10) to build an M-word incorporating the root and categoriser in the domain of NumP. First the root $\sqrt{\text{ox}}$ moves to the adjacent categoriser n as shown in (11a). Subsequently the complex head n moves to Num, as shown in (11b).



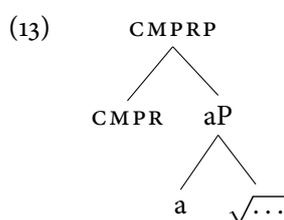
It is the structure in (11b) that VI applies to. Starting from the root, $\sqrt{\text{ox}}$ is expounded as /ɒks/, n receives zero exponence, and finally Num receives the exponent /-ən/, as shown in (12).



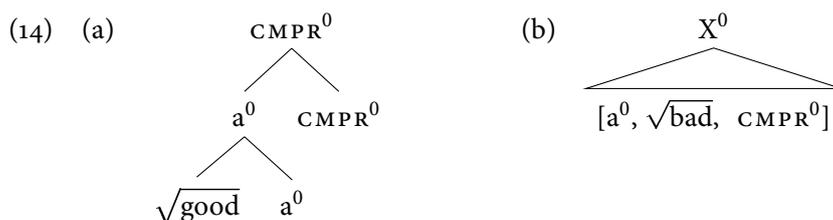
The pieces in (12) form the input to phonology and will then eventually surface as [ɒksən]. At this point it is also important to note that the derivation of (12) does not imply that head movement in some way fixes directionality and Num can only be expounded as a suffix. Affixal vocabulary items are specified in the Vocabulary List for whether they are prefixes, infixes or suffixes. This is indicated by a dash “-” in the appropriate place: /un-/ is a prefix (cf. *undo*), /-ən/ is a suffix (cf. *oxen*), /-mə-/ is an infix (cf. *sophistimacation*). Just like a single terminal can have both overt and zero exponents, so a single terminal can have both exponents that are prefixal and exponents that are suffixal associated with it. Linearisation in this sense happens late in DM and cannot simply be read off the

syntactic structure (pace Kayne, 1994). For ease of exposition I will follow the practice of graphically arranging syntactic sister nodes in the linear order in which they are eventually spelled out wherever this is feasible.

Fusion is an operation similar to head movement, but rather than creating an internally complex head, the two heads are fused into a single terminal. This is what gives rise to *portmanteaus*: configurations where a single vocabulary entry expones multiple syntactic terminals at once. Consider for instance English comparatives. We have regular *smart* ↔ *smart-er*, suppletive *good* ↔ *bett-er*, and suppletive *bad* ↔ *worse*. Bobaljik (2012) proposes that *-er* is the spellout of a comparative head CMPR which takes an aP as its complement, as shown in (13).



Clearly, the type of suppletion found in *better* is different from that in *worse*. In *better* the root is suppletive but CMPR is exponed as regular *-er*, while *worse* is a portmanteau that simultaneously expones both CMPR and the root $\sqrt{\text{bad}}$. Following Bobaljik (2012), this can be analysed as $\sqrt{\text{good}}$ undergoing simple head movement,⁶ forming a complex CMPR head as shown in (14a), while $\sqrt{\text{bad}}$ undergoes fusion, creating a new monolithic head here labelled X^0 that incorporates all the features of the fused heads a^0 and CMPR , as shown in (14b).



CMPR , $\sqrt{\text{good}}$, $\sqrt{\text{bad}}$ and X^0 will be exponed via the vocabulary items in (15).

⁶ Actually, Bobaljik assumes a *merger* operation that can be seen as a somewhat more general version of head movement restricted to the post-syntactic component.

- (15) VOCABULARY LIST:
- (a) $\text{CMPR} \leftrightarrow /-\partial/$
- (b) $\sqrt{\text{good}} \leftrightarrow /b\epsilon t/ / \text{ ______ } \text{CMPR}$
- (c) $\sqrt{\text{good}} \leftrightarrow /g\upsilon d/$
- (d) $\sqrt{\text{bad}} \leftrightarrow /b\ae d/$
- (e) $[a, \sqrt{\text{bad}}, \text{CMPR}] \leftrightarrow /w3:s/$

What is notable about (15) is that $\sqrt{\text{bad}}$ itself is only associated with a single exponent $/b\ae d/$. The exponent $/w3:s/$ is only associated with the X^0 (the fused feature bundle $[a+\sqrt{\text{bad}}+\text{CMPR}]$). This also predicts correctly that where fused (14b) is further selected by a superlative SPRL head and X^0 undergoes normal head movement to SPRL^0 , it will then receive the regular superlative suffix $-st$ (i.e. *worst*). Conversely, whenever $\sqrt{\text{bad}}$ is prevented from fusing with CMPR , for instance by an intervening evaluative head EVAL as proposed by Arregi and Nevins (2014), then the comparatives and superlatives will be *badder* and *baddest*, just as with non-suppletive forms such as *smart* \leftrightarrow *smarter* \leftrightarrow *smartest*.

Fission is in a way the converse operation of fusion. While Noyer (1992) originally conceptualised fission as an operation that spelled out subsets of features on a terminal until all feature–exponent matches are exhausted, I will follow Arregi and Nevins (2012) and Nevins (2016) in assuming that fission splits a single terminal node into two separate terminals. Fission is triggered by featural co-occurrence constraints. For instance, in Basque the features $[-\text{author}]$ (which distinguishes second and third person from $[\text{+author}]$ first person) and $[\text{+pl}]$ may not co-occur on the same terminal. This is clearly visible in the paradigm of the pronominal clitic found on Basque auxiliaries, shown in (16) (from Nevins, 2016, p. 65).

| (16) | Absolute | | Dative | | Ergative | |
|------|-----------------------|---------|----------|--------|----------|-------|
| | SG | PL | SG | PL | SG | PL |
| 1 | n- | g- | -(s)t(a) | -ku | -t/da | -gu |
| 2 | s- | s-...-e | -tzu | -tzu-e | -su | -su-e |
| 3 | (absent) ⁷ | | -tz(a) | -tz-e | -∅ | -∅-e |

⁷ A third person absolutive pronominal clitic does not arise due to independent syntactic factors.

As can be seen in (16), whenever [+pl] co-occurs with [−author], we find a suffix *−e* exponing the plural feature. The combination [−author, +pl] will still be derived in the syntax, but must be resolved before VI takes place. This is achieved by splitting up the terminal of the pronominal clitic, with the features [−author] and [+pl] distributed across the two new terminal nodes. All the non-violating features are simply copied to both nodes. This is illustrated in (17).

$$(17) \left[\begin{array}{c} \text{case: } \alpha \\ \beta\text{participant} \\ \text{−author} \\ \text{+plural} \end{array} \right] \rightarrow \left[\begin{array}{c} \text{case: } \alpha \\ \beta\text{participant} \\ \text{−author} \end{array} \right] \left[\begin{array}{c} \text{case: } \alpha \\ \beta\text{participant} \\ \text{+plural} \end{array} \right]$$

Subsequently to splitting the terminal as in (17), the [+pl] node will be exponed as *−e* while the [−author] node will be exponed as the other affix shown in (16).

Finally, *impoverishment* (first proposed in Bonet, 1991 and Noyer, 1992) is an operation that deletes features from a terminal node in specific contexts. As with fission, a common conception of impoverishment is that it is a strategy to resolve specific constraints on the occurrence of features in a specific context. For instance, it is well known that most languages with a gender distinction (including English) restrict the pronominal gender contrast to the third person (cf. e.g. Siewierska, 2013). I follow Halle (1997) in assuming that person distinctions are encoded by the two features [±author] (whether the referent is the author of the speech event) and [±participant] (whether the referent is a participant in the speech event). This gives us the three-way distinction in (18).⁸

- (18) 1 [+author, +participant]
 2 [−author, +participant]
 3 [−author, −participant]

Languages that don't allow a gender distinction in the first and second person have a constraint *[+participant, fem], which is resolved by deleting [±fem] from any terminal node that is specified [+participant]. In addition, many of the languages that only allow gender in the third person restrict this further to the third person singular, meaning this subset of

⁸ Note that the fourth combinatorial option, [+author, −participant], is logically impossible.

3-only languages have an additional constraint *[+pl, fem], resolved again by an impoverishment rule deleting [\pm fem] from such terminals. It is notable that, although rare, there are languages that show impoverishment sensitive to the opposite feature combinations here. For instance, Dagaree is a 3-only language that restricts the gender distinction to the plural, i.e. Dagaree has a constraint *[-pl, fem]. Similarly, Burunge and Iranqw both allow the distinction of gender in the first and second person, but not in the third person. These two languages thus must have a constraint *[-participant, fem], illustrating the principal arbitrariness of the restrictive context.⁹

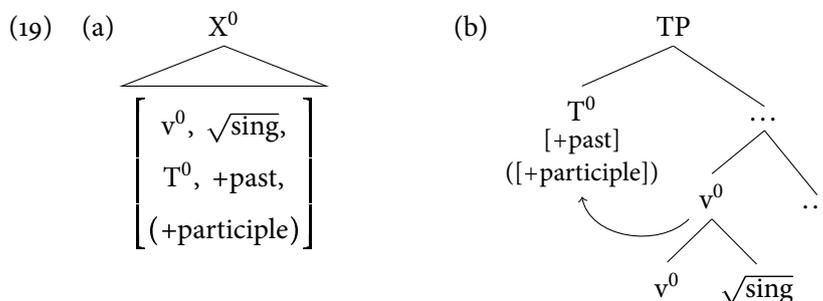
Impoverishment always leads to neutralisation of some form, because a feature is eradicated and consequently a more general vocabulary item may be inserted. In line with most work in DM, I assume that feature-changing impoverishment (e.g. changing [+fem] to [-fem] in the context of [+participant]) is not possible. Arregi and Nevins (2012) propose that, in extreme cases, impoverishment can delete an entire terminal. This special case of impoverishment is termed *obliteration*.

2.3.3 Phonological Readjustment

So far, the morphological operations and the mechanism of VI we have discussed can only produce discrete piece-based morphology. It is straightforward to account for the past and past participle forms of an English verb like *work*: the root $\sqrt{\text{work}}$ has a single exponent /wɜ:k/, with an adjacent tense head T carrying the features [+past] or [+past, +participle] being spelled out as a suffix /-d/ to produce *worked* [wɜ:kt]. What however about the simple past and past participle of English strong verbs, such as the class 6 verb *sing* with simple past *sang* and past participle *sung*? Once we know that a specific root is associated with class 6, the change in the vowel is entirely predictable, yet we cannot neatly segment *sang* into two morphemes corresponding to the root and T. In this situation, we'd likely be forced to say that all the English class 6 strong verbs have three suppletive exponents, and a T head adjacent to one of the class 6 items presumably undergoes fusion with the root. In comparison, a class

⁹ This is not to say that there isn't some universal principle at work that makes restrictions with the positively valued features much more likely than the opposite case.

2 strong verb such as *choose* with simple past *chose* and past participle *chose-n* has two exponents but does not appear to undergo fusion with [+participle] heads.¹⁰ Under this analysis, *sang* and *sung* would have the fused head structure in (19a), derived from (19b).



In order to expone (19a) correctly, we need a set of three exponents for each of the class 6 verbs as shown in (20).

(20) VOCABULARY LIST:

(a) $[v, \sqrt{\text{sing}}, T, +\text{past}, +\text{participle}] \leftrightarrow /s\Delta\eta/$

(b) $[v, \sqrt{\text{sing}}, T, +\text{past}] \leftrightarrow /s\ae\eta/$

(c) $\sqrt{\text{sing}} \leftrightarrow /s\eta/$

DM does however offer another alternative, where the vowel alternation between *sing~sang~sung* is derived by a phonological rule in a subcomponent of the morphology termed *phonological readjustment*. Phonological readjustment applies to individual exponents *after VI* and contains phonological rules that are sensitive to the morphosyntactic environment. This is exactly how Halle and Marantz (1993) propose to analyse the stem alternations in English strong verbs (of all classes). Class 6 strong verbs, for instance, would be subject to readjustment rules such as those in (21).

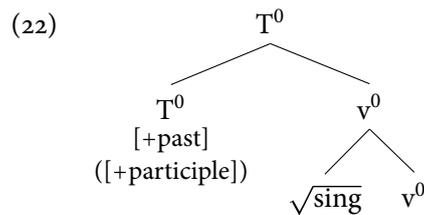
(21) (a) Rhyme $\rightarrow \ae / X_ [+past, -participle]$

(b) Rhyme $\rightarrow \Delta / X_ [+past, +participle]$

where X-Rhyme = $\{\sqrt{\text{sing}}, \sqrt{\text{ring}}, \sqrt{\text{drink}}, \dots\}$

Under the phonological readjustment analysis, the M-word ultimately expounded as *sung* or *sang* will have the same unfused structure a regular verb such as *work* would have. This is shown in (22).

¹⁰ A slightly less satisfying analysis would perhaps be to say that *sing~sang~sung* suppletion is all on an unfused but head-moved root and T has zero exponence for class 6 strong verbs.



In (22), the root undergoes VI and /sɪŋ/ is inserted. /sɪŋ/ is then subjected to the readjustment rules in (21), which turns it into [sæɪŋ] or [sʌɪŋ] depending on the features on T.v⁰ and the T⁰ node with the [±past] and [±participle] features then receive a zero exponent conditioned by the presence of a class 6 root (whereas for $\sqrt{\text{work}}$ T⁰ would here receive the exponent /-d/).

Readjustment then allows some regularities to be captured that appear otherwise opaque in the morphological approach taken in DM. However, phonological readjustment is also a problematic device in many ways. As Siddiqi (2006, 2009) points out, readjustment was in the first place based on the assumption that DM does not permit root suppletion, which ruled out suppletion analyses such as (20). However, following Pfau's (2000) work on speech errors and DM and also when adopting Harley's (2014) indexical theory of roots, it is clear that root suppletion—although much rarer than suppletion of f-morphemes—is real. Consequently, if suppletion analyses such as (20) are possible, we ought to ask whether readjustment is necessary at all.

Siddiqi (2006, 2009) argues that having an additional readjustment mechanism when a suppletion analysis is possible is undesirable for a number of reasons. First, readjustment being a rewrite mechanism (or, transformation) is a different type of grammar than DM's morphological operations; if there is no need to have this second type of grammar, economy dictates that readjustment should be dispensed with, thereby simplifying the model of DM. Second, readjustment rules introduce an undesirable type of frequent zero exponence into the grammar: in most cases where readjustment rules such as (21) expone some morphological feature, the node of that feature itself receives zero exponence. We have already argued, and it has been widely accepted, that such mutual conditioning without overt double exponence is undesirable in the case of head movement domains and has led to the adoption of head fusion to avoid precisely this situation, yet readjustment actually leads to a systematic

proliferation of exactly the same condition. And, thirdly, head fusion and competition for insertion of a root (i.e., root suppletion as in (20)), which avoids the problem of proliferating spurious zero exponence, can be motivated from more general principles of the grammar, such as Siddiqi's *Minimise Exponence* principle, which proposes a general requirement whereby morphology has the task of reducing the number of exponents as far as possible given the grammar (i.e. Vocabulary List, morphotactic constraints, type of structure fed to MS, &c.) of a specific language. In the cases at hand, this motivates head fusion both in cases such as *bad~worse* as well as in cases such as *sing~sang~sung*.

Another issue that has been widely acknowledged recently (Bobaljik, 2012, p. 140; Bermúdez-Otero, 2013, p. 83; Merchant, 2015, pp. 281f) is that no analytic criterion has hitherto been identified that could reliably discriminate between phonological readjustment and suppletion, when in principle we would expect that two such radically different grammatical mechanisms should yield at least some analytically clearly differentiable cases. Merchant (2015, p. 282) puts the issue very bluntly: "Without a criterion for deciding when a morphophonological readjustment rule is involved [...] the appeal to unspecified readjustment rules threatens to be no better than Justice Stewart's famous criterion for recognizing pornography ('I know it when I see it')." While this further questions the desirability of a division between regular morphological operations and phonological readjustment in the model, as Merchant (2015, fn. 11) points out, it does not necessarily mean that readjustment rules shouldn't exist per se. They may well provide an insightful means to model analogical change that would remain hidden from us in a purely suppletive world, but they are perhaps not part of the spellout mechanism of synchronic grammars.

The principal problem with readjustment from the modularist perspective I have adopted in §2.2 is that readjustment is clearly a modularity offending device. On the one hand, strict modularity does not allow for the computation or manipulation of phonological structures by extra-phonological processes, so readjustment cannot be part of the morphosyntactic module. On the other hand, strict modularity similarly predicts that

"There are many of us who do not like ad-hoc phonological readjustment rules, just to preserve the fiction of phonological *root* identity."

—Gillian Ramchand¹²

¹² <http://generativelinguist.blogspot.com/2015/09/thoughts-on-roots-iv-nyu.html>
(Archived: <http://www.webcitation.org/76GRKJMtE>)

phonology can neither see nor interpret the morphosyntactic structure of features. Therefore readjustment cannot be part of the phonological module. Under strict modularity, the only possible interaction between morphological form and phonological content is phonologically conditioned allomorphy. This is justifiable because the translation mechanism of VI must necessarily be able to read the alphabets of both modules in order to do any translation, but it only makes reference to phonological information it has already “fixed” at the interface and it never manipulates structures at either level; it merely makes informed choices about possibilities to translate specific nodes given information that it is already processing. In contrast, under readjustment, depending on conception, either the morphosyntax or the translation mechanisms are able to actually meddle with the phonological structure. Strict modularity then rules out readjustment, and I will consequently assume that there is no phonological readjustment mechanism in spellout.

There are two alternatives to readjustment rules: the alternative must either be down to suppletion, as already illustrated for *sing~sang~sung* above, or it must be derived by the regular phonology after morphosyntax. There is some neurophysiological evidence which suggests that the processing of English irregular verbs such as *sing* is indeed incompatible with the separate-mechanisms hypothesis of phonological readjustment (Newman et al., 2007). Rather, Newman et al.’s (2007) findings suggest that the irregular stems are indeed stored as suppletive forms, in line with the predictions of Siddiqi’s (2006; 2009) readjustment-less version of DM.

The alternative to suppletion is to derive such alternations by autosegmental means in the regular phonology. The principal idea behind this is that some terminals may be exponed by floating autosegments, such as pieces of floating structure or floating melody. The alternation results from the incorporation (association) of this floating material into the phonological structure of the stem. Probably the most prominent development of this idea is the development of the theory of Autosegmental Morphology by Lieber (1987). In fact, early work by Lieber (1983) attempted to account for Welsh mutation by inserting different floating features to effect the different mutations, e.g. inserting a floating feature such as [+nasal] to effect Nasal Mutation. The approach developed in Ch. 6 will very much follow Lieber’s (1983) analysis in this regard.

A good example showing that floating feature analyses can often be more fruitful than a readjustment approach is Lowenstamm's (2012) analysis of German umlaut. Umlaut involves the fronting of the final stem vowel and is triggered by specific suffixes, as with the plural suffix *-e / -ə /* in (23).

| (23) | SINGULAR | PLURAL | TRANSLATION |
|------|--------------------|----------------------|--------------|
| (a) | <i>Sack</i> [sak] | <i>Säcke</i> [sekə] | 'sack(s)' |
| (b) | <i>Topf</i> [tɔpf] | <i>Töpfe</i> [tœpfə] | 'pot(s)' |
| (c) | <i>Luft</i> [lʊft] | <i>Lüfte</i> [lyftə] | 'sky/skies' |
| (d) | <i>Laus</i> [laus] | <i>Läuse</i> [lɔysə] | 'louse/lice' |

An important complication is that some of the umlaut-triggering suffixes (e.g. the plural suffix *-er / -ə /* used with items such as *Rad* [ʁat] 'wheel' > *Räder* [ʁɛdɐ] 'wheels') always trigger umlaut, while others (including the suffix *-e* (23)) seem to fail to do so on occasion. This is shown for plural *-e* in (24a) and adjectival *-lich* in (24b).

| | | | | |
|------|-----|----------------------------|------------------------------|-------------------|
| (24) | (a) | <i>Ausdruck</i> [ʔausdʁʊk] | <i>Ausdrücke</i> [ʔausdʁʏkə] | 'expression(s)' |
| | | <i>Ausdruck</i> [ʔausdʁʊk] | <i>Ausdrucke</i> [ʔausdʁʊkə] | 'print(s)' |
| | (b) | <i>Mann</i> [man] | <i>männlich</i> [mɛnliç] | 'man/manly' |
| | | <i>Amt</i> [ʔamt] | <i>amtlich</i> [ʔamtlɪç] | 'office/official' |

Example (24a) clearly shows that the conditioning is not phonological but rather due to the underlying structure of the stem at MS. Note further that the apparent failure of a form such as *Amt* in (24b) to undergo umlaut cannot be explained purely by reference to the root, since the plural of *Amt*, taking the consistently umlauting suffix *-er*, is *Ämter* [ʔɛmtɐ] 'offices'.

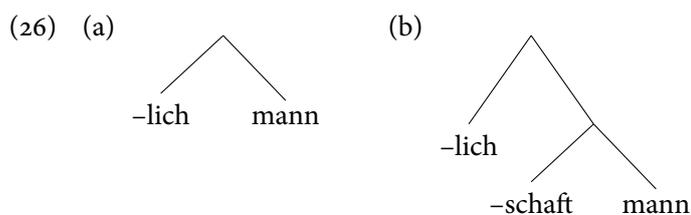
Embick and Halle (2005), assuming a theory with readjustment, argue that there is a single readjustment rule to effect umlaut:

(25) UMLAUT RULE: $V \rightarrow [-\text{back}]$

Given the apparent unpredictability of when umlaut applies, the umlaut rule must be conditioned by both the morphosyntactic node exponing the suffixes in question *and* by the root. That is, the environment for the umlaut rule must list combinations such as $\{\sqrt{\text{man}} + [+pl], \sqrt{\text{man}} + [a], \sqrt{\text{office}} + [+pl], \dots\}$, but crucially exclude combinations such as $\sqrt{\text{office}}$

+[a] where no umlauting takes place. They argue that this is precisely the type of alternation that shows the strength of readjustment rules: clearly, the environments do not form a natural class, so must be listed. Yet, umlaut is entirely regular and widespread throughout the grammar (it is also quite plausibly productive). Readjustment allows a single rule with a list of conditioning environments to efficiently capture this situation, while a root suppletion analysis would introduce high redundancy and fail to account for the regularity and productivity of umlaut.

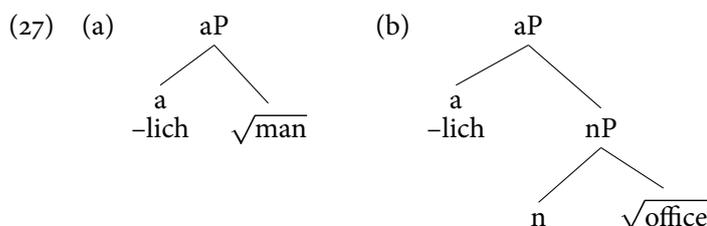
Conversely, Lowenstamm (2012) proposes that umlaut is actually triggered by a floating piece of melody [I] (an element responsible for frontness, cf. §2.4.3) at the left edge of the suffix. The floating feature is incorporated into the stem-final vowel, thereby fronting it. Since incorporation of the floating material is entirely down to the regular phonology, it predicts that umlaut is phonologically entirely regular; any exceptions or blocking effects must be down to the morphology. Indeed, Lowenstamm (2012) then shows that no listing of dual conditions (root and umlaut-triggering node) is necessary. Rather, all umlaut-triggering nodes in Lowenstamm (2012) are treated as regular (i.e. exceptionless) umlaut triggers. Lowenstamm (2012) shows that the failure of forms such as $\sqrt{\text{office}}$ and $\sqrt{\text{print}}$ to undergo umlaut is structural, and not due to the specific combination of root and suffix.¹³ Namely, suffixes in German can only trigger umlaut if they are the sister of the root (i.e. if they are situated as low as the root). Lowenstamm (2012, p. 4) demonstrates this by comparing the structures of complex *mannschaftlich* ‘teamly’ and simplex *männlich*, shown in (26).



In (26a), the suffix *-lich* is a low-attached sister of the root *Mann*, but in (26b), the suffix *-schaft* intervenes, and *-lich* ends up being attached higher. High-attached *-lich* in (26b), not being the sister of the root, is unable to trigger umlaut. The difference between suffixes that consistently trigger umlaut, such as the plural *-er* and suffixes such as plural *-e*

¹³ Indeed, it is quite possible that both ‘expression’ and ‘print’ in (24a) are derived from a single root but have different structures, giving rise to both the differential umlauting behaviour and the different semantic interpretation.

and adjectival *-lich* that appear to be unpredictable are explained simply through their selectional behaviour: *-er* can only attach to roots, while *-e* and *-lich* can attach to phrases such as *Mannschaft*, a dichotomy that can be justified independently of umlaut. The reason that *amtlich* does not show umlaut while *männlich* does is because *Amtlich* is noun derived, while *männlich* is root derived, as shown in (27).¹⁴

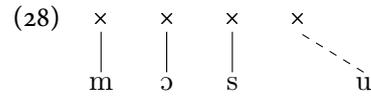


Lowenstamm's (2012) analysis of umlaut shows not only that the regularity and productivity of umlaut can be captured in a purely piece-based theory without recourse to readjustment, but that doing so actually reveals a regularity of process and makes predictions that remain hidden if we account for the phenomenon with readjustment rules.

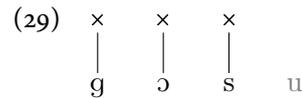
Another way of utilising floating melodic structure to account for certain alternations (termed phonologically optimising allomorphy by Faust, 2018) are single underlier analyses where two alternating segments are both part of the underlying form but only one of them is attached. Where the resulting form is phonologically ill-formed, the attached segment is detached and the alternative floating option incorporated. Examples of such analyses can be found in Faust (2014, 2018) for the Hebrew feminine marker /-at/ (variously surfacing as [-a], [-t] or [-at]) and for many different alternations in Scheer (2016). One example from Scheer (2016) is the alternation of the masculine marker /-u/ in Catalan. On some masculine nouns the marker is always overt, e.g. *mosso* [mɔsu] 'boy' (pl. [mɔsus]); on other masculine nouns it is not generally visible, e.g. *got* [gɔt] 'glass' (pl. [gɔts]), unless the item is sibilant final and followed by another sibilant-initial suffix such as the plural marker /-s/, e.g. *gos* [gɔs] 'dog' (pl. [gɔsus]). Scheer (2016) proposes that the masculine marker is exponed by a floating melody [u] without any skeletal points and always exponed as such. The item exponing $\sqrt{\text{boy}}$ has a final empty skeletal slot

¹⁴ Lowenstamm (2012) actually proposes that suffixes are bound roots themselves, and low attach as the complement of a root phrase headed by the free root. I've chosen to omit this detail here for simplicity.

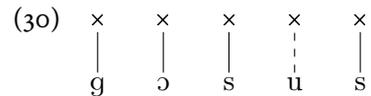
which incorporates the floating [u], thus giving rise to the form [mɔsu] as shown in (28).



The items exponing $\sqrt{\text{glass}}$ and $\sqrt{\text{dog}}$ however do not have a final empty skeletal slot, meaning that the floating melody [u] remains unaffiliated and does not surface, as shown for $\sqrt{\text{dog}}$ in (29).



However, when a sibilant-initial suffix is attached to a sibilant-final stem such as (29), [Scheer \(2016\)](#) argues, this violates a constraint against sibilant sequences and a new intervening skeletal slot is created to avoid this violation. The floating [u] can now attach to the newly created skeletal position between the two sibilants, as illustrated in (30).



In summary then, full suppletion is not the only alternative to readjustment rules. In many cases, surface alternations that appear to be good candidates for readjustment can be accounted for in an insightful way by positing exponents with floating melodic features. In Chapter 6 I will propose that Welsh mutation also is best accounted for in this way, in that mutation triggers carry floating features at their right edge which are incorporated into an adjacent item, an idea already pursued earlier by [Lieber \(1983\)](#). Although more complex, the account developed there is in its basic conception highly similar to the umlaut triggering floating [I] of [Lowenstamm \(2012\)](#).

2.4 GOVERNMENT PHONOLOGY

In this section I give a brief outline of some of the basic assumptions in Government Phonology (GP) ([Kaye et al., 1985, 1990](#); [Charette, 1990, 1991](#); [Harris, 1990, 1994](#); [Gussmann, 1992](#)), the theory of the phonological component I assume. I limit myself to only the fundamental notions

of GP here, without any aim to cover these in depth or to justify the assumptions. Where necessary, I will introduce further issues later on where they become relevant. Charette (1990) gives a more comprehensive overview of the standard theory of GP, while a compact summary can be found in Kaye (2000). I will assume the mainline version of the theory, often referred to as “Standard GP”, but I will refer to other branches of the theory (e.g. Scheer, 2004; Cyran, 2010) where relevant.

2.4.1 Constituents and their relations

The basic unit of phonological structure in GP is the skeletal point “ \times ”. In common with most other autosegmental theories, skeletal points are arranged into a linear sequence reflecting the temporal exponence of phonological information from left to right. The sequence of skeletal points forms the lowest level of projection (P_0) of a phonological form. *Adjacency* is defined at the level of P_0 :

(31) ADJACENCY (Kaye, 2000, p. 5):

In a sequence of skeletal points $\times_1 \times_2 \dots \times_n \dots \times_z$, a skeletal point \times_n is adjacent to \times_{n-1} (for $n > 1$) and \times_{n+1} (for $n < z$).

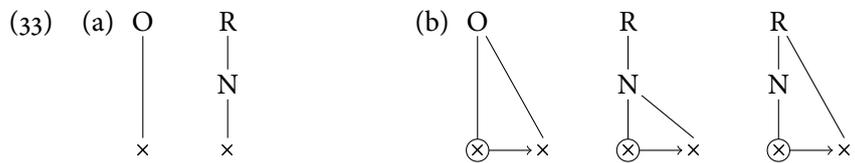
Skeletal points are grouped together into constituents. GP recognises three constituent categories: the onset O, the nucleus N, and the rhyme R. Notably, neither the coda nor the syllable are recognised as constituents in GP. Rather, GP replaces a syllabic constituent with a relation contracted between onsets and rhymes, more on which presently. O and N are selectionally restricted to skeletal points. R obligatorily selects a constituent N and may optionally take a skeletal point as an adjunct.

Constituents minimally consist of a head (non-branching constituents) and may optionally take a complement (branching constituents). The well-formedness of branching constituents is determined by *constituent government*: a complement must be constituent governed by the head of the constituent. Constituent government is subject to the locality and directionality conditions in (32).

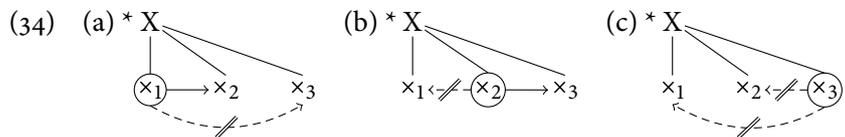
(32) CONSTITUENT GOVERNMENT (Kaye et al., 1990, p. 198):

- (i) Strict locality: governor and governee must be adjacent at P_0 .
- (ii) Strict directionality: constituent government is head-initial.

The conditions above allow us to now define the set of well-formed constituents in GP, shown in (33). In (33a) we have non-branching simplex constituents, with the single skeletal slot taking the function of a head and no complement present. In (33b) we have regular binary branching constituents, where the head is indicated by encircling and government is shown in the form of an arrow (I will not routinely indicate either head-hood or government relations, unless they are relevant to the particular example).

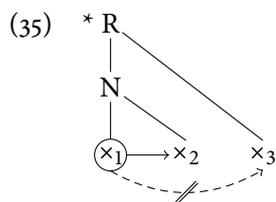


The above conditions completely rule out ternary branching constituents. As shown in (34), there is no possibility for a head in a constituent to govern more than one complement.



In (34a), \times_1 cannot constituent govern \times_3 without violating strict locality. In (34b), \times_2 cannot constituent govern \times_1 without violating strict directionality. In (34c) both strict directionality and strict locality are violated.

Finally, these assumptions also rule out superheavy rhymes, which would have to have the structure in (35).



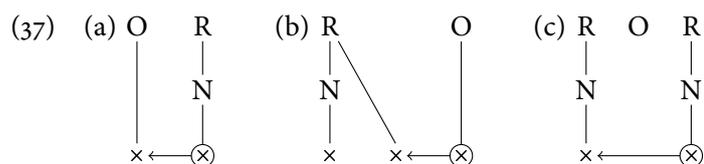
In (35), x_1 cannot constituent govern x_3 without violating strict locality. Thus (33) represents the exhaustive inventory of possible constituent structures in GP.

In addition to governing relations within constituents, there are also governing relations contracted between constituents, termed *transconstituent government* (sometimes also termed *interconstituent government*). Transconstituent government is subject to the conditions in (36).

(36) TRANSCONSTITUENT GOVERNMENT (Kaye et al., 1990):

- (i) Strict locality: governor and governee must be adjacent at P_0 .
- (ii) Strict directionality: transconstituent government is head-final.

Interconstituent government completes the set of possible governing relations between skeletal points at P_0 . The complete set of possible transconstituent government domains is shown in (37).



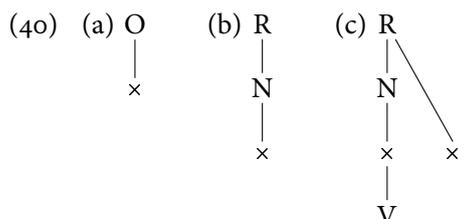
Example (37a) shows the transconstituent governing relation contracted between rhymes and their preceding onsets. As already mentioned, there is no syllable constituent in GP, so this governing relationship is the closest approximation of a syllable that exists in GP. This is especially so since rhymes must be obligatorily preceded by an onset constituent in GP, and in turn, onsets must be obligatorily followed by a rhyme.

The configuration in (37b) is partially responsible for the restricted melodic content that can be found in rhymal adjunct position. This derives from the complexity condition, which mandates that a governee must be no more complex than its governor (Harris, 1990). Complexity refers to the number of elements (which we will turn to presently) dominated by a skeletal point. This condition thus ensures that branching onsets can contain sequences such as /tr/ and /kl/, but not */rt/ or */lk/, because /t, k/ are more complex than /r, l/ and government within this constituent is left to right. In coda-onset sequences like (37b) government is right to left, and thus these configurations allow /rt/ and /lk/, but not

The reason that the final nucleus in (39b) can remain silent is due to the way that empty categories are treated in GP, as we shall see presently.

2.4.2 Empty categories

An empty category is any skeletal point that does not dominate any melodic content. The three possible empty categories are shown in (40).



Whether an empty category receives a phonetic interpretation is determined according to the Empty Category Principle (ECP) in (41).

(41) EMPTY CATEGORY PRINCIPLE (ECP):

A p-licensed empty category receives no phonetic interpretation.

There are currently three known conditions under which an empty category is p(rosodically)-licensed in line with the ECP, given in (42).

(42) P-LICENSING:

- (i) Domain-final empty categories are p-licensed by parameter.
- (ii) Properly governed empty nuclei are p-licensed.
- (ii) Magic licensing: s+C sequences p-license a preceding empty nucleus.

Condition (42i) is commonly known as the Final Empty Nucleus (FEN). The FEN is held to be responsible for the different behaviour of the right edge in languages such as English and Italian. In English, the FEN is *On*, and so the final empty nucleus in a structure such as (39b) remains phonetically uninterpreted. In contrast, in Italian (the typologically unmarked case), the FEN is set to *Off* (the default setting), which means that final empty nuclei must be interpreted. This is reflected both in the fact that Italian has no consonant-final native word stock, and “epenthesises” a final schwa on loans that end in a consonant, such as English *pitch* /pitʃ/, which in

Italian is adapted as [pit̪ə]. In GP, both the English and Italian rendition of *pitch* have the same underlying structure, the only difference being whether the final empty nucleus is p-licensed by FEN or not.

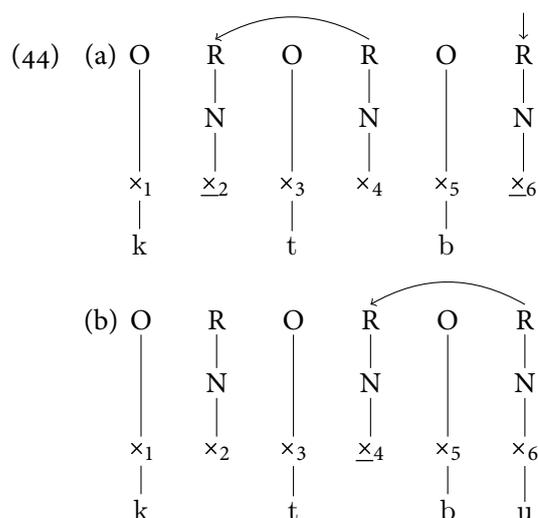
Condition (42ii), *proper government*, is a relation contracted between rhymes. Proper government is defined in (43).

(43) PROPER GOVERNMENT:

α properly governs β iff

- (i) α and β are adjacent on the relevant projection,
- (ii) α is not p-licensed itself, and
- (iii) neither α or β are government licensers.

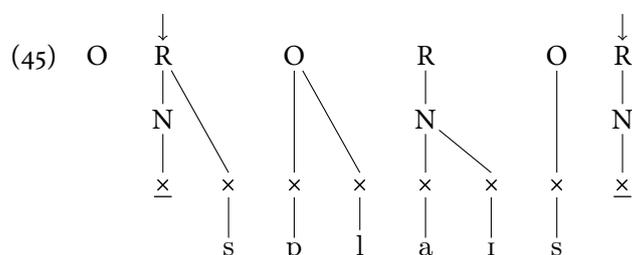
Proper government is implicated in the suppression of empty nuclei intervening between RT-type consonant sequences, and is also held responsible for vowel-zero alternations, two phenomena that often go hand in hand. Consider for example the singular and plural verbs *ktib/kitbu* ‘to write’ in Moroccan Arabic (from Kaye, 1990, p. 220). Their respective structures are shown in (44a) and (44b) respectively.



As shown in (44a), *ktib* contains two p-licensed silent empty nuclei \times_2 and \times_6 , indicated by underlining. The nucleus in \times_6 is silent due to the FEN, indicated by an arrow from above showing that the final rhyme is parametrically p-licensed. Finally, the rhyme dominating \times_2 is properly governed by the following rhyme which itself dominated \times_4 . Position \times_4 cannot be p-licensed by proper government in (44a) because the final

rhyme is itself p-licensed and so does not satisfy condition (43ii). Conversely, in the plural *kitbu*, we have a substantive final nucleus /u/ in \times_6 . This means that the final rhyme is free to properly govern the preceding rhyme, thereby p-licensing it and leaving \times_4 phonetically uninterpreted. In the plural however \times_2 must be pronounced, because the preceding nucleus is now itself properly governed and so cannot properly govern the rhyme containing \times_2 .

Finally, (42iii) refers to the structure GP assigns to sC(C) sequences. Following Kaye (1996), such sequences ought to be analysed as a rhymal complement /s/ followed by an onset, as shown in (45) for the English word *splICE*. The nucleus of the initial rhyme in such sequences is said to be subject to *magic licensing*.



Again, p-licensed empty categories in (45) are indicated by underlining, and both the FEN licensed and magically licensed rhymal positions are indicated with an arrow from above. I will discuss the magic licensing analysis of sC(C) sequences in more depth in Chapter 7 when it becomes important for the analysis of immutability.

2.4.3 Melody: The Elements

In this section I will briefly outline the theory of melodic primes assumed in GP, namely Element Theory (ET) (Kaye et al., 1985; Harris and Lindsey, 1993, 1995; Charette and Göksel, 1996; Backley, 2011). For a more comprehensive overview of the theory see especially Backley (2011). Shorter overviews of the theory can be found in Backley (2012) and van der Hulst (2016).

In line with other approaches such as Dependency Phonology (Anderson and Ewen, 1987) and Particle Phonology (Schane, 1984), ET proposes that melodic representation is based on unary primes, referred to as *elements*. As opposed to the type of feature theory popular since at least

Chomsky and Halle's (1968) *The Sound Pattern of English* (SPE), ET assumes that all melodic primes are privative rather than equipollent, and that they are independently interpretable.

Privativity means that in any given melodic expression an element is either present or not, and only an element that is present can exert any phonological influence. In contrast, in equipollent feature systems both the [+F]- and [-F]-valued features can be active contributors to phonological processing.

Independent interpretability refers to the fact that every element has a specific acoustic effect on the speech signal and can, in principle, be pronounced on its own. For instance, the element |U| on its own will be pronounced as [u] or a very similar vowel while the element |ʔ| on its own will be pronounced as a glottal stop. This is unlike feature systems such as SPE, where a feature such as [±coronal] is not interpretable by itself—it only become pronounceable in the context of a specific set of other features.

Unlike features in the SPE tradition, elements are associated with specific patterns in the acoustic signal rather than seen as encoding specific articulatory instructions (Harris and Lindsey, 1993, 1995). Elements in this way are usually understood as manifesting phonetically as modulations of a neutral schwa-like carrier signal, similar to the view advocated by Modulation Theory (Traunmüller, 1994, 2000). The carrier signal manifests where an empty melodic expression receives a vocalic interpretation, namely in empty nuclei that are not p-licensed (i.e. empty nuclei that are pronounced).

Most current versions of ET assume six elements: the three resonance elements |A, I, U| and the three manner elements |ʔ, H, L|. The same set of six elements is found in both vowels and consonants. Whether a melodic expression manifests as a vowel or consonant derives from whether the expression is found in a nucleus or in an onset.

In vocalic expressions, the elements |A|, |I|, and |U| represent the extremes of a triangular vowel space, |A| encoding the low dimension, |I| the high-front dimension, and |U| the back-high-round dimension. The elements can also combine into compound expressions such as |A, I|, which is interpreted as a mid front vowel.

Compounds can be symmetric, such as |A, I|, or asymmetric with one element assuming head status within the expression. A phonological expression may contain at most one head (even if it contains more than one element), or it may be entirely unheaded (again, no matter how many elements it contains). This principle is known as the Single Optional Headedness Condition (SOHC). The head of a melodic expression is said to distribute asymmetrically over the dependent elements in the expression, which can result in a different interpretation of that element or simply in a more salient acoustic expression of the cues associated with that element. For instance, the interpretation of an expression |A, I| (headedness in melodic expressions is indicated by underlining) will be more |A|-like, while |A, I| will be more |I|-like. Conversely, headless |A, I| will be interpreted as an intermediary vowel. In vocalic simplex expressions (i.e. expressions containing only a single element), headedness typically encodes a tense-lax or ATR distinction, e.g. in English headed |U| is interpreted as tense [u] but unheaded |U| is interpreted as lax [ʊ]. A number of example expressions, both simplex and complex, are given in (46). Note that the precise interpretation of these expressions will vary by language—for instance, where one language might interpret |A, I| as [ɛ] another language might interpret the same set of elements as [e].

| | | |
|------|----------------|-------------------|
| (46) | SIMPLEX | COMPLEX |
| | A [ɐ] | A, I [ɛ] |
| | I [ɪ] | A, U [ɔ] |
| | U [ʊ] | I, U [ɨ] |
| | <u>A</u> [a] | A, <u>I</u> [e] |
| | <u>I</u> [i] | A, <u>U</u> [o] |
| | <u>U</u> [u] | <u>I</u> , U [y] |

In consonantal positions, |A| is found in dentals, uvulars and pharyngeals, |I| is found in palatals, and |U| in labials. Alveolars and dentals variously contain |A|, |I| or both |A, I| (cf. e.g. [Cyran, 1995](#)). Velars may be unmarked (i.e., contain no resonance element), or they may contain |U| (cf. e.g. [Scheer, 1996](#); [Backley, 2011](#)). The manner elements |ʔ, H, L| in vocalic expressions are associated with glottalisation (|ʔ|), voicelessness (|H|), and nasality (|L|). When |H| and |L| are directly attached to a nucleus, they are interpreted as high and low tone. In consonantal expressions,

| | ELEMENT | HEAD/DEPENDENT |
|-------|---------|---|
| PLACE | A | Dental, uvular, pharyngeal and alveolar place |
| | I | Palatal and alveolar place |
| | U | Labial place, sometimes velar place |

| | ELEMENT | HEAD | DEPENDENT |
|--------|---------|--------------------------|------------|
| MANNER | L | Voicing | Nasality |
| | H | Frication | Aspiration |
| | ? | Implosives and ejectives | Occlusion |

Table 1: The Elements and their properties in consonants

dependent $|\text{?}|$ is found in stops, dependent $|\text{H}|$ in aspirated segments, and dependent $|\text{L}|$ in nasal segments. If headed, these three elements have a different interpretation in consonantal expressions. Headed $|\text{?}|$ is found in implosives and ejectives (cf. [Backley, 2011](#)), headed $|\text{H}|$ in fricatives¹⁵ and headed $|\text{L}|$ in voiced segments (cf. [Ploch, 1999](#); [Botma, 2004a](#); [Nasukawa, 2005](#); [Breit, 2017](#)). A number of example expressions for a variety of consonants are given in (47).

| | | | | |
|------|----------------------------------|-------------------------|----------------------------------|--------------|
| (47) | $ \text{U}, \text{?}, \text{H} $ | $[\text{p}^{\text{h}}]$ | $ \text{U}, \text{?}, \text{L} $ | $[\text{m}]$ |
| | $ \text{A}, \text{I}, \text{?} $ | $[\text{t}]$ | $ \text{I}, \text{H} $ | $[\text{ʃ}]$ |
| | $ \text{?}, \text{L} $ | $[\text{g}]$ | $ \text{H} $ | $[\text{x}]$ |

Table 1 shows an overview of the properties of the various elements in consonants.

In ET, there is no a-priori restriction on which elements may combine to form a melodic expression. Where such limitations exist these are encoded by language specific *licensing constraints* ([Charette and Göksel, 1996, 1998](#)). In a melodic expression, dependents are licensed by the head of the expression, if present (if the expression is headless, no licensing

¹⁵ It is sometimes assumed that a subset of languages contain an additional element $|\text{h}|$ encoding frication, a choice that is parametrised in [Cyran \(1996\)](#). [Ritter \(1997\)](#) proposed that headed resonance elements such as $|\underline{\text{A}}|$, $|\underline{\text{I}}|$, and $|\underline{\text{U}}|$ may encode frication in consonants.

conditions obtain). Licensing constraints limit what phonological material may be licensed by specific heads. They typically come in one of three forms: $|X|$ must be head; $|Y|$ can only be licensed by $|X|$; or $|Y|$ cannot be licensed by $|X|$.

The effect of licensing constraints is two-fold: they limit the inventory of a language they are active in, and they affect phonological processes that would create unlicensed structures. For instance, in Turkish labial harmony does not affect the vowel /a/. Charette and Göksel (1998) account for this by proposing the two licensing constraints that (i) all dependents must be licensed (i.e. headless expressions are illicit) and (ii) $|U|$ must be head. Licensing constraint (i) means that the representation of /a/ has to be headed $|A|$, while (ii) means that rounded vowels (the triggers of labial harmony) must contain headed $|U|$. Since an expression can only have one head, $*|A, U|$ is ill-formed. In the Turkish case this results in blocking of the harmony process.

Licensing constraints have thus far mainly been explored in vowels, as in the case of Turkish harmony processes. Nonetheless there is no reason why they should not be active in consonantal expressions, and I will propose two consonantal licensing constraints for Welsh in §3.6.3.

2.4.4 *The Interface with morphosyntax*

We have already dealt with the morphosyntactic side of the interface with phonology in DM in §2.3. In this section I will briefly outline the view GP takes of the phonological side of the interface. Kaye (1995) proposes that phonology provides two functions that may be accessed by morphosyntax at the interface: $\text{concat}(\alpha, \beta)$ and $\varphi(\alpha)$. The first of these takes as an argument two phonological objects α and β and returns a single phonological object that is the linear concatenation of α followed by β , i.e. $\alpha\beta$. The latter function applies phonological computation to its input α , and returns the computed phonological object α' .

Convergence at PF simply means that $\varphi(\alpha)$ has been successfully applied to every object that has been passed to it by morphosyntax. Phonological computation itself adheres to what is known as the phonological minimality principle in GP, i.e. a phonological process applies whenever the conditions for it are met—there are no strata, rule-orderings or co-

phonologies of any kind. There is a single function $\varphi(\alpha)$ which makes reference to a single set of phonological processes P and computes an object α passed to it until there are no further processes in P that can be applied to it. That is, phonological computation is passed a phonological object, checks whether there are any phonological operations for which the conditions are met, applies them, and returns the object to which all applicable operations have been applied.

Given that the assumption of strict modularity excludes the possibility that phonology accesses morphosyntactic information in any way as well as the possibility that some morphosyntactic information is passed to and persists in phonology, the amount of influence that morphosyntax can have on phonological computation is severely restricted. In the GP system with $\text{concat}(\alpha, \beta)$ and $\varphi(\alpha)$, the only influence that morphosyntax can exert is in the order of phonological domain-building. Any phonological object α passed to $\varphi(\alpha)$ will constitute a phonological domain by virtue of the fact that computation will have to be sensitive to the properties of the object that relate to domainhood, namely the edges of the domain (necessary for instance for the p-licensing of final empty nuclei) and the head of the domain (which is the only wholly unlicensed part of the domain and receives main stress). In contrast, $\text{concat}(\alpha, \beta)$ does not involve any phonological computation and so does not force its arguments to hold any specific type of domain-structure. Consequentially, different domain-structures can be derived by interleaving of the two functions.

Given two phonological objects A and B , we can derive four possible domain structures:

(i) $\varphi(\text{concat}(A, B))$ results in a single synthetic domain $[AB]$. Neither A nor B constitute a domain by themselves, and so the overall structure will only allow a single final empty nucleus and a single unlicensed rhyme to head the domain $[AB]$. This is the structure of words with a stress shifting suffixes such as *-al* in English *parental*. Synthetic compounds and suffixes will typically affect stress.

(ii) $\varphi(\text{concat}(\varphi(A), B))$ results in an analytic domain $[[A]B]$. Here $[A]$ constitutes an independent domain which may contain a final empty nucleus and an unlicensed rhyme. In addition, AB is a domain which may contain a final empty nucleus, but not another unlicensed rhyme in B since the domain spanning AB already contains one. This is the structure

associated with suffixes such as the regular past tense *-d* in English. For instance in *seeped* [si:pt] the long vowel of *seep* is indicative of the fact that the word-final [p] is an onset (if it were a rhymal adjunct this would involve the illicit structure in (35)). The final [t] of the suffix likewise must be an onset followed by an empty final nucleus which gets p-licensed by virtue of being domain-final. Analytic suffixes never trigger stress shift, because they cannot contain an unlicensed rhyme.

(iii) $\varphi(\text{concat}(\varphi(A),\varphi(B)))$ results in an analytic domain [[A][B]]. Both A and B and AB constitute domains in this case, meaning that we can find two final empty nuclei and two internally unlicensed nuclei. This is the structure of loose compounds such as *superman* which has stresses on both *super* and *man*.

(iv) $\varphi(\text{concat}(A,\varphi(B)))$ results in the analytic domain [A[B]]. This structure is as of yet unattested in the literature, and Kaye (1995) suggests that it may well be unattestable in the sense of Hale and Reiss (2008). The predictions of [A[B]] would be that, like synthetic [AB], a final empty nucleus can only be p-licensed at the right edge of B, but different from [AB], A could never contain the unlicensed rhyme that forms the head of the domain spanning AB (i.e. A would be completely unable to be stressed).

Whether a domain will be analytic or synthetic essentially boils down to whether a terminal node requires its sister to undergo phonological computation before concatenation at VI or not. A suffix such as the past tense *-d* of English will thus have listed as part of its vocabulary entry the fact that its sister must first be computed phonologically. In the case of [[A][B]], this might involve such a specification on a mutual basis. There may be also be alternatives which allow us to derive analytic or synthetic domains from other properties. For instance, Lowenstamm (2012) suggests that some affixes may be roots, and that roots can take complements and form a root phrase. If there is a requirement that the maximal projection of a root is submitted to phonological computation, then [AB] is a single \sqrt{P} , [[A][B]] consists of two \sqrt{P} s, and [[A]B] consists of some B merged above the \sqrt{P} exponing A. Yet another alternative has been proposed by Newell (2017), who suggests that synthetic affixes such as the *-al* of *parental* always begin with a floating vowel, while analytic suffixes such as the *-er* of *teacher* never begin with a floating vowel.

While the finer details of phonological domain-building at the interface are not of much importance for the analyses put forward in what is to follow, it is important to note just how constrained this view of the interface is. There are no differential boundary markers such as SPE's "+" for a morpheme boundary and "#" for a word boundary. There is no phonologically admissible distinction between different types of domains: either some phonological string constitutes a domain or it does not, and that is the entirety of structural information available phonologically.

2.5 SUMMARY

In this chapter, in addition to giving a brief summary of the theoretical apparatus assumed, I have specifically set out a number of assumptions and basic considerations in regard to the morphosyntax–phonology interface, based on which I concluded that we should assume the interface to conform to the strict modularity hypothesis. We also saw how strict modularity fares with the frameworks of morphology and phonology that I have adopted. Notably, strict modularity led us to the rejection of a phonological adjustment component which is normally assumed to be a part of the DM architecture. As we will see in Chs. 5–7, this curtailment in power of the spellout mechanism of DM implies that every non-suppletive alternation must be the exponent of a morphosyntactic terminal node, a consequence which leads to a much more restrictive model of possible alternations and which is partially responsible for the locality conditions we find in the Welsh mutation system.

3

The Welsh language

3.1 INTRODUCTION

Rather than attempting to account for the breadth of *ICM* systems found cross-linguistically, this work focuses principally on *ICM* in Welsh. There are two primary reasons for this choice:

First, Welsh has one of the most complex mutation systems attested, both in terms of the diversity of phonological alternations involved and in terms of the range of conditioning morphosyntactic factors. As such *ICM* in Welsh, compared to less complex systems, presents a particularly rich and clear testing ground for the issue of strict modularity at the morphosyntax–phonology interface.

Second, taking a single language as the primary target allows for great depth in examining the various aspects of the *ICM* and allows us to explore how this interacts with the language’s grammar more widely. Adopting a broader cross-linguistic approach would hide much of the detail and indeed the complications associated with mutation. For instance, focusing on a specific pattern of mutation may lead to an account that is readily falsified by some other pattern in the same language (as for example with [Lieber, 1983](#)). Similarly, focusing on a specific condition that triggers mutation in isolation may lead to an account that is otherwise not commensurate with any available account for mutation in other environments (as for example with [Neeleman, 2006](#)). Any empirically substantial account of *ICM* must be able to cover the breadth of alternations and triggering environments found in the language, and it minimally must not contradict other general principles of that language’s syntax or phonology. *Minimally* because we would normally expect that any process so dependent on the language’s grammar should exhibit interactions with the morphosyntax and phonology to at least some degree, so that work

“*Yn wir, trysordy o iaith yw’r Gymraeg.*”

—John C. Wells²

² From John C. Wells’ preface to [Ball and Williams \(2000\)](#).

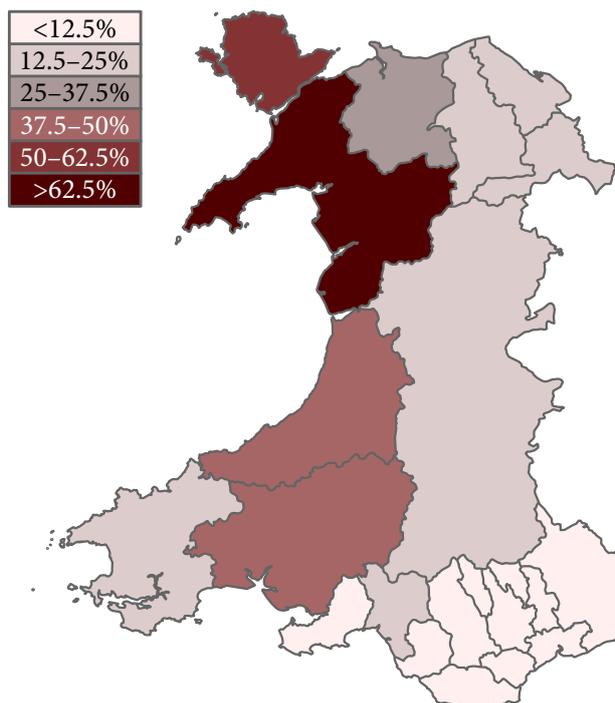


Figure 1: Areal percentage of population in Wales who reported that they can speak Welsh in the 2011 Census (Office for National Statistics, 2012).

on ICM should have something to bear on the morphosyntax and/or phonology of the language and vice versa.

Given the particular focus on Welsh here, the aim of this section is to provide the reader with a basic background on the Welsh language, with a particular focus on the relevant aspects of Welsh phonology such as the representation of the consonant system (addressed in §3.6) and metrical phonology (addressed in §§3.7–3.8).

3.2 DISTRIBUTION AND PHYLOGENY

Welsh is spoken by around 562,000 speakers in Wales (Office for National Statistics, 2012), especially in the north west and south west of the country (cf. Fig. 1). Welsh marginally retains status as a majority language in parts of Gwynedd and Anglesey in the north west.

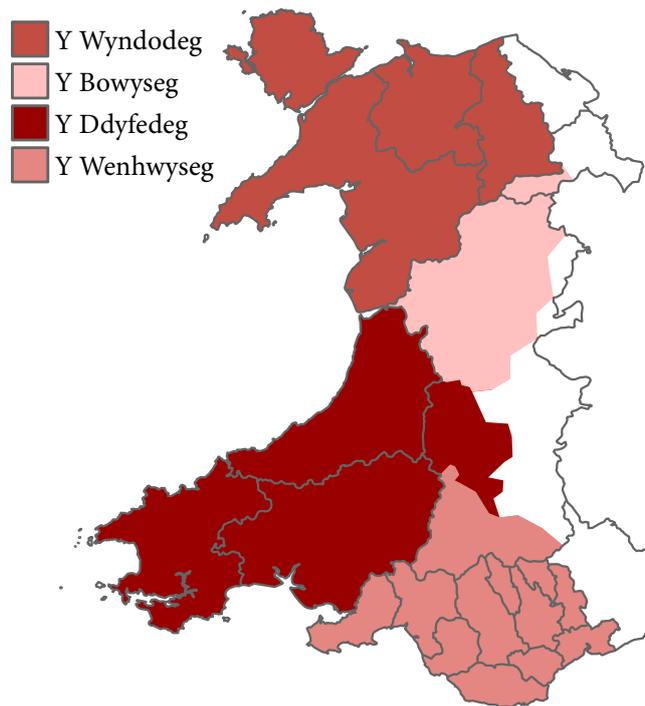


Figure 2: Map of Wales showing the four traditional dialects.

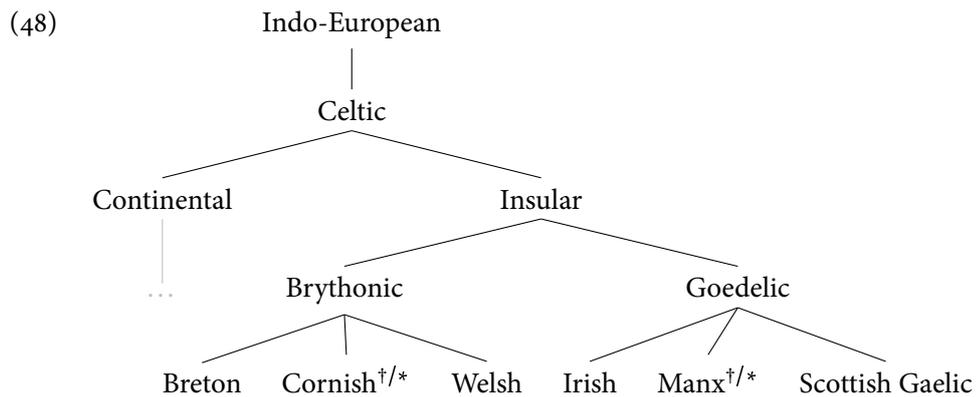
There are no precise figures on the number of Welsh speakers outside Wales, but Jones (2007, 2012) estimates that there are around 110,000 Welsh speakers in England and perhaps another 1,000 in Scotland and Northern Ireland. Welsh is also spoken by part of the population in Patagonia's Chubut Province, an area known in Welsh as *Y Wladfa* ('The Colony'). Birt (2005) estimates that there are around 5,000 Welsh speakers in Patagonia. Although it is known that there are a few thousand Welsh speakers found in the USA, Canada, Australia and New Zealand there are no geographically significant accumulations of Welsh speakers in those countries (Jones, 2012, pp. 114f).

Welsh is traditionally grouped into four major dialects: *Y Wyndodeg* 'Gwynedd-ish' and *Y Bowyseg* 'Powys-ish' in the north, and *Y Ddyfedeg* 'Dyfed-ish' and *Y Wenhwysseg* 'Gwennwys-ish' in the south of Wales, as shown in Fig. 2. Although all of these dialect groups have their differences (and contain many sub-dialects), the most notable differences are found across a south–north divide. Consequently, the latter two are usually

grouped and referred to as South Welsh, while the former two are grouped together under the heading of North Welsh (although Y Bowysseg, perhaps with slightly overlapping demarcation into the adjacent dialects, is also often given the broad label of Mid Welsh). My aim being more about the general system and not about dialectological aspects, I will largely follow the two broader labels North Welsh and South Welsh in what follows, and only make more precise reference where necessary.

Patagonian Welsh is also to be distinguished from the other Welsh dialects. Patagonian Welsh is heavily understudied however, and little is known about any possible differences in the mutation system, for which reason the variety does not make any notable appearance in the work to follow.

Under the most widely accepted classification, Welsh (together with Breton and Cornish) belongs to the Brythonic branch of Insular Celtic, which it shares with the Goedelic languages including Irish, Manx, and Scottish Gaelic. The other branch of the Celtic languages, Continental Celtic, is completely extinct. While the classification into Insular versus Continental Celtic is sometimes disputed in favour of a classification directly into P- versus Q-Celtic in the descent from Proto-Celtic, this for the main part only affects extinct Celtic languages such as Gaulish, Celtiberian, &c. In any case, as far as it concerns the surviving Celtic languages, P-Celtic is equivalent to Brythonic and Q-Celtic equivalent to Goedelic. The common classification of the surviving Celtic languages is shown in the phylogenetic tree in (48).



Cornish and Manx both became extinct in the recent past but have been revived subsequently, cf. e.g. Parry (1946) and Clague (2009).

ICM is found in all the surviving Celtic languages of the Insular Celtic branch. Whether ICM in the form known from the modern Celtic languages is restricted to the Insular Celtic branch or finds a definite precursor shared with Continental Celtic varieties is not definitively settled, not least because of continued classificatory disputes (cf. e.g. Hickey, 1996). Gray (1944) has argued that extinct Gaulish (typically grouped in the Continental Celtic branch) also featured a notably Brythonic-type mutation system, perhaps suggesting a very early common precursor. However, the Gaulish data only show mutation-like patterns word-internally and not in word-initial position and may therefore well present a distinct phenomenon.

3.3 SYNTAX

In this section I will briefly illustrate only the most basic facts of word-order that will play a role throughout the mutation system. More detail on relevant syntactic aspects of Welsh will be introduced when they become relevant to the issue at hand.

Welsh has two main word orders. The synthetic construction is VSO, while the periphrastic construction has an AuxSVO order. In colloquial speech the periphrastic construction vastly dominates. The two types of clause are illustrated in (49) and (50) respectively.

(49) *Prynodd Dafydd afel*
 buy.PST David apple
 ‘David bought an apple’

(50) *Roedd Dafydd yn prynu afel*
 be.PST.AFF David IPFV buy apple
 ‘David was buying an apple’

As can be seen from these two examples, the periphrastic construction differs not only in the inclusion of an auxiliary (which itself can expone a more diverse set of tense and mood features than a synthetic main verb) but also notably in the inclusion of an aspectual particle (here *yn* ‘IPFV’) that intervenes between the subject and the verb, while in the synthetic

construction the verb is directly adjacent to the subject and the subject directly adjacent to the direct object.

There is no overt indefinite article, but definite DPs are marked with a definite determiner *y* (*yr* prevocally), so we have *afal* ‘(an) apple’ versus *yr afal* ‘the apple’. Possessives can be marked by two morphemes, a determiner similar to Germanic possessive determiners and a post-nominal dependent pronoun. These may co-occur in the full construction, as shown in (51), or as only a determiner as shown in (52), or as only a post-nominal dependent pronoun, as shown in (53). In North Welsh options (51) and (52) are predominant, and they are widely regarded as the neutral standard, while option (53) is found mainly in South Welsh. Determiner-marked possessives are usually morphosyntactically definite.

(51) *dy afal di*
 DET.2SG.GEN apple 2SG
 ‘Thy apple’

(52) *dy afal*
 DET.2SG.GEN apple
 ‘Thy apple’

(53) *afal di*
 apple 2SG
 ‘Thy apple’

Adjectives typically appear in post-nominal position, though as in French a limited number of adjectives are found in prenominal position. Numerals are always prenominal and notably select a singular noun no matter the value of the numeral. The full structure of the Welsh DP showing the order of a possessive determiner, numeral, prenominal adjective, noun, postnominal adjective and dependent pronoun is shown in (54).

(54) *eich tri hen afal coch chi*
 DET.2PL.GEN three old apple red 2PL
 ‘Your three old red apples’

3.4 MUTATION

The intricate system of Initial Consonant Mutations (ICMs) is without doubt one of the most well-known features of Welsh (and the Celtic languages more generally). In ICM, the initial consonant in targeted words is

systematically altered under a diverse set of morphosyntactic conditions. Consider for instance the following examples in (55), showing one particular type of mutation triggered by the second person singular possessive *dy* /də/. Note that I adopt the practice of transcribing consonants which are the result of ICM with a short underline, for instance “b, d, g”; an underlying /g/ deleted as the consequence of ICM is transcribed as an underlined space, i.e. “_”.

| (55) | CITATION FORM | SOFT MUTATION | TRANSLATION |
|------|---------------|------------------|-----------------|
| | ki: | də <u>g</u> i: | ‘(thy) dog’ |
| | pabɛɫ | də <u>b</u> abɛɫ | ‘(thy) tent’ |
| | gwaɪθ | də <u> </u> waɪθ | ‘(thy) work’ |
| | ɫi:n | də <u>l</u> i:n | ‘(thy) picture’ |

The Welsh language has a number of alternation patterns such as those in (55), affecting different sets of sounds, depending on the specific pattern triggered. The trigger frequently takes the form of a lexical item directly preceding the affected target, such as *dy* [də] ‘DET.2SG.GEN’ in (55), but there are also contexts without any overt preceding lexical item that can be identified as a trigger of mutation. For instance, direct objects of a tensed verb in the synthetic construction and adjectives modifying feminine nouns show an alternation similar to (55), regardless of whether they are string adjacent to their trigger or not:

| | | | | |
|------|----|---------------|---------|---------------|
| (56) | mi | <u> </u> wɛɛf | i | <u>g</u> i: |
| | mi | wɛɛs | i | <u>g</u> i |
| | | COMP.AFF | see.PST | 1SG |
| | | | | dog |
| | | | | ‘I saw a dog’ |

| | | | | |
|------|---|-------------|-----------|--------------------------|
| (57) | ə | <u>g</u> aθ | əɪftaɪð | <u>v</u> aɣ |
| | y | gath | Eifftaidd | fach |
| | | the | cat.F | Egyptian |
| | | | | small.F |
| | | | | ‘The small Egyptian cat’ |

The example in (56) shows how *ci* /ki:/ ‘dog’ is affected by mutation under the absence of a phonologically overt string-adjacent trigger due to being the direct object of the finite tensed verb *gweld* /gwɛld/ ‘to see’ (itself undergoing mutation triggered by the pre-verbal particle *mi*). The mutation in (56) is not specific to the pronoun *i* ‘1SG’. It would similarly

occur were the subject to be swapped for any other pronoun or indeed some other DP such as *Siôn* ‘John’ or *derwydd* ‘druid’. Example (57) shows how the adjective *bach* /baχ/ ‘small’ undergoes mutation under gender agreement with the feminine noun *cath* /kaθ/ ‘cat’ (which again has itself undergone mutation) that it modifies, despite not being directly string adjacent to *cath* by virtue of the intervening adjective *Eifftaidd* /əiftaið/ ‘Egyptian’ that precedes it.

Table 2 gives an overview of the three basic patterns of Welsh ICM. The term *radical* refers to the underlying base form of the initial consonant that is affected, while Soft Mutation (SM), Nasal Mutation (NM), and Aspirate Mutation (AM) are the three basic patterns of mutation. Each of the mutation patterns is triggered by a different set of environments. For instance, no mutation is triggered by *ein* /əin/ ‘DET.1PL.GEN’, SM is triggered by *dy* /də/ ‘DET.2SG.GEN’, NM is triggered by *fy* /və/ ‘DET.1SG.GEN’, and AM is triggered by *ei* /i/ ‘DET.3SGF.GEN’. Consequently, *ci* /ki:/ ‘dog’ may variously appear as one of the four surface forms in (58), depending on the mutation pattern that applies:

| | | | |
|------|----------------------|-----------|-----------|
| (58) | əin ki: | ‘our dog’ | (radical) |
| | də gi: | ‘thy dog’ | (SM) |
| | və ŋ ^h i: | ‘my dog’ | (NM) |
| | i χi: | ‘her dog’ | (AM) |

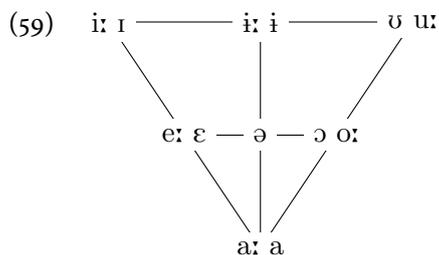
It should be readily apparent from only a few examples such as those in (55–58) that ICMs permeate the entire grammatical system of the language. They are consequently not only known for the particular issues they present in determining their morphosyntactic conditions or their phonological and phonetic effects alone, but they also pose challenges to how the different systems interface to give rise to the overall phenomenology of ICMs. There are many finer variations of the mutation alternations triggered in specific environments and an even broader variety in the triggering conditions, both issues I will address in much more detail in Ch. 4, where I undertake a detailed and comprehensive survey of the mutations and their environments. I will turn to the grammatical implementation of mutation across the interface in Ch. 6.

| RADICAL | SOFT MUTATION | NASAL MUTATION | ASPIRATE MUTATION |
|----------------|------------------|-------------------|----------------------|
| p | b | m ^h | f |
| t | d | n ^h | θ |
| k | g | ŋ ^h | χ |
| b | v | m | |
| d | ð | n | |
| g | (deleted) | ŋ | |
| m | v | | |
| n | | | |
| ɫ | l | | |
| r ^h | r | | |

Table 2: The basic patterns of Welsh ICM

3.5 THE VOWEL SYSTEM

Welsh has a triangular vowel system with 7 vowels in North Welsh and 6 vowels in South Welsh. Whereas North Welsh retains a contrastive high central vowel /i:/, this vowel has merged with high front /i:/ in South Welsh. Apart from schwa, all the vowels show a length contrast, and for all but the central vowels this is associated with a tense–lax contrast, where long vowels are tense and short vowels are lax. The North Welsh system is illustrated in (59); the South Welsh system is identical except for the lack of the high central vowel /i:/.



It is worth noting that, unlike schwa in most other languages, Welsh schwa occurs freely in stressed syllables, but is banned from word-final position (where main stress was located before the historical loss of final syllables).

Diphthongs always close in a high vowel. In South Welsh we have the full set of central and back vowels closing in /ɪ/, i.e. /aɪ, ɔɪ, əɪ, ʊɪ/, as well as the full set of central and front vowels closing in /ʊ/, i.e. /aʊ, ɛʊ, əʊ, ɪʊ/. In North Welsh, the latter series is missing /ɪʊ/ but has /iʊ/ in its place. In addition, North Welsh has set of diphthongs closing in /i/, allowing the full range of back and central vowels and notably adding a lax low central vowel /ɑ/ which does not occur as a monophthong, giving the series /aɪ, ɑɪ, əɪ, ɔɪ, ʊɪ/.

The vowel system will not be of much importance in the work that is to follow and I will thus not attempt to justify any specific set of representations for the Welsh vowels, though they doubtlessly pose some interesting questions. For more on the phonetics of the vowel system see for example [Ball and Williams \(2000\)](#). For a more in-depth phonological overview see [Hannahs \(2013b\)](#).

3.6 THE CONSONANTS AND THEIR REPRESENTATION

3.6.1 Overview

Table 3 shows an overview of the complete consonant inventory of Welsh.

Welsh has oral stops in bilabial, alveolar and velar place, occurring in a fortis series /p^h, t^h, k^h/ and a lenis series /b, d, g/. Although the situation with regard to laryngeal contrast is in reality more intricate (a matter I turn to in the next section), I will for simplicity adopt the practice of transcribing the oral stops with the plain symbols “p, t, k” and “b, d, g” for the fortis and lenis series respectively, unless the details are particularly relevant to the point at hand.

Nasal stops mirror the oral stops in their place distribution. While all the Welsh dialects have the lenis nasal series /m, n, ŋ/, the fortis nasals /m^h, n^h, ŋ^h/ occur only as a reflex of mutation and are missing entirely in some of the South Welsh dialects (these dialects have the regular lenis nasals in the same environment).

| | BILABIAL | | LABIODENTAL | | DENTAL | | ALVEOLAR | | POSTALVEOLAR | PALATAL | | VELAR | UVULAR | GLOTTAL |
|-------------|----------------|-----|-------------|-------|----------------|------|----------|--|--------------|---------|----------------|-------|--------|---------|
| PLOSIVE | p | b | | | t | d | | | | | k | g | | |
| NASAL | m ^h | m | | | n ^h | n | | | | | ɲ ^h | ŋ | | |
| TRILL | | | | | r ^h | r | | | | | | | | |
| FRICATIVE | | f v | θ ð | s (z) | ʃ | | | | | | x~χ | | | h |
| AFFRICATE | | | | | (tʃ) | (dʒ) | | | | | | | | |
| LATERAL | | | | | ɬ | l | | | | | | | | |
| APPROXIMANT | | w | | | | | | | | | j | | | |

Table 3: The Welsh consonant inventory. Sounds in parenthesis are marginal and mainly found in loanwords. The voiceless nasals occur only as mutation reflexes. The voiceless dorsal fricative is usually /x/ in South Welsh and /χ/ in North Welsh. Some dialects of South Welsh lack the voiceless nasal series.

The affricates /tʃ, dʒ/ are somewhat marginal and mainly found in English loanwords; however they have also become established in some dialects, especially in South Welsh, where they are the result of palatalisation of /t, d/ preceding /i/, e.g. in South Welsh *sgidiau* [sgɪdʒɛ] ‘shoes’.

Welsh has fortis fricatives in labiodental, dental, alveolar, postalveolar and velar~uvular place, as well as featuring a glottal fricative and a fortis lateral alveolar fricative, giving the series /f, θ, s, ʃ, x~χ, h, ɬ/. Most dialects have uvular [χ], but some South Welsh dialects have [x] instead. In native word stock we only find two lenis fricatives, labiodental and dental /v, ð/. Alveolar lenis /z/ is marginally found in some English loanwords in South Welsh, e.g. *sŵ* [zu:], though even in common English loans it is frequently adapted to fortis /s/. I will later go on to analyse the alveolar lateral fricative /ɬ/ as the fortis counterpart of the liquid /l/.

Finally, the liquids and glides we find in Welsh include the labial-velar and palatal approximants /w, j/, and in alveolar place we find the lenis trill and lateral glide /r, l/. The alveolar trill has a fortis counterpart /r^h/.

In the remainder of this section, I will provide a more detailed discussion of individual aspects of the consonantal system and propose a specific set of representations for the Welsh consonants, based on the outline of ET in §2.4.3.

3.6.2 *Laryngeal Contrast, Frication and Nasality*

Regarding the distinction between aspiration and frication in Welsh, I assume that the aspirated stops of the fortis series have dependent |H|, while fricatives have headed |H|. With regard to the distinction between voicing and nasality, I follow Botma's (2004b) proposal that the interpretation of |L| is context-sensitive. Specifically, dependent |L| is interpreted as voicing in the context of |H| (i.e. in fricatives) but as nasality elsewhere; however, I submit that headed |L| is always interpreted as voicing (in line with the view espoused by GP, cf. e.g. Ploch, 1999; Nasukawa, 2005), regardless of the remaining content of the segment.³ This situation is summarised in Table 4.

³ Note that headed |L| is inherently unable to show context-sensitivity to |H| by virtue of the SOHC excluding the doubly headed expression *|L, H|.

| EXPRESSION | INTERPRETATION |
|--------------|---|
| [<u>H</u>] | Frication |
| H] | Aspiration |
| [<u>L</u>] | Voicing |
| L] | Voicing in the context of [<u>H</u>], nasality elsewhere |

Table 4: The Interpretation of |H| and |L|

Let us briefly turn to the question of how the Welsh system encodes the laryngeal contrast. At first sight, the system appears to have a simple two-way contrast with a plain lenis and an aspirated fortis series similar to English, as shown in (60a). Unlike English however, the aspirated–plain contrast in foot-initial position doesn’t shift to voiced versus plain unaspirated non-foot-initially, but rather to voiced versus aspirated. That is to say, unlike English, aspiration in Welsh persists in foot-internal position, as shown in (60b).

- (60) (a) *tŵr* [t^hu:r] ‘tower’
 dŵr [d̥u:r] ‘water’
- (61) (b) *petal* [pɛt^hal] ‘petal’
 medal [mɛdal] ‘medal’

It might seem plausible to claim that the voicing of [d] in (60b) is simply a matter of positionally induced passive voicing, without it being encoded in the melodic representation. However, [Iosad \(2015\)](#) points out a piece of crucial evidence that suggests that Welsh does in fact encode both voicing and aspiration melodically, which is more consistent with analysis as a three-way system. This evidence comes from a process in South Welsh called *calediad* (‘hardening’). Calediad involves the devoicing of a post-tonic voiced stop, as illustrated in (62).

| | | | |
|------|----------------|------------|--------------------------------|
| (62) | <i>ceginau</i> | [kɛ'gina] | 'kitchens' (Iosad, 2015, p. 2) |
| | <i>cegin</i> | ['kɛɡin] | 'kitchen' |
| | <i>gofid</i> | ['ɡɔvɪd] | 'regret' |
| | <i>gofidio</i> | [ɡɔ'vɪdjo] | 'to regret' |

As Iosad (2015, p. 6) points out (referring to Thomas, 1983, 1988), the devoiced post-tonic stops resulting from calediad in (62) do not show aspiration, unlike underlyingly aspirated stops, which as we saw in (60b) do show aspiration in that environment. Consequently, South Welsh at least⁴ has a three-way voiced–plain–aspirated contrast post-tonically.

Given this situation, I propose that Welsh fortis stops, which are aspirated in virtually all contexts, contain [H] in their representation, while non-word-initial lenis stops contain [L]. Word initially, since these stops are typically plain unaspirated, I assume that these stops contain neither [H] nor [L] underlyingly. Lastly, when we consider the evidence from calediad together with the fact that non-stop lenis segments in all positions are [L]-voiced, we can generalise that all three representational possibilities are generally available in any position (apart from phonotactic constraints, such as the inhibition of laryngeal contrast in sC clusters). This last generalisation is crucially important for my account of mutation, since I propose that mutation-induce fortis-to-lenis changes in word-initial segments are due to the incorporation of [L]/[L̥] into the affected segment.

3.6.3 Licensing Constraints

Licensing constraints (Charette and Göksel, 1996, 1998) have proven to be an important tool in capturing the properties of vowel systems and the behaviour of nuclei when they are affected by processes such as vowel harmony. Although licensing constraints should in principle carry over from nuclei to onsets, how they apply to consonants has been given very little attention in the literature. We will see in the course of this section

⁴ There is a perhaps related process found in both South and North Welsh where specific suffixes such as the superlative *-ach* trigger devoicing of a voiced final consonant on a stem. It is an interesting, but as far as I know open, question whether the devoiced stops in that context show aspiration or not in North Welsh.

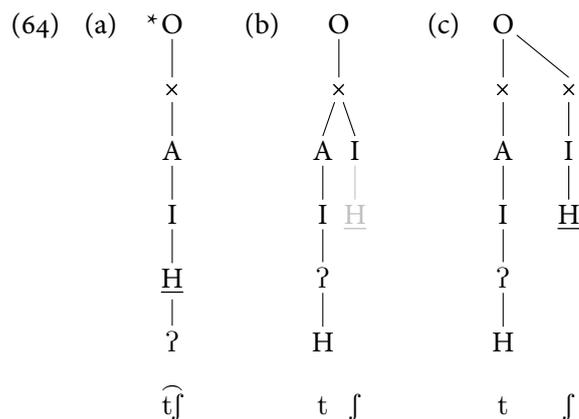
that there are at least two licensing constraints operating on onsets in Welsh, as shown in (63).

(63) LICENSING CONSTRAINTS (ONSETS):

- (a) * $[\underline{H}, \text{ʔ}]$ $[\text{ʔ}]$ cannot be licensed by headed $[\underline{H}]$.
- (b) * $[\underline{L}, \text{H}]$ $[\text{H}]$ cannot be licensed by headed $[\underline{L}]$.

Both of these constraints may also be construed in terms of what Backley (2011, pp. 194–203) describes as elemental antagonism: the two elements in each of these pairs have conflicting acoustic cues associated with them. Consequently, segments containing a pair of antagonistic elements are marked because they make it difficult to accurately encode and decode the conflicting cues simultaneously in a single portion of the speech signal. The * $[\underline{H}, \text{ʔ}]$ constraint militates against segments which are stops and fricatives at the same time. As such it excludes affricates with a unitary, fused expression as shown in (64a), as assumed for instance by Backley (2011).⁵ This exclusion fits well with the fact that Welsh does not historically have any affricates; though, as was indicated in brackets in the Welsh consonant inventory in Table 1, this is not absolutely true of the present state of the language. Recent borrowings from English frequently appear in Welsh with their affricates intact, for instance $/tʃɔklɛd \sim ʃɔklɛd/$ for *chocolate* and $/tʃɪps \sim tsɪps \sim ʃɪps/$ for *chips*. Given the * $[\underline{H}, \text{ʔ}]$ constraint, the affricates in these onsets must have either the structure in (64b) or that in (64c); structure (64a) is ruled out by the constraint.

⁵ Though in actuality, following Clements (1999), Backley (2011) obviates with the need for $[\underline{H}]$ in affricates by assuming absolute complementarity between affricates and stops, i.e. he argues that no language has affricates and stops in the same place, so that the difference is merely a matter of phonetic interpretation of stops at specific places. This somewhat extreme position seems misguided to me, given segmental triplets such as the Upper German $/\widehat{p}f, p, f/$. Such a triplet must clearly involve the melodic encoding of manner distinction between the affricate, the stop and the fricative.



There are language internal arguments against a representation of type (64a), too. In those dialects where borrowed forms are mutable, mutation of the left hand portion of affricates triggers alternation of the right hand portion, in line with general phonotactic constraints in the language. Importantly, some of the entities that result from this (e.g. [θj], resulting from AM of /tʃ/) are not possible affricates of type (64a). Neither are they stops with a modified release, nor is it in fact possible to represent them a single units within ET.⁶ Conversely, a form such as [θj] is completely unproblematic if it has a representation of type (64b) or (64c).

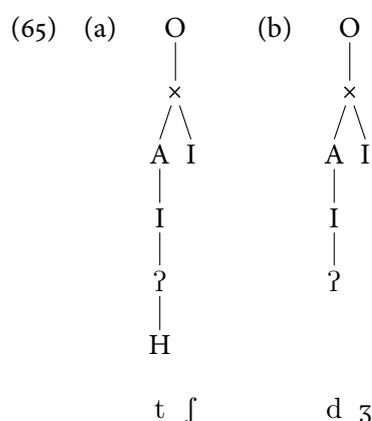
Watkins (1961, p. 19) argues that the affricates in Welsh are not clusters of type (64c), principally because they are subject to mutation in the same way that the unitary stops /t, d/ are. If this were so, it would leave us with option (64b) as the only plausible representation. For Watkins (1961), unitarity is revealed by the fact that the entire affricate sequence is mutated, i.e. /tʃ/ → [dʒ] and /tʃ/ → [θj], not */tʃ/ → [dʃ] or */tʃ/ → [θʃ]. This is not what we might expect if they were separate segments.

The surface unity of the alternation can be explained straightforwardly by general phonotactic requirements, however, if we assume that they are indeed branching onsets of type (64c). *[dʃ] is not a possible onset cluster because such clusters must agree in voicing. The right hand segment, being governed by the left hand segment in a branching onset, will inherit its voicing from the left hand segment, thus we obtain [dʒ]. *[θʃ], being a fricative–fricative sequence, is likewise illicit in a branching onset cluster and to resolve this conflict one of the segments must invariably undergo melodic reduction. It is to be expected that the right hand segment, being

⁶ Since [j] consists solely of [I], but [I] is already interpreted as part of [θ], there would be no way of melodically distinguishing [θ] from “[θj]”.

a weaker dependent, should lose the violating head [H], leaving behind only the place element [I]. Thus here again, from general phonotactic requirements, we obtain [θj].

While this ultimately leaves both the possibilities of (64b) or (64c) available to explain the behaviour of the affricates, I will assume the classic unfused contour representation in (64b), principally because this fits with the general observation that fricatives are not permitted in the right-hand portion of Welsh branching onsets otherwise. I assume that the right hand portion of this segment contains only the place element [I], and that its interpretation variously as [ʃ~ʒ~j] is simply down to phonetic implementation.⁷ Thus, I propose that the affricates /tʃ/ and /dʒ/ have the representations in (65a) and (65b), respectively.



The second constraint in (63), *|L, H| excludes the co-occurrence of voicing and aspiration in oral stops and liquids (where it is encoded by headed [L]). Again, this relation is antagonistic in *Backley's* terms, and this type of L–H incompatibility is relatively well established cross-linguistically (cf. *Ploch, 1999*). Note however the specific consequences of the *|L, H| constraint proposed here to a more general *|L, H| or a reverse *|L, H| constraint. *|L, H| only excludes the co-occurrence of headed [L] and dependent [H] in the oral stops and liquids (i.e. it excludes breathy/murmured plosives and liquids). It does not impede the combination |L, H| found in aspirated nasals, nor does it exclude the combination |L, H| found in voiced fricatives.

Given the assumptions set forth above, let us now attempt to draw up melodic representations for the remaining Welsh consonants.

⁷ That is, unfused dependent [I] is phonetically interpreted as a fricative when it co-occurs with occlusion, it is interpreted as a glide otherwise.

| SEGMENT | p ^h | t ^h | k ^h | b | d | g |
|---------|----------------|----------------|----------------|-----|-----|-----|
| PLACE | U | A,I | | U | A,I | |
| MANNER | ʔ | ʔ | ʔ | ʔ | ʔ | ʔ |
| LX | H | H | H | (L) | (L) | (L) |

Table 5: Representation of the Welsh Plosives

| SEGMENT | m ^h | n ^h | ŋ ^h | m | n | ŋ |
|---------|----------------|----------------|----------------|---|-----|---|
| PLACE | U | A,I | | U | A,I | |
| MANNER | ʔ | (ʔ) | ʔ | ʔ | (ʔ) | ʔ |
| LX | L,H | L,H | L,H | L | L | L |

Table 6: Representation of the Welsh Nasals

3.6.4 Plosives

The plosive series consists of three fortis stops /p^h, t^h, k^h/ and the three lenis stops /b, d, g/, each at three places of articulation: bilabial, alveolar and velar. In terms of manner all of these stops contain the edge element [ʔ]. Regarding the laryngeal contrast, as argued for in §3.6.2, I propose that the fortis series contains [H], while the lenis series contains either headed [L] where they are phonetically voiced (namely word-internally) or neither [H] nor [L] where they are not, i.e. word-initially. Regarding place, the bilabial plosives contain [U], the alveolar plosives have the combination [A, I] and the velar plosives have no element for place, i.e. velar is the default place. These assumptions regarding place representation follow the assumptions made earlier by [Cyrán \(2010\)](#); assuming a different distribution of place elements will have no impact on the account of mutation I propose. This gives us the representations illustrated in Table 5 for each of the plosives.

3.6.5 *Nasals*

The series of nasals is analogous to that of plosives, with the fortis, aspirated nasals /m^h, n^h, ŋ^h/ and three lenis nasals /m, n, ŋ/, again in the three places bilabial, alveolar and velar; though the fortis nasals only occur as a consequence of NM. The representation of place is the same as for the plosives, i.e. |U| for bilabial, |A,I| for alveolar and no place element for the velars. In terms of laryngeal specification, all of the nasals contain dependent |L| (recall that dependent |L| is interpreted as nasality unless it co-occurs with |H|), and the fortis nasals additionally contain dependent |H|, which is responsible for their aspiration analogously to the fortis plosives.

The manner specification of the Welsh nasals is a matter of some interest. [Cyrn \(2010\)](#) proposes that, in languages that do not contrast nasal stops from nasal continuants, the edge element |ʔ| is redundant in nasals, and consequently Welsh nasals may not contain |ʔ|. However, when we look at the behaviour of each of the nasals, we can see an interesting pattern where some of them pattern with the plosives in terms of natural class behaviour and others do not. One piece of evidence comes from the mutation system itself: SM targets the plosive /m/, but not /n/, so that we may conclude that /m/ forms a natural class with the plosives, but /n/ does not. Since /ŋ/ never occurs word-initially, mutation cannot reveal whether it patterns with the plosives or not.

The other piece of evidence comes from the patterning of nasals with stops in monosyllables. In South Welsh stressed monosyllables have a short vowel when they are followed by /p, t, k, ŋ/ (and usually /m/) or a cluster, e.g. *lloc* [ʎɔk] ‘sheepfold’, but a long vowel before most other consonants, e.g. *gwell* [gwe:l] ‘better’. That is, the length of a vowel in that position is conditioned by the natural class of the consonant that follows it, an issue I will address in more depth in §3.8, which deals with quantity. Notable exceptions to the system are the nasal /n/ and the liquids /l, r/, which can co-occur both with short and long vowels. For instance with /n/ we find both *ton* [tɔn] ‘wave’ and *tôn* [to:n] ‘tone’ ([Awbery, 1984a](#)). While we do find the same contrast with /m/ in forms such as *pum* [pim] ‘five’ and *bûm* [bi:m] ‘be.1SG.PST’, *bûm* is the only attested /V:m/ word in Welsh, and is found exclusively in the literary language;

| SEGMENT | h | s | ʃ | f | θ | χ | v | ð |
|---------|---|----------|----------|----------|----------|----------|----------|----------|
| PLACE | | A | I | U | A,I | | U | A,I |
| MANNER | | <u>H</u> |
| LX | | | | | | | L | L |

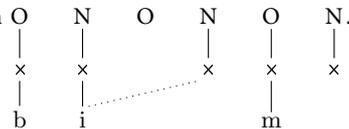
Table 7: Representation of the Welsh Fricatives

consequently I will assume that /m/ for most speakers of modern Welsh is essentially restricted to co-occurrence with short vowels.⁸ One way of accounting for the variable behaviour of /n/ in this context is to assume that there are two types of /n/: one containing [ʔ] and one without [ʔ]. The version of /n/ that contains [ʔ] behaves exactly like /m, ŋ/ in that position, so that they group with the voiceless stops to produce a system where vowels are always short before stops that do not contain [L]. The version of /n/ without [ʔ] simply does not belong to the natural class of stops and hence co-occurs with long vowels (see §3.8 for more detail on quantity). Since word-initial /n/ never takes part in mutation, while /m/ in that environment behaves just like the other stops, it is a matter of stipulation that in Welsh word-initially only the [ʔ]-less version of /n/ occurs underlyingly; that is to say [ʔ]-full /n/ is banned from word-initial position in Welsh, just like /ŋ/.⁹

3.6.6 Fricatives

Let us now turn to the fricatives. With an inventory of /h, s, ʃ, f, θ, χ, v, ð/ this is where Welsh exhibits maximal place contrast. I will assume that

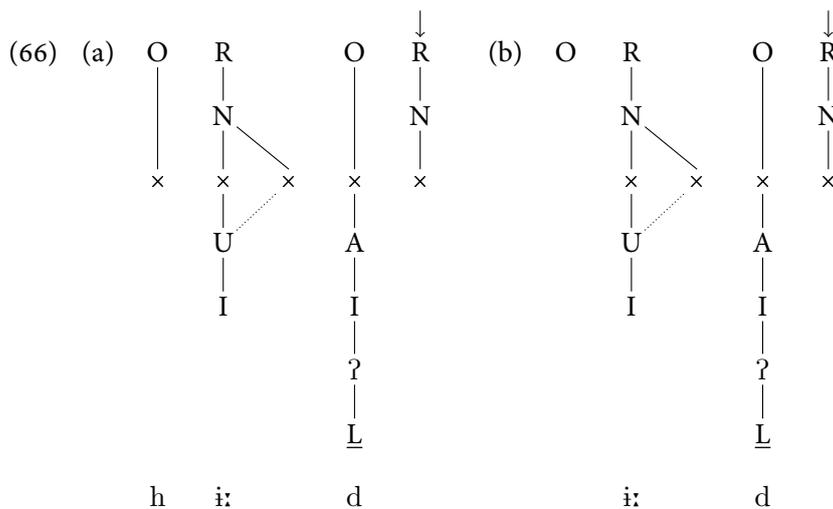
⁸ Given that *bûm* is historically complex, it may well be possible that it contains a “bogus long vowel” with a structure of the form



⁹ Where initial [n] is derived by NM of /d/ the derived representation would in the first instance include [ʔ] since that element is part of the representation of /d/. This does not necessarily stand in the way of accounting for the absence of word-initial [ʔ]-full /n/ by an outright phonotactic ban on it: if [ʔ]-full /n/ is banned from word-initial position, we would simply expect that phonology deletes [ʔ] from the derived [n] in that position.

alveolar /s/ has |A|, palatal /ʃ/ has |I|, labiodental /f, v/ have |U|, alveolar /θ, ð/ have |A, I|, and velar /ɣ/ has no place element (and neither does /h/, on which more presently). Why should alveolar /s/ have |A| only while alveolar /θ, ð/ have |A, I|, even though I have proposed above that alveolar stops have |A, I|? This is simply because we see from the mutation process that alveolar plosives under SM and AM alternate with the alveolar fricatives, but there is no alternation between alveolar stops and alveolar /s/; by hypothesis then the alveolar fricatives and alveolar stops must form a natural class. In terms of manner and laryngeal contrasts, I propose that all of the fricatives except /h/ have headed |H|, and the two voiced fricatives /v, ð/ have dependent |L| making them voiced. The full set of representations this gives us is shown in Table 7.

Let us now briefly turn to the representation of /h/, which I have so far proposed contains neither place nor manner nor laryngeal specification. What I propose is that Welsh /h/ is an empty onset. In line with [Charette's \(1991, pp.86–96\)](#) analysis of French *h*-aspiré, I assume that empty onsets can come in two flavours: an empty onset that dominates a skeletal position, i.e. an onset with an ×-slot, and an empty onset that does not dominate any skeletal position, i.e. an onset without an ×-slot (this is traditionally called a *pointless onset*). Those onsets which do not dominate any skeletal position are never realised in Welsh, but those which dominate a skeletal position are realised as /h/. Thus a minimal /h/—zero pair such as *hŷd* [hɪ:d] ‘long’ and *ŷd* [ɪ:d] ‘corn’ is a reflection of the two representations in (66a) and (66b) respectively, the first dominating a melodically empty skeletal position, the second not dominating anything.



| SEGMENT | r^h | ɹ | r | l | w | j |
|---------|-------|-----|-----|-----|---|---|
| PLACE | A | A,I | A | A,I | U | I |
| MANNER | | | | | | |
| LX | H | H | (L) | (L) | | |

Table 8: Representation of the Welsh Liquids and Glides

The fact that an empty onset in Welsh is pronounced as /h/ while it remains silent in French is simply down to language-specific implementation.

An interesting question arising from an analysis of Welsh /h/ as an empty onset is in how far this lends itself to an analysis of /h/—zero alternations such as *brenin* ‘king’ ~ *brenhinol* ‘royal’, which are frequent in the language and chiefly positional in nature (cf. e.g. [Hannahs, 2013b](#), pp. 102–115), especially by analogy to the vowel–zero alternations we typically find with empty nuclei. This does however go beyond the remit of my analysis here and I leave that question open for future work.

3.6.7 Liquids and Glides

The four remaining segments are the liquids / r^h , ɹ, r, l/ and the glides /w, j/. I propose that the two trills / r^h , r/ contain the place element |A| while the two laterals /ɹ, l/ have |A, I|. The two glides /w, j/ have the place elements |U| and |I| respectively. Although laterals are sometimes argued to contain |ʔ|, and both [Buczek \(1995\)](#) and [Cyran \(2010\)](#) propose that /ɹ, l/ contain |ʔ|, I assume that this is not the case in Welsh. Not only is there no evidence that /ɹ, l/ form a natural class with the stops to the exclusion of / r^h , r/, but the fact that Welsh /ɹ/ appears to be phonetically continuant in nature also speaks for a |ʔ|-less analysis.

I follow [Wood \(1988\)](#) in assuming that /ɹ/ is in essence simply a fortis version of /l/; something that has also been implicitly assumed by [Buczek \(1995\)](#) and [Cyran \(2010\)](#). [Nolan \(2016\)](#), based on the study of Estonian Swedish [ɹ] in [Schötz et al. \(2014\)](#), has recently suggested that, from comparison of Welsh /ɹ/ with Estonian Swedish [ɹ] and [l̥], this seems acous-

tically plausible. While [Hannahs \(2013b\)](#) points out that Welsh does seem to have a phonetically voiceless variant of /l/ which is supposedly acoustically distinct from /ɬ/, this is essentially restricted to those positions in onset clusters where no voicing contrast can be encoded (e.g. /tɬ/ → [tɬ̥]). This is unproblematic since /ɬ/ cannot appear in that position, so that the two are never in contrastive distribution. A potential counterargument is made by [Kibre \(1997\)](#). [Kibre](#) suggests if we treat Welsh /ɬ/ as a voiceless lateral approximant we might expect it to show distributional restrictions similar to the voiceless alveolar trill, /r̥^h/, which is for instance banned from word-final position. However, /ɬ/ does not seem to show any such distributional restrictions, leading [Kibre \(1997\)](#) to conclude that it is phonologically treated as a fricative.

In terms of representing laryngeal contrasts, I assume that the two fortis liquids /r̥^h, ɬ/ have dependent [H], much like the fortis stops, while the lenis liquids /r, l/ have two variants, one with headed [L̥] and one without a laryngeal specification. I propose that lenis /r, l/ always have [L̥] word-initially, and never in the context #C_, while both the [L̥]-full and [L̥]-less variants may occur freely elsewhere (i.e. word-internally). The reason for this dichotomy is that we again see a split in the interaction between stressed nuclei and their following consonants, where stressed vowels before lenis /r, l/ can be either long or short. Analogously to what I have proposed for the nasals, I suggest that this is encoded in the representation of these liquids: those triggering vowel lengthening have [L̥], while the [L̥]-less variant licenses a short stressed vowel (cf. §3.8).

Regarding the glides /w, j/ I will assume that they contain neither manner nor laryngeal specifications, in line with much of the [GP](#) literature. There are alternations between vocalic /u, i/ with /w, j/ that appear to confirm that they are melodically the same as their corresponding vowels. It is quite possible that their place elements are headed, and whether this is so is certainly an interesting issue, but it is of no particular import to my analysis. I will assume for simplicity's sake that they are unheaded.

3.6.8 Summary

For ease of reference, [Table 9](#) contains a summary of all the representations I have proposed for the Welsh consonants.

| | | | | | | | | | | | | | | |
|---------|----------------|----------------|----------------|----------|----------|----------|----------------|----------------|----------------|-----|-----|-----|---|---|
| SEGMENT | p ^h | t ^h | k ^h | b | d | g | m ^h | n ^h | ŋ ^h | m | n | ŋ | | |
| PLACE | U | A,I | | U | A,I | | U | A,I | | U | A,I | | | |
| MANNER | ʔ | ʔ | ʔ | ʔ | ʔ | ʔ | ʔ | (ʔ) | ʔ | ʔ | (ʔ) | ʔ | | |
| LX | H | H | H | (L) | (L) | (L) | L,H | L,H | L,H | L | L | L | | |
| SEGMENT | h | s | ʃ | f | θ | ç | v | ð | r ^h | ɹ | r | l | w | j |
| PLACE | | A | I | U | A,I | | U | A,I | A | A,I | A | A,I | U | I |
| MANNER | | <u>H</u> | <u>H</u> | <u>H</u> | <u>H</u> | <u>H</u> | <u>H</u> | <u>H</u> | | | | | | |
| LX | | | | | | | L | L | H | H | (L) | (L) | | |

Table 9: Representation of the Welsh Consonants (combined)

3.7 STRESS

Stress in Welsh is highly regular, with primary stress falling on the sole syllable in monosyllables and on the penultimate syllable in polysyllabic words and secondary stresses every other syllable to the left of the main stress, if applicable. This is illustrated in (67), which also shows that stress shifts under synthetic suffixation to maintain penultimate position.

- (67) (a) *agor* [ˈa:ɡɔɾ] ‘open’
agoriad [aˈɡɔɾjad] ‘opening’
agoriadau [aɡɔɾˈjaɪdaɪ] ‘openings’
- (b) *gair* [ˈɡaɪr] ‘word’
geiriad [ˈɡɛɪrjad] ‘vocabulary’
geiriadur [ɡɛɪrˈjaɪdɪr] ‘dictionary’
geiriaduron [ɡɛɪrjaˈdɪrɔn] ‘dictionaries’
- (c) *amser* [ˈamser] ‘time’
amserydd [amˈse:rið] ‘timer’
amseryddiaeth [ˌamseˈriðjaɪθ] ‘chronology’
amseryddiaethau [amˌseɪriðˈjaɪθaɪ] ‘chronologies’

The pattern in (67) applies to the majority of the word stock in Welsh, regardless of length or diachronic origin.

In addition to the above, there are also a number of items in Welsh that show an irregular stress pattern. Irregularly stressed items are either stressed on the antepenultimate or on the final syllable. Antepenultimate stress is found exclusively in borrowings from English. This is illustrated in (68) (this and the following set of examples are from [Hannahs, 2013b](#), §3.2).

- (68) *testament* [ˈtɛstəmənt] ‘testament’
polisi [ˈpɔlɪsi] ‘policy’
paragraff [ˈparəgrɑf] ‘paragraph’

Final stress may be found both in loanwords and in native vocabulary, as illustrated in (69a) and (69b), respectively.

- (69) (a) *parêd* [paˈre:d] ‘parade’
canŵ [kaˈnu:] ‘canoe’
sigâr [siˈgɑ:r] ‘cigar’
balŵn [baˈlu:n] ‘balloon’
- (b) *parhad* [parˈha:d] ‘continuation’
mwynhad [muɪnˈha:d] ‘enjoyment’
parhau [parˈhɑi] ‘to continue’
mwynhau [muɪnˈhɑi] ‘to enjoy’
ymdroi [əmˈdrɔi] ‘to loiter’
ymdaith [əmˈdaɪθ] ‘to march’
Cymraeg [kəmˈraɪg] ‘Welsh’

Final stress in native vocabulary items is usually associated with specific affixes. For example in (69b) we see final stress associated with the nominaliser *-had*, with the verbaliser *-hau*, and with the reflexive marker *ym-*. It seems plausible, and is often argued, that these affixes are associated with internal domains (i.e. with analytic structure), e.g. *parhad* has an internal structure of the form [par[ˈha:d]], or perhaps [[par][ˈha:d]] with subsequent destressing of [par].¹⁰ The reflexive prefix *ym-* has been

¹⁰ [Kaye \(1995\)](#) stipulates that words with an internal [A[B]] structure are unattested (though they are definitely attestable, in the sense of [Hale and Reiss, 2008](#)), which would force

argued to behave like a proclitic, i.e. *ymdaith* has the internal structure [əm[daɪθ]] and the prefix is not present when stress is first computed.

Some native vocabulary items with final stress, such as *Cymraeg* in (69b), have diachronically derived from coalescence of a vowel sequence. For instance, *Cymraeg* with the diphthong [ai] arose from coalescence at the juncture of the stem *Cymra* and the suffix *-eg* used with language names (cf. *Ffrangeg* ‘French’, *Saisneg* ‘English’), resulting in the reduction of the word’s syllable count. As Hannahs (2013b, p. 48) points out it is not really plausible to analyse such items as undergoers of synchronic coalescence and thus derive their irregular stress from a non-surfacing syllable. This means that a word such as *Cymraeg* has to either be stored with its idiosyncratic stress or with a non-morphological internal domain.

Hannahs (2013b, pp. 46ff) also makes the interesting observation that irregularly stressed items such as those in (68) and (69) tend to revert to the regular penultimate stress pattern when affixed with a synthetic suffix. For instance the plural of *testament* [ˈtɛstament] ‘testament’ is [ˌtɛstaˈmɛntai], with penultimate stress. This speaks for these items being underlyingly coded with stress, which is overridden with the regular stress assignment as soon as two items are concatenated to form a new synthetic domain.

3.8 QUANTITY

As the attentive reader may have already noticed, the primary stressed syllable in all but two of the examples in (67–69) are heavy by virtue of either containing a coda, a long monophthong, or a diphthong. Notably also, as seen in (67), the long vowels in primary stressed syllables are short when stress shifts away, and previously unstressed short vowels appear long in the primary stress context. These are all tell-tale signs of a quantity-determined system.

Indeed, quantity has a role to play in the Welsh stress system. In general, the vowel remains short in closed syllables and preceding /p, t, k, m, ŋ, s/, as well as before /t̪/ in North Welsh. The vowel is generally long in final open stressed syllables or preceding /b, d, g, ʃ, f, θ, χ, v, ð/, as

the latter analysis. This caveat may not apply to proclitics. If the structure were [[A]B] we would expect main stress to prevail on A, since, being the most deeply embedded domain, it would project its stressed nucleus first.

well as before /t̪/ in South Welsh. /h, t̪^h, m̪^h, n̪^h, ŋ̪^h/ only occur foot-initially and therefore are never found immediately following a stressed vowel. Likewise, /w, j/ do not occur as intervocalic singletons. Word-internal singleton /p, t, k, m, ŋ, s/ (and /t̪/ in North Welsh) geminate following the primary stressed vowel. The situation is in reality somewhat more complex, mainly due to significant dialectal variation. I will ignore these issues here (though see [Awbery, 1984a](#) for a good overview of the relevant dialectal issues) and assume a somewhat idealised North Welsh state of affairs.

The behaviour of stressed nuclei in closed syllables and open final syllables is amply apparent from (67–69); the pattern preceding word-internal singletons is shown in (70). (70a) shows that vowels remain long before lenis stops and most fricatives, and (70b) shows that the vowels remain short and are followed by gemination in the case of fortis consonants, /s/, and /t̪/.

| | | | | |
|------|-----|---------------|-----------|---------------|
| (70) | (a) | <i>aber</i> | [ˈaːbɛr] | ‘estuary’ |
| | | <i>adeg</i> | [ˈaːdɛg] | ‘time/period’ |
| | | <i>agor</i> | [ˈaːgɔr] | ‘open’ |
| | | <i>asio</i> | [ˈaːʃɔ] | ‘to weld’ |
| | | <i>offer</i> | [ˈoːfɛr] | ‘tools’ |
| | | <i>ethol</i> | [ˈɛːθɔl] | ‘to elect’ |
| | | <i>achub</i> | [ˈaːχɪb] | ‘to rescue’ |
| | | <i>afal</i> | [ˈaːvəl] | ‘apple’ |
| | | <i>addo</i> | [ˈaːðɔ] | ‘to promise’ |
| | (b) | <i>capel</i> | [ˈkappɛl] | ‘chapel’ |
| | | <i>atal</i> | [ˈattal] | ‘to impede’ |
| | | <i>acen</i> | [ˈakkɛn] | ‘accent’ |
| | | <i>amaeth</i> | [ˈammaiθ] | ‘agriculture’ |
| | | <i>angen</i> | [ˈaŋŋɛn] | ‘need’ |
| | | <i>asen</i> | [ˈassen] | ‘she-ass’ |
| | | <i>allan</i> | [ˈaʔʔan] | ‘outside’ |

Overt gemination as in (70) is only found intervocallically, but the vowel length facts before word-final consonants in monosyllables are virtually the same. This is shown in (71).

| | | | | |
|------|-----|--------------|------------------------|----------|
| (71) | (a) | <i>mab</i> | [ˈmaːb] | ‘son’ |
| | | <i>rhad</i> | [ˈr̥ ^h aːd] | ‘cheap’ |
| | | <i>bag</i> | [ˈbaːg] | ‘bag’ |
| | | <i>rhaff</i> | [ˈr̥ ^h aːf] | ‘rope’ |
| | | <i>brath</i> | [ˈbraːθ] | ‘wound’ |
| | | <i>bach</i> | [ˈbaːχ] | ‘small’ |
| | | <i>braf</i> | [ˈbraːv] | ‘fine’ |
| | | <i>gradd</i> | [ˈgraːð] | ‘degree’ |
| | (b) | <i>clap</i> | [ˈklap] | ‘gossip’ |
| | | <i>fflat</i> | [ˈflat] | ‘flat’ |
| | | <i>llac</i> | [ˈɭak] | ‘lax’ |
| | | <i>cam</i> | [ˈkam] | ‘step’ |
| | | <i>sang</i> | [ˈsaŋ] | ‘tread’ |
| | | <i>dall</i> | [ˈdaɭ] | ‘blind’ |

Note the absence of /s, ʃ/ in the examples in (71). As [Awbery \(1984a, p. 69\)](#) has already noted, /s/ in monosyllables is preceded by a long vowel, not a short vowel as one would expect (cf. *glas* [ˈglaːs] ‘blue’, *nes* [ˈneːs] ‘until’, *cas* [ˈkaːs] ‘hatred’, ...). There are, to my knowledge, no monosyllabic native vocabulary items ending in /ʃ/, and scarcely any borrowed items either (loaned /ʃ/ is typically transposed to /s/ in word-final position). The only such item I know of is the relatively recently loaned *ffres* [ˈfrɛʃ] ‘fresh’, which also against the expected pattern has a short vowel, but this may admittedly be an exception: we find similar cases with unexpected long vowels in some loan words, e.g. *gêm* [ˈgeːm] ‘game’. It is entirely plausible then that *ffres* presents a case of preserving the original vowel length. This would be in line with the fact that it seems to have exceptionally retained word-final /ʃ/.¹¹ In South Welsh, word-final /ɭ/ also switches behaviour in the same way as /s/ ([Awbery, 1984a, p. 69](#)), an issue I will ignore.

¹¹ Another potentially interesting aspect of *ffres* is that loans usually retain long vowels in unexpected positions, but I know of no other examples where an unexpected short-vowel is retained.

| | | | | | | | | |
|--------------|------------------|------------------|------------------|----------------|----------------|----------------|---|---|
| MORAIC: | p _μ | t _μ | k _μ | m _μ | ŋ _μ | ʈ _μ | | |
| NON-MORAIC: | b | d | g | f | θ | χ | v | ð |
| CONTRASTIVE: | l _(μ) | n _(μ) | r _(μ) | | | | | |

Table 10: Moraicity of underlying consonants in North Welsh following [Hannahs \(2013b\)](#).

Finally, preceding /l, n, r/ we find both long and short vowels, and this is contrastive, as illustrated in (72).

| | | | | |
|------|-----|------------|---------|-----------|
| (72) | (a) | <i>tâl</i> | [ˈta:l] | ‘payment’ |
| | | <i>tôn</i> | [ˈto:n] | ‘tune’ |
| | | <i>gêr</i> | [ˈgɛ:r] | ‘near’ |
| | (b) | <i>tal</i> | [ˈtal] | ‘tall’ |
| | | <i>ton</i> | [ˈtɔn] | ‘wave’ |
| | | <i>ger</i> | [ˈgɛr] | ‘near’ |

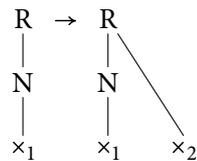
We find the same contrastive behaviour in penultimate stressed syllables, e.g. *melyn* [ˈmɛllin] ‘yellow’ but *gelen* [ˈgɛlɛn] ‘leech.sg’, and *celynnen* [kɛˈlɪnnɛn] ‘holly.sg’ but *tenau* [ˈte:naɪ] ‘thin’.

[Hannahs \(2013b\)](#) proposes that we can account for the distribution of vowel and consonant length by assuming differential moraicity of the various consonants in Welsh. The non-geminable consonants that go with a long vowel in (70a) are always non-moraic, while the geminable consonants that go with a short vowel in (70b) are always moraic. Regarding the variable behaviour of /l, n, r/ in (72), it is proposed that these three consonants are contrastively moraic; that is, the items in (72a) have a non-moraic final consonant /l, n, r/, while the items in (72b) have a moraic final consonant /l_μ, n_μ, r_μ/. [Hannahs’s \(2013b\)](#) system of moraicity is shown in Table 10 (omitting problematic /s, ʃ/ and positionally indeterminable /h, r^h, .../).

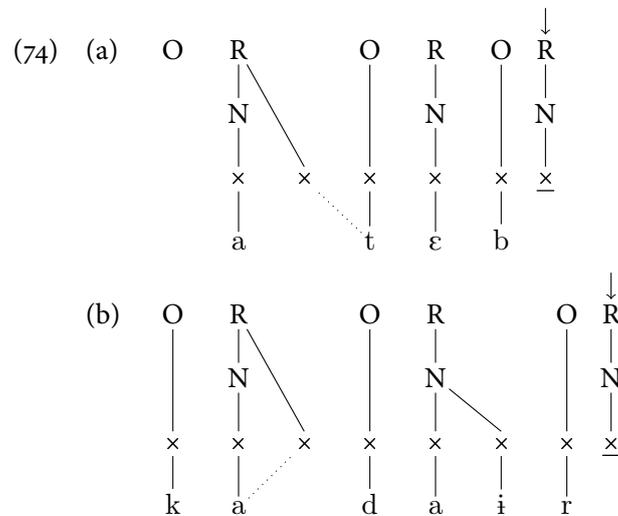
As [Breit and Harris \(2014\)](#) point out, this really raises the question of whether Welsh is a quantity-determined system, in the sense that (primary) stressed syllables must be heavy. What is unusual about Welsh is that quantity-sensitive systems such as Italian do not usually care about the identity of a consonant, but Welsh appears to do so. I will assume

here that Welsh is indeed such a quantity-determined system with weight being the consequence of a branching rhyme (more precisely: a rhyme that dominates two skeletal positions). This condition can be satisfied inherently, for instance through an underlying rhymal appendix (an internal coda) or a diphthong. Where the requirement is not already met by the underlying structure, a regular process of metrical lengthening takes place, creating a rhymal adjunct position in order to satisfy the requirement. This process is illustrated in (73):

(73) METRICAL LENGTHENING:



The newly created position \times_2 must be melodically filled. This can be achieved either by spreading the onset from right to left, as shown for *ateb* in (74a), or by spreading the vowel from left to right, as shown in (74b) for *cadair*:



This is much in line with a proposal credited to Lars Johnsen, who envisages a similar branching rhyme condition for metrical lengthening in languages like Italian. The structure of the stressed rhyme in (74b) is consequently known as a Johnsen vowel (cf. fn. 7 in [Kaye, 1996](#)). The earlier analyses in [Buczek \(1998\)](#), [Bednarska \(2011\)](#) and [Czerniak \(2012\)](#) are along similar lines to what I propose here, though different in some

specifics (most significantly, they do not consider in much detail the melodic make-up of the following consonant). I will not recount their analyses here, though see Czerniak (2014) for a very concise summary of much of the previous work in this area.

What makes the Welsh situation different from those in languages where we only find a lengthened vowel is that it preferentially spreads the adjacent consonant and only spreads the vowel if the consonant does not qualify for gemination. Rhymal appendices are typically consonantal in nature, and I argue that this leads to a preferential spreading of consonantal material from an adjacent onset over spreading of vocalic material from an adjacent nucleus (this implies that nuclear positions have the opposite preference); in other words, I'm assuming that the classical Johnson vowel as in (74b) is universally dispreferred or "marked" in some way.

An important task then is to make explicit what consonants may or may not geminate in Welsh, and the vowel and consonant length facts should derive from that. The two categories are the ones Hannahs (2013b) labelled as moraic and non-moraic: the moraic consonants are readily geminable, while the non-moraic consonants are non-geminable. Let us first take a look at the group of consonants that always geminate under the above conditions; these are /p, t, k, m, ŋ, ʈ/. Their representations are shown in Table 11. We observe that, apart from /ʈ/ these all contain the stop element |ʔ| and a dependent laryngeal element |H| or |L|. Now let us compare this to those consonants which never geminate; these are /b, d, g, f, θ, χ, v, ð/. Their representations are shown in Table 12. In contrast to the consistently geminable consonants, we observe here that while they may contain the stop element |ʔ|, or the dependent laryngeal element |L|, they always contain a headed laryngeal element |H| or |L|, while none of the consistently geminable consonants contain headed |H| or |L|. We may preliminarily conclude on this basis that headed |H| or |L| (or indeed the presence of any headed element) prevents an onset from spreading leftward under metrical lengthening. In these cases the nucleus has to spread its melody to create a Johnson vowel.

What then about the consonants /l, r, n/, which contrastively occur with long vowels or geminate with a short vowel (they are contrastively moraic, under Hannahs' analysis)? In §3.6 above, I argued that /n/ has

| SEGMENT | p | t | k | m | ŋ | ɫ |
|---------|---|-----|---|---|---|-----|
| PLACE | U | A,I | | U | | A,I |
| MANNER | ʔ | ʔ | ʔ | ʔ | ʔ | |
| LX | H | H | H | L | L | H |

Table 11: Representation of Consistently Geminable Consonants

| SEGMENT | b | d | g | f | θ | χ | v | ð |
|---------|----------|----------|----------|----------|----------|----------|----------|----------|
| PLACE | U | A,I | | U | A,I | | U | A,I |
| MANNER | ʔ | ʔ | ʔ | <u>H</u> | <u>H</u> | <u>H</u> | <u>H</u> | <u>H</u> |
| LX | <u>L</u> | <u>L</u> | <u>L</u> | | | | L | L |

Table 12: Representations of Non-Geminable Consonants

two underlying representations, one containing [ʔ] and one not containing [ʔ], with the positional restriction that word-initially /n/ never contains [ʔ]. For /l, r/ I made an argument by analogy to /b, d, g/, which I argued can optionally contain headed [L], marking them as fully voiced, with the positional restriction that non-initial lenis stops always contain [L]. The two representational variants for each of /l, r, n/ are shown in Table 13. We can see from this that /n/ fits in straightforwardly with what we have already discovered: the variant that contains [ʔ] and [L] geminates just like [m, ŋ] while the variant lacking [ʔ] resists gemination much like the voiced continuants above. [l, r] have one variant that consists of the place elements [A] and/or [I] only, while the other also contains headed [L]. In principle either characteristic could serve as a distinguishing factor, but I want to stipulate that it is the variant with headed [L] that is unable to geminate, as this is consistent with the inability of the [L]-voiced stops [b, d, g] to geminate and allows for the generalisation that segments with laryngeal heads (i.e. [L] or [H]) cannot geminate.

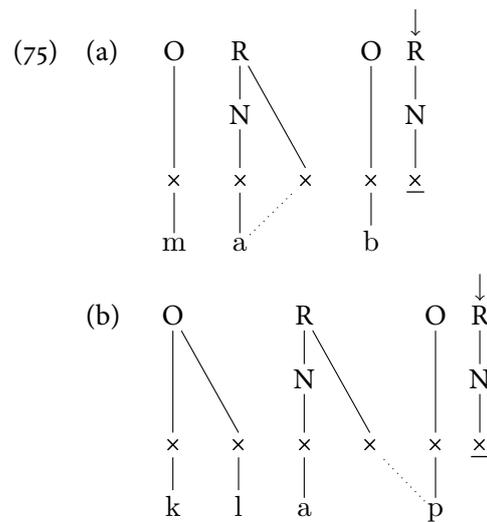
While the prohibition on segments with laryngeal heads to spread seems to be a solid generalisation, it leaves us unable to account for the patterning of contrastively geminable /n/: /n/ containing [A,I,ʔ,L] appears to be geminable, and we would expect this given that this makes

| | Geminable | | | Non-Geminable | | |
|---------|-----------|---|-----|---------------|----------|-----|
| SEGMENT | l | r | n | l | r | n |
| PLACE | A,I | A | A,I | A,I | A | A,I |
| MANNER | | | ? | | | |
| LX | | | L | <u>L</u> | <u>L</u> | L |

Table 13: Representations of Contrastively Geminable Consonants

it completely consistent with the behaviour of /m, ŋ/. However, non-geminable /n/ consists of |A,I,L| and should thus also be able to geminate if only the prohibition of laryngeal heads prevents gemination. I am thus forced to assume additionally that segments containing |L| cannot geminate unless |L| co-occurs with |?|. Possible solutions might lie in a reanalysis of either the representation of /ʎ/ or /n/. Recall for instance that in some South Welsh dialects /ʎ/ is non-geminable. If in these dialects /ʎ/ can be shown to contain headed |H|, it will pattern with the other non-geminable fricatives (as it appears to do in the dialects concerned), but moreover geminability can be rephrased so that in general dependent laryngeal elements are geminable only in the context of |?|, leaving us with a split where exactly two types of segments are geminable in South Welsh: Those containing |?| and dependent laryngeals, and those consisting only of the vocalic elements |A,I,U|. It is quite possible that some of the differential behaviour of dialects may result from differently phrased constraints on what may geminate along these two lines, and this is obviously inherently tied to the analysis of the segments in question. The issue of how /s, ʃ/ are to be treated also remains as of yet unresolved. Clearly some further research on these issues is required.

Briefly returning to monosyllables, I assume that the exact same requirements apply and result in the same pattern of metrical lengthening (recall that GP does not recognise word-final codas, analysing them instead as onsets followed by a parametrically licensed empty nucleus). Thus the two monosyllabic words *mab* [ma:b] ‘son’ and *clap* [clap] ‘gossip’ have the structures in (75a) and (75b) respectively.



While there are some indications that word-final fortis stops in Welsh are longer than their lenis counterparts, there is currently very little systematic work on this and no research concerned with establishing whether this may be a cue to overt word-final geminates or not (if it is, one would perhaps expect that geminable non-stops such as /l, n, r/ show a similar durational differentiation). There are also phonological indications that these final positions have underlying geminates. Namely, when a monosyllabic vowel-initial suffix is attached, the stem-final consonant does surface as an overt geminate, e.g. *hap* ['hap] 'chance' > *hapau* ['happaɪ] 'chances'. I will thus assume that the absence of a final surface geminate in items such as (75b) is simply due to phonetic realisation, that is Welsh word-final geminates are virtual geminates.

To sum up the analysis: Welsh has a quantity-determined fixed stress system, reflected in a requirement for stressed rhymes to branch (more precisely: to dominate two positions). If the stressed rhyme does not already dominate more than one position, a new adjunct position is created through metrical lengthening. The new position must be filled with melodic material. Rhymal adjuncts are preferentially filled by consonantal material, and the following onset is thus spread to its position. However, segments containing a headed laryngeal element (or any laryngeal element in the absence of [ʔ]) may not link to more than one position at a time and therefore cannot spread into this position. If this is the case and the onset cannot spread, then the nucleus is spread to fill the position instead, creating a Johnson vowel. The contrastive behaviour of /l, n, r/

arises from the fact that they have contrastive underlying representations which fall either side of the requirements for gemination.

3.9 SUMMARY

Apart from giving a brief general overview of the language, in this chapter I have given a summary of Welsh ICM that shows why the Welsh case, in particular, is fruitful testing ground for the strict modularity hypothesis. Following this, I have made detailed proposals as to the melodic representation of the Welsh consonants, which will form the basis of the analysis of mutation I argue for in Ch. 6. I have also put forth an analysis of the Welsh metrical system here, which partially informs the consonantal representations argued for, but more importantly will be implicated in my account of immutability in Ch. 7.

4

The mutations and their environments: It's all about the triggers

4.1 INTRODUCTION

As we have already seen in §3.4, there are three major patterns of mutation in the Welsh language. In this chapter I will give a more in-depth description of each of these patterns, together with the conditions that trigger them. I will also describe some of the common variant patterns found in the language, namely a pattern of mutation mixing elements from SM and AM, a “defective” version of SM not affecting /t̪, r^h/, and the tacitly AM-linked Pre-Vocalic Aspiration (PVA). I will conclude the chapter by discussing some of the general factors constraining Welsh ICM.

One of the main aims of this chapter, apart from a detailed survey of mutation patterns and triggering environments, is to show that Welsh ICM is crucially dependent on the trigger of mutation and that it is the trigger which is the locus of variation rather than the affected target. This is important when we contrast accounts such as Lieber’s (1983) and my own, which posit that mutations are implemented in the form of floating features attached to the mutation trigger, with accounts such as Green’s (2006; 2007) and Hannahs’ (2013a; 2013b), which posit that mutation is implemented in as a form of suppletion of the mutation target. The former predicts that the locus of variation is the trigger, the latter suggests that it should be the target of mutation that is the locus of variation.

In compiling the list of triggering conditions that follows, I have drawn heavily on the description of mutation conditions in King (2016, §§3–12), as well as the survey of mutation environments in Kibre (1997, Ch. 5).

“I’ve always been an obsessive collector of things. Richard Briers collects stamps. I collect cars and guns, which are much more expensive, and much more difficult to store.”

—Michael Gambon²

² *Behind the scenes*. Interview in *The Observer*, 29 February 2004.

| RADICAL | SM | RADICAL | SM |
|----------------|----|---------|-----------|
| p | b | b | v |
| t | d | d | ð |
| k | g | g | (deleted) |
| ʃ | l | m | v |
| r ^h | r | | |

Table 14: The pattern of Soft Mutation

4.2 SOFT MUTATION

4.2.1 *The pattern*

By far the most common and robust pattern of ICM is generally known as Soft Mutation (SM).³ As shown in Table 14, SM affects all the oral stops (/p, t, k, b, d, g/), the bilabial nasal /m/, as well as /ʃ/ and /r^h/.

The effect of SM on the voiceless segments /p, t, k, ʃ, r^h/ is to induce voicing in them, and in the case of the lateral fricative /ʃ/ despirantise the segment. This is illustrated with the already familiar second person singular possessive *dɣ* in (76):

| (76) | CITATION FORM | SOFT M. | TRANSLATION |
|------|--------------------|---------|---------------|
| | pʊʃ | də bʊʃ | ‘(thy) pool’ |
| | tʊʃ | də dʊʃ | ‘(thy) hole’ |
| | kʊrʊ | də gʊrʊ | ‘(thy) beer’ |
| | ʃʊrʊ | də lʊrʊ | ‘(thy) track’ |
| | r ^h u:χ | də ru:χ | ‘(thy) grunt’ |

Regarding the despirantisation of /ʃ/ it noteworthy to point out again that it is possible to treat this phonologically as something closer in identity to a voiceless lateral approximant /l_s/, and thus a counterpart to Welsh /l/. While this is the view I have adopted in §3.6.7, some researchers (e.g.

³ This pattern is also occasionally referred to as “Lenition” or “Leniting”, possibly because that is the typical label given to the related pattern in Irish ICM. I find such a label to be misleading however, given that the process is clearly not one of phonological lenition.

Kibre, 1997) explicitly adopt the stance that /t̪/ should not be treated as a fortis antagonist to /l/, and ought to be treated as a fricative instead.

The voiced stops /b, d, m/ spirantise to [v, ð, v] respectively (resulting in surface neutralisation of the contrast between /b/ and /m/), while /g/ is deleted, as illustrated in (77):

| (77) | CITATION FORM | SOFT M. | TRANSLATION |
|------|---------------|-------------|------------------|
| | barn | də v̥arn | ‘(thy) opinion’ |
| | darn | də ð̥arn | ‘(thy) piece’ |
| | garan | də _aran | ‘(thy) heron’ |
| | marchog | də v̥archog | ‘(thy) horseman’ |

Similar to how the despirantisation of /t̪/ to /l/ prevents the surfacing of a voiced lateral fricative *[ɬ], the deletion of /g/ in place of spirantisation prevents SM from resulting in a voiced velar fricative *[ɣ], which like *[ɬ] is not part of the Welsh consonant inventory.

The situation is slightly different with the adjustment of Place of Articulation (PoA) in the spirantisation of /d/ to [ð]; while Welsh does not have a voiced alveolar fricative [z] in any native forms, it is now found in some borrowings from English, for instance in sŵ [suː~zuː] ‘zoo’, especially in South Welsh (Hannahs, 2013b, p. 22). Additionally, as we will see shortly, Aspirate Mutation turns voiceless alveolar /t/ into a voiceless dental fricative [θ] in parallel to SM /d/→[ð], despite the fact that Welsh has a voiceless alveolar fricative [s], so that the PoA adjustment here cannot be attributed purely to some general principle of structure preservation.

Regarding the inclusion of /m/ to the exclusion of the other two nasals /n, ŋ/ it is important to note that, similarly to English, Welsh does not allow a velar nasal in word-initial position, so that the exclusion effectively only applies to the alveolar nasal /n/. It does not matter whether we assume that /ŋ/ takes part in mutation or that it doesn’t, as either would always be vacuously true.

4.2.2 *The triggers*

SM is triggered by a limited set of lexical items such as the familiar second singular possessive /də/, as well as some prefixes and a number of structural conditions.

The lexical item that trigger **SM** on the item immediately adjacent to their right are the following:

| | | | |
|------|--------------------------|--------------------|------------------------------|
| (78) | <i>a</i> | /a/ | ‘COMP.INT, COMP.INT.REL.AFF’ |
| | <i>am</i> | /am/ | ‘for, how.INT, INTEN’ |
| | <i>ar</i> | /ar/ | ‘on, PRSP’ |
| | <i>at</i> | /at/ | ‘at, to’ |
| | <i>dacw</i> | /daku/ | ‘yonder.DEM’ |
| | <i>dau</i> | /dai/ | ‘two.M’ |
| | <i>dros</i> | /drɔs/ | ‘over’ |
| | <i>dwy</i> | /dui/ | ‘two.F’ |
| | <i>dy</i> | /də/ | ‘2SG.GEN’ |
| | <i>dyma</i> | /dəma/ | ‘here.DEM’ |
| | <i>dyna</i> | /dəna/ | ‘there.DEM’ |
| | <i>ei</i> | /i/ | ‘3SGM.GEN’ |
| | <i>fe/mi⁴</i> | /vɛ, mi/ | ‘COMP.AFF’ |
| | <i>gan</i> | /gan/ | ‘by’ |
| | <i>go</i> | /go/ | ‘fairly, really’ |
| | <i>heb</i> | /hɛb/ | ‘without’ |
| | <i>hyd</i> | /hid/ | ‘till, to (delimitative)’ |
| | <i>i</i> | /i/ | ‘to’ |
| | <i>neu</i> | /nei/ | ‘or’ |
| | <i>newydd</i> | /nɛwið/ | ‘CESS’ |
| | <i>nos</i> | /nɔs/ | ‘night’ (only with weekdays) |
| | <i>o</i> | /o/ | ‘from’ |
| | <i>pa</i> | /pa/ | ‘which’ |
| | <i>pan</i> | /pan/ | ‘when.AFF’ |
| | <i>pur</i> | /pɪr/ | ‘quite’ |
| | <i>rhy</i> | /r ^h i/ | ‘too’ |

(cont'd overleaf)

4 *Mi* is generally used in North Welsh whereas *fe* is predominant in South Welsh.

| | | |
|--------------|---------|------------------------|
| <i>tan</i> | /tan/ | ‘until’ |
| <i>trwy</i> | /trui/ | ‘through’ |
| <i>wrth</i> | /urθ/ | ‘because, by means of’ |
| <i>y(r)</i> | /ə(r)/ | ‘the.F’ |
| <i>(y)ma</i> | /(ə)ma/ | ‘here’ |
| <i>(y)na</i> | /(ə)na/ | ‘there’ |

It must be noted that the complementisers *a*, *fe*, *mi* are frequently left unpronounced in the spoken language while the mutations they trigger remain (Awbery, 2004). It is commonly assumed that the complementisers simply have a phonologically null form, which is still structurally present and so triggers mutation the same as if it were overt, though as Awbery (2004) shows in some of the cases where there is no overt complementiser the mutation is lost also.

Nos ‘night’ only triggers SM on the days of the week but not on any other words that may follow it, i.e. we have *Nos Wener* [nɔs wɛnɛr] ‘Wednesday night’ (<*gwener* /gwɛnɛr/ ‘Venus’) but *nos da* [nɔs da] ‘good night’ (not *[nɔs ða]).

The following prefixes trigger SM on the stem to which they attach:

| | | | |
|------|---------------|---------------------|-------------------|
| (79) | <i>af-</i> | /av/ | ‘un-’ |
| | <i>di-</i> | /di/ | ‘-less’ |
| | <i>cam-</i> | /kam/ | ‘miss-’ |
| | <i>cyd-</i> | /kəd/ | ‘co-, con-’ |
| | <i>gwrth-</i> | /gurθ/ | ‘anti-, counter-’ |
| | <i>hunan-</i> | /hinan/ | ‘self-’ |
| | <i>rhag-</i> | /r ^h ag/ | ‘pre-, fore-’ |
| | <i>ym-</i> | /əm/ | ‘REFL’ |

The definite article, *y(r)*, triggers SM on feminine gender nouns that immediately follow it, but it triggers LSM on adjectives, and triggers no mutation on numerals. The behaviour of the definite article is discussed further in §4.3 on Limited Soft Mutation.

The following examples illustrate SM due to prefixation with the highly productive prefix *cyd-*:

| (80) | UR | SOFT M. | TRANSLATION |
|------|-------------|------------|-------------------------------|
| | kəd-inə | kədinə | ‘to coalesce’ (<‘to join’) |
| | kəd-təð̃i | kəddəð̃i | ‘to merge’ (<‘to melt’) |
| | kəd-mənd | kədvənd | ‘to concur’ (<‘to go’) |
| | kəd-gweiθjə | kəd_werθjə | ‘to collaborate’ (<‘to work’) |

Let us now turn to the structural conditions for **SM**. The first of these is that adjectives preceding a noun trigger **SM** on that noun, as illustrated for the adjectives *prif* /priv/ ‘main’ and *hen* /hen/ ‘old’ in (81–82):

| | | | | | | |
|------|------------------------------|-----|------|-----------|------|------|
| (81) | maɪ | ’r | priv | _wemidjəg | ən | hur |
| | mae | ’r | Prif | Weinidiog | yn | hwyr |
| | be.3SG.PRS.AFF | the | main | minister | PRED | late |
| | ‘The Prime Minister is late’ | | | | | |

| | | | | | | |
|------|----------------------------|----|----|-----|-----|---------|
| (82) | dan | ni | ən | ər | hen | gələg |
| | dan | ni | yn | yr | hen | goleg |
| | be.2PL.PRS.AFF | we | in | the | old | college |
| | ‘We’re in the old college’ | | | | | |

What must be noted in regard to examples such as those in (81–82) is that adjectives in Welsh are normally postnominal and only a very limited number of adjectives can occur prenominal. Importantly, while it may seem on the surface as though some adjectives, such as *hen*, are allowed both pre- and postnominally, this is (i) not always the case (for instance *prif* and *pob* cannot occur postnominally), and (ii) the two homophonous forms are given a different semantic interpretation. For instance prenominal *hen* means ‘old’, while postnominal *hen* means ‘ancient’; prenominal *unig* means ‘only’, postnominal *unig* means ‘lonely’. Consequentially, it may be assumed that the few prenominal adjectives form part of the class of lexical items in (78) triggering mutation, rather than mutation being a property of the structural configuration **ADJ+N**. This analysis seems further supported by the fact that some of the other modifiers which can occur prenominal in Welsh, such as numerals, trigger mutation only inconsistently, as we will see shortly. The following is a list of all the adjectives occurring in prenominal position:

| | | | |
|------|-----------------|-----------|--------------|
| (83) | <i>annwyl</i> | /anuɪl/ | ‘dear’ |
| | <i>hen</i> | /hen/ | ‘old’ |
| | <i>hoff</i> | /hof/ | ‘favourite’ |
| | <i>holl</i> | /hoɫ/ | ‘entire’ |
| | <i>pob</i> | /pob/ | ‘every’ |
| | <i>prif</i> | /prɪv/ | ‘main’ |
| | <i>unig</i> | /ɪnɪg/ | ‘only’ |
| | <i>dewis</i> | /dɛwɪs/ | ‘chosen’ |
| | <i>dirprwy</i> | /dɪrpruɪ/ | ‘deputy’ |
| | <i>diweddar</i> | /dɪwɛðar/ | ‘deceased’ |
| | <i>gwir</i> | /gwɪr/ | ‘true, real’ |
| | <i>cas</i> | /cas/ | ‘nasty’ |
| | <i>mân</i> | /maɪn/ | ‘minor’ |
| | <i>uchel</i> | /iχɛl/ | ‘high’ |
| | <i>ambell</i> | /ambeɫ/ | ‘occasional’ |
| | <i>dirgel</i> | /dɪrgɛl/ | ‘secret’ |
| | <i>cyfrin</i> | /kəvɪɪn/ | ‘secret’ |

There are two other structural conditions that trigger *SM*. The first is a noun that receives vocative case, as shown in (84), though note that proper names generally do not undergo mutation so that vocative *SM* is only visible where a person or group is addressed by a descriptive term.

| | | | | |
|------|------------------------|-------|------|--------------|
| (84) | dɛvχ | van | hən | blant |
| | dewch | fan | hyn, | blant |
| | come.2PL.PRS | place | this | children.VOC |
| | ‘Come here, children!’ | | | |

(King, 2016, p. 14)

As Kibre (1997) points out, the vocative in Welsh was historically marked by a particle *O* ‘DET.VOC’ which precedes the noun, similar to Irish *a* and Manx *y*, and still occasionally used for poetic effect. Consequently, an analysis may posit that vocative is analogous to the phonologically null forms of the complementisers *fe*, *mi*, *a* which still trigger mutation.

The second case of structural *SM* is what is often called direct object mutation. Here the initial item of a phrase in a certain syntactic environment receives *SM*, as illustrated below:

- (85) gwel^oð ə d̪ɪn ɡi:
 gwelodd y dyn ɡi
 see.3SG.PST the man dog
 ‘The man saw a dog’ (Lieber, 1983, p. 170)

- (86) prɪn^oð ə ð̪ənes vɛɪk
 prynodd y ddynes feɪc
 buy.3SG.PST the woman bike
 ‘The woman bought a bike’ (Tallerman, 2006, p. 1751)

Various proposals have been made as to the exact environment triggering mutation in such cases. Lieber (1983) proposes that as a consequence of the assumption that verbs and prepositions can assign case only locally, and the fact that the direct object in these VSO constructions is not local, the direct object is unable to receive case marking from the governing verb. Consequently, in order to satisfy the case filter, a functional preposition similar to English *of* must be inserted to assign case to the direct object locally. She proposes that it is precisely this phonologically null case assigning preposition which triggers SM, thus making the case of direct object mutation one reminiscent of the affirmative complementisers and vocative case marking. Conversely, Roberts (2005) proposes that SM on the direct object *beic* ‘bike’ in a sentence such as (85) is precisely due to assignment of Accusative (ACC) case to the direct object in VSO constructions. Yet another proposal is made by Borsley and Tallerman (1996), and further developed in Tallerman (2006), who argue that direct object mutation is triggered whenever a maximal projection is preceded by another maximal projection—what they call the XP Trigger Hypothesis (XPTH). Following their proposal, in a sentence such as (85), SM on *beic* is due to it being preceded by a maximal projection, viz. “prynodd [DP y ddynes][DP feɪc]”. Finally, Neeleman (2006) proposes that rather than the environment for direct object mutation being conditioned by syntactic phrasing, it is triggered by a preceding prosodic phrase boundary marker Φ , inserted at the juncture between the two syntactic phrases at spellout. I will address this issue in more depth in §4.8.

| RADICAL | LSM | RADICAL | LSM |
|---------|-----|---------|-----------|
| p | b | b | v |
| t | d | d | ð |
| k | g | g | (deleted) |
| | | m | v |

Table 15: The pattern of Limited Soft Mutation

4.3 LIMITED SOFT MUTATION

4.3.1 *The pattern*

In addition to the full pattern of Soft Mutation we have just discussed, Welsh also exhibits a more limited pattern of SM, which I will refer to as Limited Soft Mutation (LSM). LSM is ‘defective’ in that it does everything full SM does but it excludes the voiceless trill /r^h/ and the voiceless lateral fricative /ɬ/, yielding the pattern shown in Table 15.

4.3.2 *The triggers*

As with SM, LSM has both a number of lexical triggers and some that are more aptly characterised as structural conditions.

The lexical items triggering LSM are as follows:

- (87) *cyn* /kən/ ‘as... as.EQTV’ (with *-ed*)
mor /mɔr/ ‘so, EQTV’
un /ɪn/ ‘one.F’
y(r) /ə(r)/ ‘the.F’
yn /ən/ ‘PRED’

There are a number of qualifications to be made about the list of triggers in (87), however. The equative *cyn* triggers mutation only in the construction *cyn X-ed â Y* ‘as X as Y’ (lit. ‘before X-EQTV with Y’), where *-ed* is a specific equative suffix (Morris-Jones, 1931, p. 242). This is a more formal way of forming an equative, with the alternative *mor X â Y* ‘as X as Y’ (lit. ‘so X

with Y'), without the equative suffix that goes with *cyn*, being much more common in the spoken language. Elsewhere *cyn* appears as a temporal delimitative preposition, e.g. *cyn i mi ddechrau* 'before I begin' and does not trigger mutation. This at least rears the suspicion that LSM here may be connected with the equative construction rather than *cyn* as a preposition. *Mor* triggers mutation both in its function as an equative marker and as an intensifier, e.g. in *mae'n mor boeth* 'it's so hot' (<*poeth* 'hot').

The predicative particle *yn* which precedes nominal and adjectival predicates in the periphrastic construction consistently triggers LSM, but the homophonous aspectual marker *yn* 'IPFV' does not trigger any mutation at all, and the locational preposition *yn* 'in' triggers Nasal Mutation. While in periphrastic constructions all of these can occur in the same linear slot, they also show disparate behaviour apart from the difference in the mutations they trigger: both the predicative and imperfective particles can contract to 'n following a vowel (e.g. *dw i'n hapus* 'I'm happy') but the locational *yn* cannot be contracted. Locational *yn* also shows regressive place assimilation of the nasal (e.g. *ym Manceinion* 'in Manchester') while neither the predicative nor the imperfective particles do.

Lastly, the definitive article *y* (which takes the form *yr* /əɾ/ before vowels, and is reduced to 'r /=ɾ/ when it is preceded by a vowel regardless of what follows it) is often included among both the SM and the LSM triggers. This is because feminine nouns immediately following it receive SM and adjectives immediately following it receive LSM. However there are various other occurrences of SM/LSM in the nominal projection, with feminine gender not directly attributable to the definite article, which we will turn to presently, and the fact that numerals are not mutated after the definite article also makes the hypothesis that the article itself is the trigger suspect. I think it is more appropriate to subsume the mutation following the definite article under either a general morphosyntactic condition of feminine gender mutation, which also captures the fact that adjectives that modify a feminine noun are given LSM, or as I shall propose in §6.9, as a definiteness-agreement marker.

To illustrate the data at hand, consider first the three examples in (88–90):

- (88) ə yerχ
 y ferch
 the girl.F

‘The girl’

- (89) ə verχ dal
 y ferch dal
 the girl.F tall.F

‘The tall girl’

- (90) ə verχ neis dal
 y ferch neis dal
 the girl.F nice.F tall.F

‘The nice tall girl’

These examples show that not only does a feminine noun receive *SM* following a definite article, but any adjectives modifying it are mutated also. Crucially, (90) shows that even if an adjective that is itself immutable intervenes, the following adjective is still mutated. It is clear that the mutation of these modifiers is due to feminine gender agreement if we consider that some adjectives have feminine gender allomorphs which are selected in the same environment, as can be seen from the selection of feminine *ber* ‘short.F’ versus masculine *byr* ‘short.M’ in (91–92):

- (91) ə verχ vɛr
 y ferch fer
 the girl.F short.F

‘The short girl’

- (92) ə dɪn bɪr
 y dɪn byr
 the man.M short.M

‘The short man’

Nonetheless, there is some conditioning by the definite article here: if a numeral intervenes between the definite article and a noun, then the noun does not undergo feminine gender mutation but rather the mutation we would normally expect after that numeral, despite the fact that the numeral itself shows gender agreement. Compare the feminine forms in (93–94) with the masculine equivalent in (95–96):

- (93) ə tair verχ dal
 y tair ferch dal
 the three.F girl.F tall.F

‘The three tall girls’

(94) ə p̄imp merχ d̄al
 y pump merch dal
 the five.F girl.F tall.F
 ‘The five tall girls’

(95) ə tri d̄in tal
 y tri dyn tal
 the three.M man.M tall.M
 ‘The three tall men’

(96) ə p̄imp d̄in tal
 y p̄imp dyn tal
 the five.M man.M tall.M
 ‘The five tall men’

It is clear from the data in (88–96) that the Welsh nominal projection displays extensive gender agreement, and that the environment for mutation is thus much better characterised as the effect of feminine gender agreement in the nominal projection, with the caveat that a numeral intervening between the head *D* and the lower *NP* overwrites the mutation on *N*. Interestingly, this analysis appears to provide some evidence for the hypothesis that the restricted set of prenominal adjectives in (83) are structurally situated in *Spec,NumP* (Rouvert, 1994).

Note that there remain two puzzles regarding feminine gender agreement mutation. The first is presented by the fact that prenominal adjectives themselves also exhibit the *LSM* triggered by feminine gender agreement in the nominal projection, while true numerals do not, despite the fact that the numerals clearly agree in gender with the noun. This divergent behaviour of the two types of prenominal modifier is shown in (97–98).

(97) ə b̄riv l̄au v̄aur
 y brif law fawr
 the main.F hand.F big.F
 ‘The primary big hand’

(98) ə tair ł̄au v̄aur
 y tair llaw fawr
 the three.F hand.F big.F
 ‘The three big hands’

The second puzzle is to do with the selection of the correct definite article itself. The definite article shows three basic allomorphs: enclitic

| RADICAL | AM |
|---------|----|
| p | f |
| t | θ |
| k | χ |

Table 16: The pattern of Aspirate Mutation

ʳ /₌r/ when preceded by a vowel regardless of what follows; yr /ə_r/ when not preceded by a vowel but preceding a vowel, glide or /h/; and y /ə/ everywhere else. What is notable is that if the mutation purportedly triggered by the definite article leads to the loss of initial /g/ in a noun following the definite article, then the definite article selects according to the post-mutation form, e.g. if SM causes the mutation of a word such as *gaf_r* /gav_r/ ‘goat’ to *af_r* [av_r], then the pre-vocalic yr allomorphy is selected. As [Hannahs and Tallerman \(2006\)](#) point out, if it is the definite article that triggers mutation on a feminine noun, a paradox arises in that the definite article has to be inserted before the noun in order to trigger SM on the noun, but it has to be inserted after the noun because it is sensitive to the already mutated form.

4.4 ASPIRATE MUTATION

4.4.1 *The pattern*

After SM and LSM, Aspirate Mutation (AM) is the third most common pattern of mutation. As shown in Table 16, Aspirate Mutation (AM) affects only the fortis plosives /p, t, k/, which alternate with the fricatives [f, θ, χ] respectively. Note the PoA adjustment from bilabial to labio-dental and alveolar to dental, which is analogous to the PoA adjustment of the voiced stops /b, d/ and the bilabial nasal /m/ to [v, ð, v] under SM. The velar plosive /k/ is adjusted to uvular [χ] in North Welsh, but remains velar [x] in South Welsh, in accordance with the PoA for the dorsal fricative in the specific dialect (cf. Table 3).

King (2016, p. 12) points out that the pattern is not consistently applied to all three stops in the colloquial language, however. He notes that, first of all, cross-dialectally AM is not consistently applied after any of the lexical triggers; and secondly that where it is applied it is most frequently applied to targets with initial /k/, less frequently to /p/ and only infrequently to /t/.⁵ According to King (2016, p. 12), while mutation of /k/ to [x~χ] is seen as perfectly natural, some native speakers perceive AM of /p/, and especially /t/, in normal speech as “affected”, and it is primarily associated with higher formality or L2 speakers. It is probably reasonable to assume that for at least some speakers AM has been lost completely, and the gradual narrowing of the number of targeted consonants is quite possibly indicative of an ongoing shift toward the complete erosion of AM, though I am not aware of any detailed empirical studies of this shift, either diachronic or in apparent time, and some researchers believe that the situation is essentially stable (e.g. Sabine Asmus, *pc*).

4.4.2 *The triggers*

AM is triggered by the following lexical items:

| | | | |
|------|-------------|--------|------------------|
| (99) | <i>a</i> | /a/ | ‘and’ |
| | <i>â</i> | /a/ | ‘with’ |
| | <i>chwe</i> | /χwe:/ | ‘six’ |
| | <i>ei</i> | /i/ | ‘her.GEN’ |
| | <i>gyda</i> | /gəda/ | ‘with’ |
| | <i>tri</i> | /tri/ | ‘three.M.SG’ |
| | <i>tua</i> | /tia/ | ‘about, towards’ |

As has already been noted, there is speaker-to-speaker variation in whether any of the items in (99) trigger AM. For instance, from my own observations it would seem that AM is applied much more consistently with *ei* ‘her.GEN’, *tri* ‘three’ and *â* ‘with’ than with any of the other items. Likewise, King (2016, p. 12) notes that AM is applied fairly consistently after *ei* but that there is much variation with the other triggers.

⁵ That is, there appears to be a PoA hierarchy for AM preferability, with the order k>p>t.

Note that the conjunction *a* ‘and’ and the preposition *â* ‘with’ are completely homophonous and both trigger AM.⁶ The conjunction *a* ‘and’ takes the form *ac* /ak/, and *â* ‘with’ the form *ag* /ak~ag/ when they precede a vowel. The form *gyda* ‘with’ is primarily found in South Welsh and triggers AM virtually exclusively in formal registers now, while the North Welsh equivalent (*h*)*efo* ‘with’, which traditionally also triggered AM has all but ceased to function as a trigger.⁷ *Gyda* ‘with’ takes the form *gydag* /gɔdak/ before a vowel. The 3rd person singular feminine possessive *ei* /i/ ‘her.GEN’ is homophonous with 3rd person singular masculine possessive *ei* /i/ ‘his.GEN’, but the feminine triggers AM while the masculine triggers SM. Regarding the numeral *tri* ‘three’, it is notable that it only triggers AM on masculine singular nouns; there is no mutation of plural nouns following *tri*, and the feminine numeral *tair* ‘three’ does not trigger any mutation at all.

Unlike SM and LSM, AM is not triggered by any structural configurations (though note the conditions for Mixed Mutation discussed presently).

4.5 MIXED MUTATION

4.5.1 *The pattern*

Mixed Mutation (MM) is a further variant pattern of mutations, involving elements from both AM and SM. As shown in Table 17, the voiceless plosives /p, t, k/ are spirantised to [f, θ, χ], precisely as in AM, while /b, d, m/ spirantise to [v, ð, v], /g/ is deleted and /t̪, t̪^h/ are despirantised and voiced to [l, r], as with regular SM but exempting the voiceless stops which have already been spirantised (rather than voiced, as they would be under regular SM).

Because the pattern of AM affects a subset of SM, MM is often described as a pattern where AM is applied first and SM is then applied to those segments which remain unaffected by AM (e.g. King, 2016, p. 13), though

6 Though it is an interesting empirical question whether the two items co-vary or converge in the consistency with which they trigger AM.

7 For illustration, a Google search on 11 Mar 2016 finds roughly 2,000 results each for “*gyda car*”, “*gyda car*” and “*efo car*” (‘with car’), but only 8 hits for “*efo char*”. Notably, none of the 8 results for “*efo char*” are in Welsh.

| RADICAL | MM | RADICAL | MM |
|----------------|----|---------|-----------|
| p | f | b | v |
| t | θ | d | ð |
| k | χ | g | (deleted) |
| ʈ | l | m | v |
| r ^h | r | | |

Table 17: The pattern of Mixed Mutation

theoretical accounts vary widely in whether they treat **MM** as a mixture of their respective implementation of **AM** and **SM** or not.

4.5.2 *The triggers*

MM is triggered exclusively by the three negative complementisers in (100):

| | | | |
|-------|------------|-------|----------------------------------|
| (100) | <i>ni</i> | /ni/ | ‘COMP.NEG’ |
| | <i>na</i> | /na/ | ‘COMP.REL.NEG, COMP.COND.NEG’ |
| | <i>oni</i> | /oni/ | ‘COMP.INT.NEG, COMP.COND.CF.NEG’ |

As with the complementisers *a*, *mi* and *fe*, the complementisers *ni* and *na* are frequently absent from spoken Welsh, in which case negation is realised by a negative polarity item *ddim* /ðim/ ‘NEG’ following the subject position, both in periphrastic and synthetic constructions. The mutation triggered by the negative complementiser may or may not stay behind in cases where it is omitted, similarly to how omitted *mi/fe* still frequently shows the **SM** associated with it. For this reason it has sometimes been proposed that the phonologically null forms be analysed as triggered by a morphosyntactic condition rather than a lexical item (Kibre, 1997). *Ni*, *na* and *oni* have the alternate forms *nid* /nid/, *nad* /nad/, and *onid* /onid/ when they precede vowels.

As with **AM**, **MM** is not consistently applied after any of these complementisers, with some speakers missing it completely and with others using **SM** consistently in place of **MM**, though it is still heard quite regularly

| RADICAL | NM | RADICAL | NM |
|---------|----------------|---------|----|
| p | m ^h | b | m |
| t | n ^h | d | n |
| k | ŋ ^h | g | ŋ |

Table 18: The pattern of Nasal Mutation

with some speakers. As far as I am aware, there is no variation depending on the PoA of the plosives targeted by MM, in contrast to the sensitivity discussed regarding AM; however, to my knowledge no empirical studies of MM frequency in the spoken language exist.

4.6 NASAL MUTATION

4.6.1 *The pattern*

Nasal Mutation (NM) targets all of the plosives and turns them into nasals of the same place and voicing, as shown in Table 18. It is noteworthy that the voiceless series of nasals thus produced occurs exclusively as the reflex of NM; they are not generally available as segments elsewhere, though as shown by the following examples, they can clearly be contrastive in the context of an NM trigger:

| | | | |
|-----------|----------------------|-------------|-----------|
| (101) (a) | NASAL M. | TRANSLATION | |
| | ə me:l | ‘my havoc’ | (</be:l/) |
| | ə m ^h e:l | ‘my ball’ | (</pe:l/) |
| (b) | ə nʊr | ‘my water’ | (</dʊr/) |
| | ə n ^h ʊr | ‘my tower’ | (</tʊr/) |
| (c) | ə ŋar | ‘my thigh’ | (</gar/) |
| | ə ŋ ^h ar | ‘my car’ | (</kar/) |

4.6.2 *The triggers*

NM is triggered by the following two lexical items:

| | | | |
|-------|-----------|----------|------------|
| (102) | <i>fy</i> | / (v)ə / | ‘1SG.POSS’ |
| | <i>yn</i> | /əɪn / | ‘in’ |

The first person singular possessive *fy* is usually pronounced [ə] in the spoken language and so frequently homophonous to the definite article, which however shows different mutation behaviour, as discussed in §4.3. However, in normal speech it seems quite common to find three alternate pronunciations of *fy*, namely [ə] before nasals, [əɪn] before any other immutable sound, whether a vowel or a continuant consonant, and a phonologically null form only reflected in the mutation of the target item for mutable forms, especially when a postnominal reflexive pronoun is used also (cf. King, 2016, p. 94), as illustrated (103):

| (103) | NASAL M. | TRANSLATION | |
|-------|------------------------|-------------|------------|
| | əɪn ʃɔp i | ‘my shop’ | (</ʃɔp/) |
| | əɪn əvəl i | ‘my apple’ | (</əvəl/) |
| | ɪ̯ ^h a:ɪn i | ‘my fire’ | (</ta:ɪn/) |
| | ɪ̯ ^h avr i | ‘my goat’ | (</gavr/) |

The preposition *yn* ‘in’ shows place assimilation in the nasal, as shown in (104), which is in contrast to the non-triggering imperfective aspect marker and the SM triggering predicative particle *yn*, neither of which show place assimilation of the nasal.

| (104) | NASAL M. | TRANSLATION | |
|-------|-------------------------------|-----------------|------------------|
| | əɪn mɑŋgɔr | ‘in Bangor’ | (</bɑŋgɔr/) |
| | əɪn ɪ̯ ^h əvɪn | ‘in Tywyn’ | (</təvɪn/) |
| | əɪ ɪ̯ ^h aɪrɪnɑrvɔn | ‘in Caernarfon’ | (</kaɪrɪnɑrvɔn/) |
| | əɪn mɑɪstɛg | ‘in Maesteg’ | (</mɑɪstɛg/) |

As can be seen from the last item in (104), the nasal in *yn* assimilates in place regardless of whether the target itself has undergone mutation or not. As King (2016, p. 367) points out, while many speakers consistently apply NM after *yn* ‘in’, others have SM here or do not mutate after *yn* at

all, though **NM** is certainly considered standard in most areas. Notably, for speakers who have **SM** in place of **NM**, place names with underlying initial /g/ tend to resist mutation.⁸ It seems to me that such variation affects *yn* more than *fy*, but again we have no empirical data of this.

In addition to the two lexical items in (102), **NM** is also triggered by the preposition *an-* ‘un-, in-’, as illustrated in (105) below.

| (105) | UR | NM | TRANSLATION | |
|-------|-----------------|---------------------------|--------------|------------------|
| | <i>an-amal</i> | <i>anamal</i> | ‘rarely’ | (<‘often’) |
| | <i>an-tɛbig</i> | <i>an^hɛbig</i> | ‘unlikely’ | (<‘likely’) |
| | <i>an-kɔvjɔ</i> | <i>aɲ^hɔvjɔ</i> | ‘to forget’ | (<‘to remember’) |
| | <i>am-pɔsib</i> | <i>am^hɔsib</i> | ‘impossible’ | (<‘possible’) |

It is noteworthy that the type of variation affecting the lexical **NM** triggers *fy* and *yn*, where some speakers have **SM** in place of **NM**, does not appear to affect the prefix *an-* which triggers **NM** very regularly; forms such as **andebyg* [andɛbig] ‘unlikely’ (</tɛbig/ ‘likely’) are, as far as I am aware, completely unattested.

Lastly, as already touched on very briefly in §4.3, there are three time words which show what we may call a fossilised form of **NM** when they follow numerals higher than four. These are *blynedd* /blənɛð/ ‘year’, *blwydd* /blʷið/ ‘year (of age)’, and *diwrnod* /dʷjurnɔd/ ‘day’. Note that these are already specialised forms only used in the context of counting quantities of years or days, with the forms *blwyddyn* ‘year’ (pl. *blynyddoedd*) and *dydd* ‘day’ used elsewhere. With regards to mutation, these forms behave like any other noun following the numerals one through four (i.e. they show gender agreement with the numeral and exhibit **SM** after the numeral *dwy* ‘two.F’). However, with numerals from five and upward they usually appear in an **NM** form (*mlynedd* [mlənɛð], *mlwydd* /mlʷið/ ‘year (of age)’, and *diwrnod* /dʷjurnɔd/ ‘day’), where other nouns do not undergo mutation. This is illustrated for the two feminine nouns *blynedd* ‘year’ and *cath* ‘cat’ in (106) below:

⁸ Note that application of **SM** to Welsh place names beginning in /g/ varies widely in general and is not a special property of the alternative **SM** with *yn* ‘in’. For instance for the high frequency phrase “to Gwynedd” (one of the major areas of North Wales) it is quite common to hear and see both the forms *i Wýnedd* [i wɪnɛð] and *i Gwynedd* [i gwɪnɛð], while the rarer “to Gresford” (a village near Wrexham) is virtually always *i Gresfordd* [i gresfɔrð] and not *i Resfordd* [i resfɔrð].

| (106) | NUMERAL | BLYNEDD | CATH |
|-------|---------|---------|------|
| 1 | in | blənεð | ka:θ |
| 2 | dui | vlənεð | ga:θ |
| 3 | tair | blənεð | χa:θ |
| 4 | pɛdair | blənεð | ka:θ |
| 5 | pim | mlənεð | ka:θ |
| 6 | χwe: | mlənεð | χa:θ |
| 7 | saiθ | mlənεð | ka:θ |
| 100 | ka:n | mlənεð | ka:θ |

It should be pointed out that in traditional grammars and very formal registers, the form following *chwe* /χwe:/ ‘six’ is typically the radical; this is perhaps best explained by the fact that this numeral triggers **AM** in the regular pattern while the other higher numerals are not active as mutation triggers. In any case, in the colloquial language the paradigm has been levelled and all the numerals from five and up typically take the **NM** form as in (106) above. Although King (2016) does not note much about variability here, Borsley et al. (2007) note that although the pattern is fairly robust for *blynedd* ‘year’ and *blwydd* ‘year (of age)’, not all speakers apply **NM** to *diwrnod* ‘day’ in this context.

4.7 PRE-VOCALIC ASPIRATION

A number of the **AM** triggers in (99), but not all of them, also have an effect on vowel-initial targets. Here an additional /h/ is inserted before the vowel, a phenomenon known as Pre-Vocalic Aspiration (**PVA**). This is illustrated for *ei* /i/ ‘her.POSS’ and *aval* /aval/ ‘apple’ below:

| | | | | | | | |
|-------|------------|----------|----------------------------|------|------|---------|------|
| (107) | rɔið | i | haval | hi | n | ylasis | jaʊn |
| | roedd | ei | hafal | hi | 'n | flasmus | iawn |
| | be.PST.AFF | her.POSS | apple | 3SGF | PRED | tasty | very |
| | | | ‘Her apple was very tasty’ | | | | |

PVA is triggered by the following lexical items:

| | | | |
|-------|----------------|-------|----------------------|
| (108) | <i>ei</i> | /i/ | ‘her.GEN’ |
| | <i>ein</i> | /ən/ | ‘our.GEN’ |
| | <i>eu</i> | /i/ | ‘their.GEN’ |
| | ?’ <i>m</i> | /=m/ | ‘thy.GEN (enclitic)’ |
| | ?’ <i>eich</i> | /eiχ/ | ‘your.GEN’ |

In addition to the above, *ar* /ən/ ‘on’ triggers PVA on numerals (but not on any other items). In the traditional highly formal register of the language, the enclitic version of the second person singular possessive *m* /m/ also triggers PVA, but this has largely fallen out of use both in the written and spoken language. King (2016, p. 94) notes that some speakers have PVA after *eich* ‘your.POSS’, although it is clear from what he writes that this is generally regarded as incorrect, perhaps originating as a type of hypercorrection.

While sometimes regarded as a sub-pattern of AM, PVA is not restricted to a subset of AM triggers, so that we find all of the following three: (i) AM triggers which also trigger PVA (e.g. *ei* ‘her.POSS’), (ii) AM triggers which do not trigger PVA (e.g. *tri* /tri/ ‘three.M’), and (iii) PVA triggers which do not trigger AM (e.g. *eu* [i] ‘their.POSS’). Given the double dissociation between AM and PVA triggers, it seems that PVA is best regarded as a process more or less independent of AM.

Kibre (1997) suggests that PVA should not actually be analysed as part of the mutation system at all, but instead proposes that it is a case of allomorphy in the trigger akin to the English indefinite article selecting *a/an* depending on whether it precedes a vowel or not. Such alternations are rife in Welsh, e.g. we find *y/yr* ‘the’, *a/ac* ‘and’, *â/ag* ‘with’, *gyda/gydag* ‘with’, in each case with the former preceding consonants and the latter preceding vowels. With this in mind, Kibre (1997) proposes that PVA is simply a case of triggers selecting a form with final /h/ before vowels, i.e. *ei* ‘her.GEN’ has at least two allomorphs,⁹ /i/ and /ih/, the latter of which is selected before vowel-initial targets. As we will see in Chapter 6, this proposal is in perfect alignment with the mechanism I propose as underlying virtually all of the Welsh mutations.

⁹ It also has an allomorph /u/, and perhaps /uh/ when adjoined to the preposition *i* ‘to’.

4.8 MORPHOSYNTACTIC CONDITIONS

As we have seen in the survey of mutations above, the conditions under which mutation occurs can generally be grouped in one of two categories. The first of these, where the target is immediately preceded by one of a limited set of a lexical items such as *dy* 'your.GEN' or *ar* 'on', is what is commonly known as *contact mutation*. The second, where a target is mutated due to morphosyntactic conditions other than a preceding lexical item such as is the case in direct object mutation or feminine gender mutation, is what is commonly known by the interchangeable labels *grammatical mutation* or *structural mutation*. As we shall see presently, there are a number of important generalisations that can be made with regard to both of these types of mutation triggering environments.

4.8.1 *Conditions for contact mutation*

As Kibre (1997) points out, one of the crucial observations with regards to the set of lexical items that trigger contact mutation is that virtually all of them are closed class function words (or, f-morphemes in DM) such as prepositions, prefixes and numerals, something that is readily apparent from the survey above. Even in the case of prenominal adjectives which trigger SM it is apt to speak of a closed class, since only postnominal adjectives can be formed productively while new adjectives are generally not allowed to occur prenominally. We have also seen that the prenominal adjectives, where there is a postnominal homophonous adjective, have different semantics to their postnominal counterparts. This further underpins the point that they form a unique class not commensurate with the open class of postnominal adjectives.

Contact mutation is further subject to strict locality conditions. The most important and most widely agreed upon (cf. e.g. Awbery, 1975; Ball and Müller, 1992; Kibre, 1997) of these is string adjacency at the surface. This is commonly known as the Trigger Constraint, formalised in (109).

(109) TRIGGER CONSTRAINT:

A triggers mutation on B iff:

- (i) A is a lexical trigger of mutation;
- (ii) A is string adjacent to B at PF;
- (iii) A precedes B at PF.

Following the Trigger Constraint, lexical triggers can trigger mutation on words that immediately follow them, but not items that are farther removed.

Thus, as can be seen in the two examples in (110), mutation is always triggered by the item immediately preceding the target (*ei* triggers AM on *unig* and *unig* triggers SM on *cath*) while it is not possible to have a situation where say *ei* triggers AM on both the string adjacent *unig* and the further removed *cath*.

- (110) *ei chath* [i χaθ] ‘her.GEN cat’
ei hunig gath [i h̄inig ɡaθ] ‘her.GEN only cat’
 **ei hunig chath* *[i h̄inig χaθ] ‘her.GEN only cat’

Green (2006, 2007) is the notable exception with regards to consensus on the Trigger Constraint, which he does not accept as holding true of any of the Celtic languages’ mutation systems. He motivates this by showing that in Irish there are a number of cases where contact mutation appears to reach a non-adjacent target. The first of the cases he presents is what we have shown in (110) to be impossible in Welsh, namely that a mutation-triggering possessive pronoun triggers mutation on a target noun despite another item intervening. Green argues that the Irish numeral *dhá* ‘two’ represents just such a case. *Dhá* is a regular trigger of Lenition in Irish, so we have *teach* ‘house’ but *dhá theach* ‘two house(s)’. However, when preceded immediately by a possessive pronoun, the mutation on the target will be whatever the possessive pronoun triggers, and not necessarily the Lenition expected after *dhá*. This is illustrated in (111).

- (111) (a) *mo dhá theach* ‘my two house(s)’
 (b) *do dhá theach* ‘thy two house(s)’
 (c) *a dhá theach* ‘his two house(s)’
 (d) *a dhá teach* ‘her two house(s)’
 (e) *ár dhá dteach* ‘our two house(s)’
 (f) *bhur dhá dteach* ‘your two house(s)’
 (g) *a dhá dteach* ‘their two house(s)’

As can be seen in (111a–d), we find Lenition after the first, second and third-masculine, but no mutation after the third-feminine. In the plurals in (111e–g) we find Eclipsis in every instance. In an account such as Pyatt’s (1997), discussed in more detail in §5.3, this behaviour is fairly straight forward to implement: *dhá* is lexically specified with a diacritic {L}, but there is a morphological rule replacing the diacritic on *dhá* with that of an immediately c-commanding genitive determiner, including the non-mutation triggering default diacritic {z} in (111d). Green however uses such examples to argue mainly against accounts that posit a triggering floating feature at the right edge of the trigger. He argues that the data in (111) pose a number of problems to such an account: *dhá* should absorb the mutation from the pronoun because it is string adjacent to the right of the pronoun, *dhá* should always trigger Lenition on an item string adjacent to its right. Consequently, cases (111d–g) are a challenge to such accounts. There are however two factors that suggest that the situation may not be as dire as it seems. First, the numeral two shows extensive suppletion: *dhá* is used only as a quantifying adjective (e.g. *X number of Y’s*), in counting years, and as an inanimate pronominal (e.g. *John has two*, where *two* refers to some entity such as books, tables, houses, &c.). In animate pronominal use cases (e.g. *John has two*, where *two* refers to daughters, friends, &c.) the exponent of the numeral is *dís*, and in all other cases (e.g. counting, time, maths, giving numbers) it is *dó*. Given that we have at least three vocabulary entries here which are sensitive to their morphosyntactic environment at spellout, it is readily conceivable that *dhá* further shows conditioning by the ϕ -features of an adjacent determiner and spells out as a non-mutation trigger where a feminine feature is found, as an Eclipsis trigger where a plural feature is found and as a Lenition trigger in all other cases. Another possibility is that whatever

feature complex we find at the right edge of the determiner is in fact not contiguous with the determiner, i.e. that “*mo* + Lenition” in fact consists of two terminals, one spelling out as *mo*, *do*, *a*, &c., the other as Lenition, Eclipsis or nothing. If *dhá* could be shown in some way to undergo a merger, perhaps resembling a second position effect, with the pronoun, the terminal realising the mutation may end up to the right of the numeral. This is not as implausible as it might seem at first when we consider the fact that the possessive pronouns frequently undergo such mergers with adjacent prepositions. For instance *le* ‘with’ + *ár* ‘our’ is realised as *lenár* ‘with+our’. This process is not regular, and forms may differ across dialects. For instance, in Munster Irish we have *lem* ‘with+my’ and *led* ‘with+thy’ where most other dialects do not show a merger and have unmerged *le mo* and *le do*, respectively. Although the merged and isolated forms are closely related, it is not always clear whether the merged form is derived by a simple rule,¹⁰ yet they always continue to trigger the same mutation as the bare possessive pronoun. One possible account of these facts would be to propose that the determiner undergoes fission (or involves an actual Num projection). Lenition and Eclipsis would then be the exponents of a terminal carrying [\pm pl]. The absence of mutation for a 3SGF feature bundle could be explained either by assuming that [$-$ pl] is deleted in the context of [$+$ fem], or that all the other feature configurations carry a [$-$ fem] specification (so that Lenition exposes [$-$ pl, $-$ fem] and Eclipsis exposes [$+$ pl, $-$ fem]). It would certainly be an interesting endeavour to see which of these options best fits other facts about the Irish DP, but it seems clear that one can plausibly argue for a scenario where *dhá* does not involve non-adjacent mutation.

Another case discussed by Green (2006, 2007) is mutation triggered on both conjoined phrases under coordination, as shown in (112) (from Green, 2006, p. 1966):

¹⁰ While [n]-excrescence in this context is highly regular, appearing between V–V junctures, other factors are not as straight-forwardly phonological. Final vowels on the pronoun are deleted only in the first and second singular, the final nucleus of *faoi* monophthongises only with the first and second singular but not elsewhere. With the second person plural we get *in (bh)ur* [mu:r] ‘in+your’ with [n]-excrescence and a missing initial [v] on *bhur*, but this does not happen with any of the other vowel final prepositions (though in some dialects *bhur* is always vowel-initial and we consistently find [n]-excrescence).

- (112) *síoc agus sneachta* ‘frost and snow’
 **síoc agus shneachta* ‘frost and snow’
 shíoc agus shneachta ‘through frost and snow’

As can be seen in (112), *agus* does not itself trigger lenition, but if a trigger precedes the first of two conjoined nouns then both are Lenited. It is not clear whether this phenomenon also applies to Eclipsis, how consistently it is applied, whether there are any modifiers that do not trigger mutation on both conjoined items, and what role semantic scope plays. If the phenomenon applies also to Eclipsis and is scope-sensitive (e.g. if some phrase such as [?]*dhá úll agus phiorra* ‘two apples and (two) pears’ can be contrasted to a phrase such as [?]*dhá úll agus piorra* ‘two apples and (a) pear’), one possible analysis would be that the modifier is present on either side, but the lower copy of the modifier remains silent except for the mutation it triggers. This would mean that there is an adjacent morphosyntactic terminal with a mutation trigger, but it remains difficult to account for the fact that it remains silent except for the mutation, perhaps leading one to resort to a stranded mutation similar to the *L* in Roberts’ (2005) account of Welsh Direct Object Mutation (discussed in §4.8.2). While this may bring us closer to achieving adjacency and reasoning why mutation should be replicated, this is clearly not a satisfactory solution to the problem. Further, as I will show shortly, Green’s (2006; 2007) model cannot account for the problematic data either, and we are left here with a situation where the empirical facts are not well understood and no present theory of mutation can account for the data. The case of *agus* is thus highly problematic for all accounts of (Irish) mutation, and while it would greatly benefit from further study, does not at present provide a discriminatory criterion for the various theories of mutation.

Lastly, Green gives the case of the expletive *fuckin’*, which appears to be transparent to mutation. This is illustrated in (113) (from Stenson 1990, p. 171; cited in Green, 2006, p. 1966):

- (113) *Cá bhfuil mo fuckin’ sheaicéad?*
 ‘Where’s my fucking jacket?’

Relatively little is known about such cases of transparent expletives, and these are also found in Welsh. Breit (2012) studied the behaviour of two expletives, *ffwcin* ‘fucking’ and *blydi* ‘bloody’, intervening between an AM

trigger and a target in seven speakers of North Welsh. In Welsh, if the expletive were a fully fledged prenominal modifier, one would normally expect it to trigger *SM* on the modified noun. With this in mind, there were three possible outcomes: (i) the expletive would behave like a regular prenominal modifier and trigger *SM* on the target, (ii) the expletive is treated as entirely transparent and the target receives *AM*, or (iii) the expletive blocks *AM* but does not trigger *SM* either. Breit (2012) found that there was a great deal of variation, both within and across speakers, and for some speakers across the two expletives used. Expletives were treated as though they are syntactically not present in about half the cases (outcome ii), and it blocked mutation without itself functioning as a trigger in the majority of the remaining cases (outcome iii). In only a handful of cases was the expletive treated like a prenominal modifier. Breit (2012) hypothesised that the variability shows that speakers struggle to integrate these items into the system, but that it is perhaps most plausible to analyse them as a form of infixation, with early infixation leading to the blocking effect and late infixation leading to a transparency effect. If such an analysis can be corroborated by future work, this would mean that expletive insertion is not necessarily problematic in terms of adjacency.

While I have argued above that the evidence against adjacency presented by Green (2006, 2007) is much weaker than he makes it out to be, they nonetheless prove challenging and all warrant further attention. For Green (2006, 2007), however, it is clear from these data that string adjacency is not the appropriate way to capture the locality requirements involved in mutation. Instead, he proposes that mutation is determined by syntactic government: a target is mutated when it is governed by a lexical item that is a mutation trigger. He thus conceptualises this to happen in a similar fashion to, say, case or theta-role assignment by a syntactic governor to its governee.

While government imposes some locality requirements (the governor has to *m-command* its governee, and no other barrier may intervene) this proposal seems unable to account for the data in (??), and possibly for that in (112), in part due to requiring violation of minimality and in part depending which intervening categories constitute barriers. A common definition of syntactic government is given in (114), adapted from Haegeman (1994, p. 479).

(114) GOVERNMENT (SYNTAX):

A governs B iff:

- (i) A is a governor;
- (ii) A m-commands B;
- (iii) no barrier intervenes between A and B;
- (iv) minimality is respected.

Where governors are heads (typically of the category A, N, V, P, or I; cf. Haegeman, 1994, p. 580) or co-indexed XPs, barriers are constituted by most maximal projections (cf. e.g. Haegeman, 1994, pp. 554ff for more specifics), and minimality is violated if another potential governor of B intervenes between A and B.¹¹

The data in (112) then demand that we accept that both the possessive determiner and the numeral should be potential governors, since they are mutation triggers and mutation triggers must govern their targets. However, if this is the case then *dhá* in *ar dhá gcuid* ‘our.GEN two part(s)’, as a governor of *cuid* intervening between the governor *ar* and the target *cuid*, violates minimality, so that *ar* should be unable to govern *cuid*.¹²

The mutation of coordinated structures in (112) requires the assumption that the coordinating conjunction is neither a governor nor a barrier. However, in Welsh the coordinating conjunction *a* ‘and’ is an AM trigger, and so must necessarily constitute a governor, again leading to a violation of minimality. As we can see from the present discussion, Green’s (2006; 2007) model of mutation is actually itself unable to account for the same cases he pits against models where mutation is derived in adjacency to a trigger (e.g. both models with an adjacent diacritic and models with floating phonological features).

¹¹ Haegeman (1994, p. 479) defines minimality as follows:

(115) MINIMALITY (SYNTAX):

A governs B iff there is no node Z such that:

- (i) Z is a potential governor for B;
- (ii) Z c-commands B;
- (iii) Z does not c-command A.

¹² If *dhá* is a Num head then its maximal NumP projection may additionally constitute a barrier regardless of the minimality violation.

Another problem with Green's (2006; 2007) argument is that he draws on data from a variety of Celtic languages to draw inferences about mutations across all of the Celtic languages. There is however no a priori reason why we should expect that only because of their historical development from the same Proto-Celtic or Brythonic sandhi process (if the story should indeed be this simple) mutations should be implemented in the same way in all the descendent modern Celtic languages.¹³ And clearly, while Irish may not adhere to the strict definition of the Trigger Constraint in (109), in Welsh string adjacency is a strict requirement for contact mutation. The equivalent structures to the non-adjacency cases Green discusses for Irish simply do not exist in Welsh. It thus seems apt to retain the stricter Trigger Constraint for Welsh, at least as a surface generalisation. While it does seem true as a general requirements for mutations in Welsh that a trigger must c-command its target (the only part of Green's proposal that holds for the problematic Irish examples), this is obviously a much less restrained condition than what Green (2006, 2007) proposes, and does not enforce much in the way of locality at all.

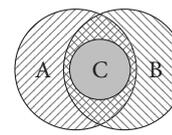
To summarise the conditions on contact mutation then, the two principal observations here are that (i) the lexical items triggering contact mutation form are all closed class, and (ii) contact mutation must satisfy the Trigger Constraint in (109), i.e. a trigger must immediately precede its target at PF. We have not discussed the role of immutable words, such as *dy* 'your.GEN', which never mutate even if all the other requirements are met. This will be addressed shortly, however let us first turn to the other type of mutation triggering environment, grammatical mutation.

4.8.2 Conditions for grammatical mutation

In the survey above we have seen a number of conditions under which either SM or LSM is triggered in the absence of an overt lexical trigger. While some of these cases quite clearly meet the criterion of not having

¹³ This is not to claim that mutation in the different Celtic languages is evolutionarily convergent. Rather it is to say that while monophyly may increase the likelihood of homology, homology does not imply identity. Deducing identity from homology is an instantiation of the association fallacy, i.e. it is fallacious to assert that some given property holding of mutation in language A must also hold in language B just because of shared origin. Thus, even if the Celtic mutation systems show swathes of analogy due to homology, on the level of individual properties monophyly is not a valid argument against homoplasy.

Association Fallacy:



$$C \subseteq A \wedge C \subseteq B \\ \implies A = B$$

an overt lexical trigger, there are others where this is not as clear, as with mutation triggered by prenominal adjectives, or in the case where a pre-verbal particle such as *mi* ‘COMP.AFF’ or *ni* ‘COMP.NEG’ is omitted but the mutation remains. As regards the prenominal adjectives, I have above taken the position that since they belong to a closed class and have different semantics to related postnominal forms, they fit straightforwardly into the category of contact mutation. Since the pre-verbal particles/complementisers are still overtly seen at least some of the time, I also submit that they are best treated simply as cases of contact mutation, which in addition to their overt form have a phonologically null exponent that still triggers mutation just like the other lexical triggers in contact mutation.

The two more interesting and clear cases of grammatical mutation are what I have in the survey referred to as feminine gender mutation and direct object mutation, respectively.

Let us first consider the case of feminine gender mutation. As we have already seen in §4.3, feminine singular nouns receive *SM* following the definite article, prenominal feminine adjectives receive *LSM* following the definite article, and postnominal adjectives receive *LSM* when they modify a feminine singular noun, as illustrated in (116), where both the noun and the adjective are mutated.

- (116) ə ʏɛɾχ _wɛn
 y fɛrç wɛn
 the girl.F white.F
 ‘the white girl’

One way of approaching this pattern is to stipulate that the definite article *y*, and all the feminine nouns, are lexical mutation triggers. To account for the fact that the definite article only triggers mutation on singular feminine nouns, we might further stipulate that there is a feminine and masculine version of the definite article, only the former of which is a lexical mutation trigger. However, such an analysis is inelegant for two reasons. First, it would admit nouns, an open class (l-morphemes, in *DM*), to the class of mutation triggers which we have seen in the survey above is otherwise very much closed. Second, because where feminine singular nouns are followed by a chain of adjectives, every adjective is targeted by *LSM*, not just the one closest to the noun, as shown in (117).

- (117) ə vεrɣ _wɛn vaɣ
 y ferch wen fach
 the girl.F white.F little
 ‘the little white girl’

If we wanted to uphold the proposition that such mutation is triggered by the feminine singular noun, then this would clearly violate the Trigger Constraint formulated for contact mutation in (109). The only way out would be to admit all the adjectives as mutation triggers, also. This in turn would be rather futile, as we would have to propose that, as with the definite article *y*, there are two versions of each adjective, a feminine and a masculine one, the former of which is a lexical mutation trigger but the latter of which isn't. This is highly problematic given that adjectives are open class items; why should we expect that new members implicitly come with the mutation-triggering feminine counterpart? Further, while a very limited number of adjectives have phonologically distinct feminine and masculine forms, why would we want to propose that essentially every single adjective in the language has a completely homophonous feminine singular form?

The solution to feminine gender mutation is clearly to be found in gender agreement within the Welsh nominal projection. As we can see from comparing the examples in (116) through (118), adjectives agree with the noun they modify in gender.

- (118) ə dɪn gwin
 y dyn gwyn
 the man white
 ‘the white man’

However, as shown in (119–121), both gender agreement and mutation are lost in the plural; a cross-linguistically common case of impoverishment.

- (119) ə dɪn-jɔn gwɪn-jɔn
 y dynion gwynion
 the man-PL white-PL
 ‘the white men’
- (120) ə mεrɣ-ɛd gwɪn-jɔn
 y merch-ed gwyn-ion
 the girl.(F)-PL white-PL
 ‘the white girls’

- (121) *ə vɛrɣ-ɛd wɛn-jən
 y fɛrɰ-ɛd wɛn-jən
 the girl.F-PL white.F-PL
 ‘the white girls’

It would seem then that, as Tallerman (1987) proposes, rather than the feminine nouns or adjectives themselves being triggers, it is the features [+feminine, –plural] which trigger LSM. In fact, Ball and Müller (1992, p. 162) suggest that we can reduce the trigger to the feature [+feminine], given that there is no overt gender agreement in plural nouns and their modifiers. This is visible in examples such as (120), where the pluralised version of the feminine noun *merch* takes the pluralised form of the “masculine” adjective *gwyn*, rather than that of the feminine adjective *gwen* as we might otherwise expect. Thus we might propose that the feature [+feminine] triggers LSM on adjectives, and the reason this only shows in singular forms is that they are not specified for [±feminine].

Although neither Tallerman (1987) nor Ball and Müller (1992), who also entertain this proposal, seem to envisage this, I propose that rather than the specific feature on a preceding item triggering mutation on the item following it, it is the feature on the adjective itself which triggers mutation on it. That is, given an example such as that in (117), it is not the case that the feature [+feminine] on *merch* triggers LSM on the adjective *gwen*, and [+feminine] on *gwen* in turn triggers LSM on *bach*, but rather that [+feminine] on *gwen* triggers LSM on *gwen*, and [+feminine] on *bach* triggers LSM on *bach*. Given this analysis, it is the percolation of [+feminine] from feminine singular nouns that trigger mutation on the adjectives, and so the mutation trigger here is strictly local. Especially if we conceive of the trigger as something in the sense of a [+feminine] prefix (which is precisely what I will suggest later on), then the apparent long-distance gender mutation clearly fits all the criteria of the Trigger Constraint.

There is another advantage to the proposal that it is the local feature [+feminine] which triggers LSM on the adjective it is attached to, namely what Oftedal (1962) calls *retrospective* mutation, i.e. mutations apparently removed from their triggering source, as for instance in example (122) (from Ball and Müller, 1992, p. 163):

- (122) kaθ vaʊr ɔið əno | dɛwa ən ə bid
 cath fawr oedd yno , dewaf yn y byd
 cat big be.PST.3SG there fattest in the world
 ‘a big cat was there, the fattest in the world’

To rescue the proposal that [+feminine] on a preceding item triggers LSM, Ball and Müller (1992) propose that structures such as (122) contain a trace of the noun, preceding *tewaf*, which is still fully specified for its features, and so can still trigger mutation on that noun. As we will see later on, assuming that a trace can trigger mutation is problematic, principally because one of the properties of traces is that they do not receive phonological interpretation and thus do not figure in PF. This makes them incompatible with an analysis where mutation is part of the spellout of the trigger, and forces an analysis where the targets are assigned a diacritic feature visible to PF, where it is this diacritic which then triggers the mutation. It seems much simpler to say that it is the feature [+feminine] on the adjective *tewaf* that triggers its LSM. For this we already have empirical evidence, and it does not rely on features left behind by a trace, or a diacritic to double its work. The proposal that [+feminine] triggers LSM on the adjective it is attached to maintains strict locality and does away with the need to invoke any additional machinery to account for the “retrospective” gender mutation.

In §6.9, I will propose that mutation on postnominal adjectives and following the definite article are all the spellout of the feature [+fem], sometimes in combination with a category or definiteness feature, but there are various additional complicating factors which preclude us from discussing this in more detail at present. Either way, we have seen that feminine gender mutation clearly adheres also to the conditions we have already discussed for contact mutation, namely that the trigger context is restrictive, and that feminine gender mutation adheres to the same strict locality requirements as contact mutation.

Let us now briefly consider direct object mutation, already touched on in §4.2. In its simplest form, direct object mutation characterises the SM triggered on the left-most item of a constituent that forms the direct object of a finite tensed verb, as illustrated in examples (85–86), repeated here as (123–124).

(123) gwel^oð ə d̪ɪn ɡi:
 gwelodd y dyn ɡi
 see.3SG.PST the man dog
 ‘The man saw a dog’ (Lieber, 1983, p. 170)

(124) prən^oð ə ð̪ənes veik
 prynodd y ddynes feic
 buy.3SG.PST the woman bike
 ‘The woman bought a bike’ (Tallerman, 2006, p. 1751)

As we have already seen in §4.2, there are a number of proposals to account for this type of grammatical mutation environment. The easiest to dismiss is the proposal that pronouns and proper names are triggers, since any NP can be the subject in clauses such as (123–124). However, a generalisation that has been drawn from this is that it is the subject NP itself, rather than its lexical content, that functions as a trigger. This line of argument has developed into a more generalised triggering environment where any maximal projection XP functions as a trigger on a phrasal sister, or a complement, depending on the precise formulation. This is generally known as the XP Trigger Hypothesis (XPTH) (Harlow, 1981, 1989; Tallerman, 1990, 1999, 2006, 2009; Borsley and Tallerman, 1996; Borsley, 1997, 1999; Borsley et al., 2007). Borsley (1999, p. 286) formulates it as follows:

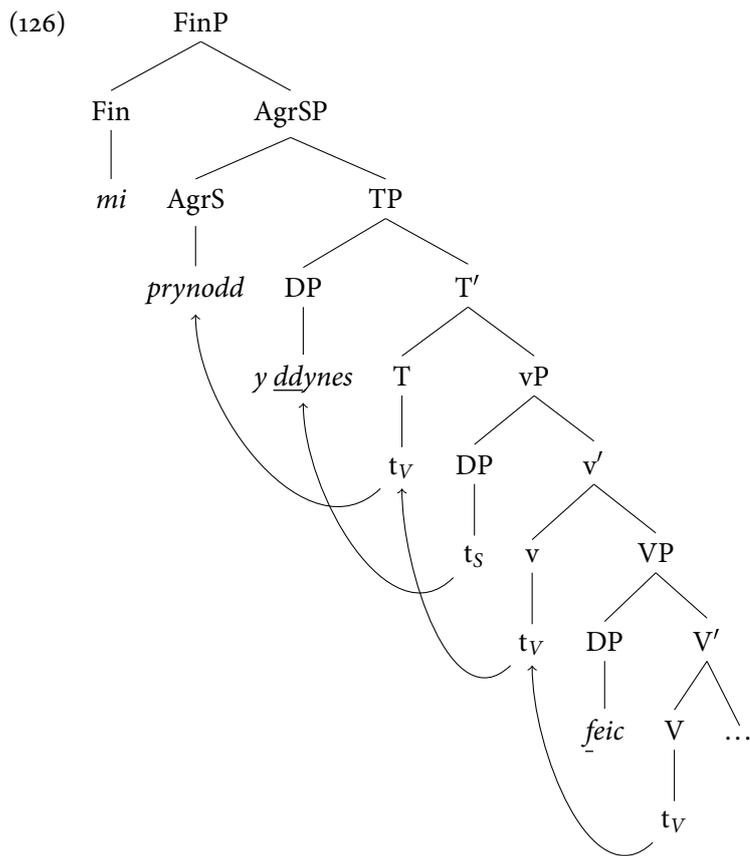
(125) XP TRIGGER HYPOTHESIS:

A complement bears SM if it is immediately preceded by a c-commanding phrase.

If we accept the phrase/XP itself as a trigger, then it is clear that the environment described by the XPTH also fits the requirements of the Trigger Constraint in (109). An interesting problem posed by the XPTH with regards to the way it interfaces with the phonological implementation of its mutation is what exactly it is that is referenced here. Neither abstract structural concepts such as XP nor their boundaries (aka brackets) are substantial morphosyntactic objects that receive exponence. Exponence is standardly a property only of morphosyntactic nodes, which an XP is not. Similarly, while there are clearly structural conditions in context-sensitive morphological processes, they are ultimately always relating to some morphosyntactic object (i.e. features on a node); processes are not

known to take place purely in the context of some structural configuration. Ultimately, “ $XP[XP]$ ” is simply not a coherent morphosyntactically real object that could be spelled out. This is also the basis for most of the criticism levelled at the various versions of the XP_{TH} , namely that, while it seems to capture the data extremely well, it does not essentially refer directly to any substantial entity that is known to otherwise figure in the morphosyntax (cf. e.g. Ball and Müller, 1992; Roberts, 2005). That is, it does not correlate with any otherwise functional morphosyntactic feature (though cf. Tallerman’s 2009 attempt at providing a functional explanation broadly in the same vein as what Ball and Müller, 1992 envisage).

The main competing analysis of direct object mutation is the case-linked account of Roberts (1998, 2005), which is conceptually not unlike that of Lieber (1983) and Zwicky (1984), who also link such mutations to case. Following Roberts’ (2005) analysis, a sentence such as that in (124) has the structure shown in (126).



As illustrated here, Roberts (2005, p. 70) argues that the direct object of a transitive verb is merged at *Spec,VP*, while the subject is merged at *Spec,vP*. The verb then moves through *v* and *T* to its final position in *AgrS*,¹⁴ and the subject moves up to *Spec,TP*.

As to the triggering of *SM* on the direct object in *Spec,VP*, he proposes that this is tied in with the verb assigning accusative case in *v* when adjacent to the direct object in *Spec,VP*. Importantly, Roberts (2005) does not propose that the direct object *DP* is assigned accusative case here and *SM* is then the realisation of that accusative case feature on the direct object itself—which would make it parallel to what I have proposed happens with [+feminine, –plural] within the nominal projection. This would perhaps lead to the wrong prediction that a fronted direct object originating in *Spec,VP* and receiving accusative case there would still show *SM* when it does not, as illustrated in (127):

- (127) beik præn-ǝð y ðynes t
 beic pryn-odd y ddynes t
 bike buy-3SG.PST the woman [DP t]
 ‘A bike, the woman bought’

Rather, what Roberts (2005) proposes is that accusative in *v* is realised as an autosegmental diacritic feature *L* which attaches to the left edge of the string adjacent direct object complement. Since the complement has moved in (127), *L* cannot attach to it and does not surface.

The obvious problem with this proposal is that, since the verb moves through *v* on its way to *AgrS*, we would expect that it also picks up the morphosyntactic features from *v* and the trace it leaves behind should not receive any exponence. We would then expect *SM* on the subject, rather than the object, since that is what ends up being string adjacent to the verb. To address this issue, Roberts (2005, p. 77) proposes that the feature-copying operation that underlies movement is only applicable to morphosyntactic features, but since *L* is by its nature a phonological feature, which he conceptualises in a fashion similar to the floating [+voice, +cont] autosegment of Lieber (1983), *L* is not copied and gets stranded in

¹⁴ Actually, Roberts (2005, p. 54) replaces *AgrSP* with a *PersP* dominating a *NumP* and the verb ending up in *Pers* and the subject in *Spec,NumP*. I've omitted this as it is immaterial to the analysis of direct object mutation.

v. There it can function as a trigger even after movement of the verb from v to T.¹⁵

Unfortunately it is not completely clear from Roberts' account exactly how he envisages the materialisation of *L* as the realisation of accusative in v to take place. The problem is this: if *L* is the spellout of ACC in v, and movement copies all morphosyntactic features from its source to its destination and then deletes the same features in the trace, we would expect that *L* is realised in AgrS, not in v. To ensure that *L* is stranded in v when the verb moves to T, Roberts (2005) proposes that the movement operation only affects morphosyntactic features, but that *L* is a phonological feature that is unaffected by the movement operation and so remains stranded in its site of origin, v. For this to work, of course, ACC must be selectively spelled out in v while the remaining morphosyntactic features of that head are not; and this quite possibly has to happen even before any lower heads are spelled out, though Roberts does not detail how he envisages this is implemented in practice. The obvious question here is why a spellout operation targeting v before movement takes place should only target ACC and leave all the other features untouched. If v is spelled out at this point, we'd expect that all of its features are spelled out before movement takes place.¹⁶

Another issue arises from Roberts' analysis of the Welsh passive construction. As illustrated in (128), the direct object of a passive clause does not show mutation:

- (128) prən-oid beik
 pryn-wyd beic
 buy-PASS.PST bike
 'A bike was bought'

The explanation of the lack of direct object mutation on *beic* in (128) is relatively straight forward under Roberts' proposal: it is not assigned accusative case so shouldn't bear mutation. However, because he assumes

¹⁵ Another problem with Roberts' account is that, if there is movement out of Spec,VP but *L* stays behind, this would predict that *L* can trigger mutation on a stranded phrase following V, e.g. in a double object construction or on an adverbial adjunct. As far as I'm aware that prediction is incorrect.

¹⁶ And of course allowing movement after spellout in this fashion—if moving from v to T after the insertion of *L* can be understood as such—opens up a great number of questions regarding how such movement were to be restrained. It is most certainly incompatible with devices such as the syntactic phase (Chomsky, 1995).

that L is already present in v , Roberts (2005) has to somehow account for its absence where v bears the feature $PASS$. To account for the absence of L with $PASS$ he tenuously suggests that L may be part of the ϕ -features. The absence of L would then be explained by the absence (or obliteration) of ϕ -features in the context of $PASS$. This then only serves to further blur the precise nature of L ; it is phonological when movement strands it, yet behaves like a morphosyntactic feature in its possible affiliation with the ϕ -features.

The problem regarding the strange behaviour of L can perhaps be averted if we assume that case assignment is essentially positional, and not due to an ACC case feature or L on v itself. A DP in $Spec,VP$ is valued ACC for its uninterpretable case feature when it is the sister of v (and is not valued for some other case in that position, e.g. Roberts allows valuation as NOM in this configuration under certain conditions). Conversely, a fronted direct object such as *beic* in (127), which does not bear mutation, is not assigned accusative case since it does not occupy the position in which ACC is assigned. A potential problem with this proposal is that a clause with a fronted direct object such as (127) ends up with a fronted subject that still has an unvalued uninterpretable CASE feature, as shown in (129).

- (129) [$bike_i$ -CASE buy_j -3SG.PST [TP the $woman_k$ buy_j -PST [vP the $woman_k$ buy_j $bike_i$ -ACC [vP ...]]]]]

Consequently, we would incorrectly predict the sentence in (127) to be ungrammatical. Nunes (2004, p. 69) shows that a similar problem may arise on the LF branch with an English clause such as (131), in which the trace is valued for case but the fronted WH-word retains an unvalued CASE feature, as shown in (131).

- (130) What did John see?

- (131) [$what_i$ -CASE did+Q [TP John [vP see $what_i$ -ACC]]]

To address this problem, Nunes (2004, pp. 70ff) proposes that there is a feature uniformity condition imposed on all the items in a chain, such that each of these items must have the same features visible at LF . The mechanism by which he proposes this condition is satisfied is one where

a minimal number of features are deleted across the chain to effect satisfaction of the uniformity condition. The effect of this is that every case feature in a clause such as (131) is eliminated (Nunes, 2004, p. 72).

What would happen if we found that Nunes' uniformity condition for case holds also at PF in Welsh? The unvalued case feature on the fronted copy of *bike* would be eliminated, without the fronted element ever being assigned ACC case itself (the lower tail of the *bike*-chain in (129) is of course not exponed). While we might expect to see other effects at the interface if a Nunes-style analysis is actually correct, were we to come to accept such an analysis of accusative case assignment for Welsh, then an analysis of direct object mutation where the trigger of the mutation is in fact the ACC case feature on the target itself (just like the ϕ -features on adjectives and nouns in feminine gender mutation) seems plausible, and we avoid all the uncertainty surrounding the behaviour of Roberts' *L* diacritic.

A less principled alternative to the chain-linked analysis would be to stipulate that ACC is subject to impoverishment or simply has a null exponent outside Spec,vP. This is not entirely implausible, given that case in general (not just ACC) is usually assumed to be syntactically universal in nature and figures at LF, but is not overtly exponed in Modern Welsh except in very few cases.

This last point is however one of the major discontentments that XPTH-supporters have with regard to the case-linked accounts of Lieber (1983), Zwicky (1984) and Roberts (1998, 2005). Specifically, they question that case is featurally active in Welsh, given that there is little evidence of morphological case marking in Welsh apart from direct object mutation itself (cf. Tallerman, 2006; Borsley et al., 2007), though Roberts has argued that there appears to be a categorical split between the behaviour of subjects and possessives versus objects in Welsh which reflects precisely the split between nominative and genitive versus accusative in languages with extensive morphological case marking (cf. Roberts' remark in Borsley et al., 2007, p. 232, fn. 4).

As for an analysis based on ACC on the target itself (as with Lieber, 1983, Zwicky, 1984 and my suggestion leaning on Roberts, 2005; but not Roberts' indirectly case-linked account itself), Borsley et al. (2007) also specifically cite cases such as the non-mutation of fronted direct objects as counter-evidence, though we have just seen that their non-accusativeness

is not necessarily surprising. The more difficult data for the case-linked account are sentences such as (132) with an *AdvP* preceding the subject:

- (132) mai ən ər _arð ɡi
 mae yn yr ardd gi
 be-3SG.PRS [*AdvP* in the garden] dog
 ‘In the garden (there) is a dog.’

Borsley et al. (2007) argue that the mutation of *ci* in (132) is triggered by the preceding *XP yn yr ardd*, and that the case-linked accounts are unable to account for such cases since *ci* is clearly a subject in these clauses and so cannot bear *ACC*. Regarding sentences such as (132), Roberts (2005) proposes that the subject here is displaced to *Spec,VP* and so does bear *ACC* as would an object otherwise, though Borsley et al. (2007) do raise the issue of some more intricate examples of low subjects that seem only unsatisfactorily explained by a displacement analysis.

In any case, it is not my aim here to arbitrate between the two proposals in terms of their morphosyntactic adequacy¹⁷ and doing so would take us too far afield from the matter at hand, the implementation of *ICM* across the morphosyntax–phonology interface.

As far as is of immediate relevance to us otherwise, we see that both proposals account reasonably well for the environments in which we find direct object mutation. The main problem with the *XPTH* is that there is some uncertainty as to what exactly the mental object is that we are to assume is expounded by direct object mutation, while its great advantage is the achievement of very good empirical coverage from a very simple hypothesis. On the other hand, the case-linked accounts find their strength in that they link direct object mutation directly to the exponence of a mental object—the *ACC* case feature—which we have much independent evidence to believe is something that can be morphologically expounded, from the vast array of case marking languages, including some of Welsh’s Celtic cousins, if not independently motivated by Welsh in and of itself. The downside of the case-linked approach is that the various intricacies of apparent exceptions require much more involved analyses (and their corresponding hypotheses) to uphold that link. From the interface perspective, both the *XPTH* and the *L*-diacritic accounts have their problems.

¹⁷ For a more in-depth discussion of the morphosyntactic merits and problems faced by the various proposals see for instance Borsley et al. (2007, Ch. 7).

The *XPTH* is clearly highly problematic because it requires the exponence of something that cannot be expounded. Floating *L* is problematic because of its paradoxical spellout requirements and its ambivalent nature with regards to whether it is morphosyntactic or phonological, both of which blur the line between morphosyntax and phonology. Only the directly *ACC*-based account is fully compatible with standard assumptions about exponence, spellout and modularity.

What is clearly apparent though is that both types of account are strictly local, in line with the Trigger Constraint in (109). Under the *XPTH*, so long as we admit “sister *XP*” as a trigger of *SM*, *SM* is triggered precisely when a target is string adjacent to a sister *XP* and it is preceded by that sister *XP*. Under the directly *ACC*-based account, the trigger is immediately present on the target and can be spelled-out as would be a case-prefix on the target, in the same way as I have suggested regarding feminine gender mutation. Under Roberts (1998, 2005) original account with the *L* diacritic in *v*, there likewise is a specific trigger of *SM* (namely *L*) that triggers mutation on a target precisely when it immediately precedes it. We can conclude from this that the Trigger Constraint holds both for contact mutation and grammatical mutation alike, and that the structural configuration involved in mutation triggering is thus highly similar in both cases with regards to its locality requirements.

4.9 VARIATION

We have so far conducted an extensive survey of the various mutation patterns and their various triggering environments, as well as the morphosyntactic conditions under which mutation can take place. However, a description of mutation would not be complete without also discussing the ways in which cases might deviate from what I have described as the regular pattern so far. As we might expect, variation can be found both in relation to the triggers—and we have already noted some variation in the mutation patterns themselves—and in relation to the targets of mutation. Let us now consider each of these in turn.

4.9.1 *Trigger variation*

With regards to triggers, the first kind of variation we may note is where the type of mutation triggered deviates from one of the three basic patterns (SM, NM, AM). This may be by way of a “defective” version of that mutation, as we find in Limited Soft Mutation (LSM), which can be characterised as a version of SM that “lacks” voicing and despirantisation of /t̪, r̪^h/. In an even more drastic case, some speakers apply a severely restricted form of SM following the numerals *saith* ‘seven’ and *wyth* ‘eight’, where we find SM only of the voiceless plosives /p, t, k/ but of none of the other sounds typically targeted by SM or LSM (Watkins, 1993; Thorne, 1993). King (2016, p. 12) describes something similar regarding AM, which in some cases is not applied to targets with initial /t/, and in others excludes both /t/ and /p/, effectively targeting only a single sound.

The most extreme version of this is when a trigger loses its triggering function altogether. For instance in the dialect of New Quay *fy* ‘my.GEN’ still triggers full NM, but *yn* ‘in’ triggers no mutation at all (Davies, 1934, cited in Ball and Müller, 1992, p. 238).

Alternatively it may take the form of merging two of the basic patterns, as is the case with Mixed Mutation (MM), which can be characterised as an application of AM wherever possible, with a fallback to SM elsewhere. We may also add to this category Pre-Vocalic Aspiration (PVA), if we count it to the mutations, as some but not all AM triggers also trigger PVA, though of course not all PVA triggers are AM triggers (i.e. the set of PVA triggers is not a subset of the set of AM triggers). We also find what is arguably the opposite case to the “defective” LSM, namely that a mutation pattern is extended to include sounds which are not part of that pattern in the majority of dialects: in some dialects AM has been extended to apply also to the nasals and semivowels (e.g. Sweet, 1884, pp. 432f, for the dialect of Gwynant Valley in Caernarfonshire).

A second kind of trigger variation, always dialectal in nature, is where the pattern of mutation triggered by a specific environment is supplanted by a different pattern, as for instance in the Caernarfon dialect where *yn* /ən/ ‘in’ triggers SM rather than NM as it does in most other dialects.

What is perhaps interesting to note, especially with regard to the observation that triggers of contact mutation form a closed class, is that apart

from the noted case of PVA with *eich* ‘your.GEN’ there seem to be no cases where an item that was previously not active as a trigger newly acquires trigger status. There is a disparity here then, where triggers can gradually or suddenly lose their status as triggers, but non-triggers do not appear to newly acquire status as a trigger.

4.9.2 Target variation

As regards variation in the target, this generally falls into one of two categories: (i) items which are entirely immutable, (ii) items which have a fossilised mutated form, appearing either everywhere or restricted to a set context, with some significant overlap between the two.

4.9.2.1 Immutability

Let us first discuss immutability. What should be clear from the patterns discussed in §§4.2–4.7 is that target words that begin with one of the consonants not targeted by the specific pattern of mutation in question are not affected by mutation in any overt way. Consequently words beginning with a consonant not targeted by any of the patterns, e.g. *ffordd* /fɔrð/ ‘road’ may be considered inherently immutable. This is rather unsurprising and of little interest in itself. More interesting are cases where a word begins with a consonant that is generally mutable, but resists mutation nonetheless. These are relatively frequent in the language, and typically fall into one of three categories: (i) they are proper names, (ii) they are borrowed, (iii) they are fossilised mutated forms. Let us consider each of these in turn now.

(i) Proper names generally do not undergo mutation. This is especially true of personal names, such as *Dafydd* /davið/ ‘David’, which are never mutated in a phrase such as **i Ddafydd* [i ðavið] ‘to David’ in the modern language. However, historically at least it appears that personal names were mutable, a fact still visible in the fossilised mutation of personal names that are part of a place name, e.g. *Llanfair* /ʎanvair/ ‘Mary’s church’ < *llan* /ʎan/ ‘church’ + *Mair* /mair/ ‘Mary’. Generally brand names are also excepted, though a very small number of brand names of Welsh origin are mutable. For instance Ball and Müller (1992, p. 205) point out that *Cymro* ‘Welshman’ in the name *Y Cymro* ‘The Welshman’ (a Welsh

language newspaper) is often mutated, e.g. appearing with **NM** in phrases such as *yng Nghymro'r wythnos hon* [əŋ ɨ̥^həmrɔ=r uiθnɔs hɔn] 'in this week's Cymro' (Ball and Müller, 1992, p. 205).

The situation with place names is more bipartite: place names that are Welsh or very high frequency foreign place names take part fully in the mutation system, but foreign language place names that are not high-frequency are generally completely immutable. For instance *Caernarfon* /kairnarvɔn/ may variously appear as *i Gaernarfon* [i gairnarvɔn] 'to Caernarfon', *yng Nghaernarfon* [əŋ ɨ̥^hairnarvɔn] 'in Caernarfon' and *â Chaernarfon* [a χairnarvɔn] 'with Caernarfon', but with the English *Kidderminster* /kɪdərminstə/ no mutation is possible (i.e. **i Gidderminster* [i ɡɪdərminstə] would generally be considered ungrammatical). As Ball and Müller (1992, pp. 205f) point out, there is significant variation in regards to what foreign place names are considered common enough that they receive mutation, and some speakers may mutate forms such as *Brussels* and *Paris*, while other speakers may treat them as immutable. It is also notable that in some dialects it appears that place names are never mutated, including Welsh place names. According to Griffiths (1974, cited in Ball and Müller, 1992, p. 239) this is the case in the dialect of Llanfair Caereinion in Powys, where he reports that place names do not take part in mutation.

(ii) Some borrowed words do not undergo mutation, but others do. The main two factors determining this are commonness and phonological shape. As regards commonness, established loans generally take part fully in the mutation system, e.g. *coffr* /kɔfr/ 'coffer', borrowed from English as early as the 13th century (Thomas, 1967), which can mutate in *ei goffer* [i ɡɔfr] 'his coffer', *fy nghoffer* [ə ɨ̥^hɔfr] 'my coffer' and *ei choffer* [i χɔfr] 'her coffer' just like most other Welsh words, similarly *poced* /pɔkɛd/ 'pocket' mutates regularly in a phrase such as *ei boced* [i bɔkɛd] 'his.GEN pocket' (cf. e.g. Fowkes, 1949 for more on mutation in loanwords). This is true with very few exceptions. For instance *braf* [brav] 'excellent', borrowed as early as the 16th century from the English *brave* (Thomas, 1967), and high frequency in Welsh, is generally immutable. The immutability of long-standing borrowings such as *braf* can often be explained in the same way as the immutability of some Welsh-origin radical forms; in this case that some adjectival and adverbial modifiers, such as *braf*, traditionally

appeared only together with a definite determiner. The determiner thus “shielded” these items from mutation, and they retained this immutability after the definite article preceding them was lost (cf. King, 2016).

Conversely, very recent low-frequency or ad-hoc loans generally do not undergo mutation, thus *fy princess* ‘my princess’ and not **fy mhrincess*; the same applies to more extensive code-switching, in an English code-switched phrase in a Welsh matrix clause appears to always be resistant to mutation. Of course it is difficult to differentiate ad-hoc loans from code-switching of single items, though a good marker of mutability is whether a loanword has been phonologically adapted to fit the Welsh system or not, and an indicator for the immutability of ad-hoc loans in addition to code-switched phrases may be the fact that ad-hoc loans from languages in which the speaker is not proficient are also immutable, e.g. *copain*, French ‘companion’, would be realised as unmutated *fy copain* [ə kɔpɛ̃] ‘my companion’ rather than *[ə ɨ̃^hɔpɛ̃]. Note however that loans, once they become established, are frequently integrated fully into the mutation system, as we have seen for *coffr* and *poed* above.

Phonological shape matters, in that loanwords with initial /g/ are generally immutable even after they become established. Thus *gêm* /gɛ:m/ ‘game’ from English *game* /geɪm/, while very common and clearly phonologically adapted, is immutable, so that we have *dy gêm* [də gɛ:m] ‘thy.GEN game’ and *fy gêm* [ə gɛ:m] ‘my.GEN game’, while **dy êm* [də ɛ:m] and **fy ngêm* [ə ɨɛ:m] would be ungrammatical. The exclusion of /g/-initial loans from mutation is relatively easy to motivate phonologically if we assume that there is a general dispreference for the loss of entire segments—a generally well-known explanatory factor in phonology and recognised by most current phonological theories, for instance through the typically very high ranking of constraints such as MAXIO (which militate against the deletion of segments) cross-linguistically in work conducted in the OT framework. I submit that given a dispreference for deleting underlying segments, a learner of Welsh has a certain conservativity bias and will assume that deletion is unacceptable unless they see clear evidence to the contrary. That is unless the learner observes a word with initial /g/ to undergo mutation (which implies the /g/ may be deleted, given the right conditions), they will posit that it is protected from mutation. Since the consequences of allowing non-/g/-initial items to mutate even in the

absence of explicit evidence of their mutability does not contravene the bias against deletion, the learner has no disadvantage from assuming that they are mutable unless they see evidence to the contrary, i.e. unless they observe that the word does not mutate despite all the conditions being met.

What is also interesting to note regarding the immutability of /g/-initial loans is that, for some speakers, /g/-initial native monosyllables (e.g. *glo* /glo:/ ‘coal’ and *gro* /gro:/ ‘gravel’) are also immutable (King, 2016, p. 15), suggesting that such a conservativity bias is also operating in monosyllables (which have been found to be less susceptible to certain alternations in other languages, cf. e.g. Becker et al., 2011, 2012 for discussion and analyses of various such cases).¹⁸ What must be noted here especially is that words which resist mutation because of their phonological shape, i.e. because they avoid deletion of an initial /g/, do not simply avoid deletion of /g/ and otherwise take part in mutation as usual—something that would seem logically entirely possible—but if they resist deletion of initial /g/ that makes them entirely immutable, and they cannot be mutated by any of the mutation patterns, not even those which would not result in deletion.

(iii) Items in which the mutated form has been reanalysed as the radical/underlying form are usually immutable. This is frequently the case with function words, including many of the mutation triggering prepositions, but also with some content words. For instance *dros* /drɔs/ ‘over’ is originally the SM form of *tros* /trɔs/ ‘over’, which is still found in the literary language, but most speakers have reanalysed this and now use *dros* everywhere. While it would be entirely plausible to suppose that *dros*, being the underlying form now, could be mutated to *ddros* [ðrɔs] in a phrase such as *gweithies i dros/*ddros y penwytnos* [gweiθief i drɔs/*ðrɔs ə pɛnwiθnɔs] ‘I worked over the weekend’, but this is generally considered ungrammatical. It must be noted however that while some of these items have undoubtedly been reanalysed in such a way, for others this is only the case for some speakers. For instance with the preposition *tan/dan* ‘until’, some speakers have reanalysed this as *dan* /dan/ while others still

¹⁸ There is an interesting additional factor which might explain the bias against deletion from monosyllables, namely that the fewer segments there are the harder it becomes for the hearer to match a word to a lexical entry. The effect of deleting a segment from a very short string is thus potentially much more detrimental to lexical search than deletion from a longer string.

have the original form *tan* /tan/. In such cases the reanalysed form (viz. *dan*) is generally immutable, while the original radical form (viz. *tan*) is still mutable.

Although this effect has traditionally been understood as simply being the consequence of the forms already being mutated, so that they cannot be mutated again, the immutability of such items is not universal and there are indeed some reanalysed forms which can be mutated further for some speakers. A good example is the word for people, originally *pobl* /pɔbl/ (from Latin *populum*, cf. Thomas, 1967). Since the noun is feminine and tends to frequently occur with the definite article causing SM, a subset of speakers have reanalysed the form as *bobl* /bɔbl/. A small minority of those speakers who have reanalysed *pobl* as *bobl* are able to mutate the form further to *fobl* [vɔbl],¹⁹ for instance in the phrase *lawer o fobl* [laʊr o vɔbl], while for others this is ungrammatical (cf. Thomas, 2000, p. 307).²⁰

In addition to the items described in categories (i–iii) here, there are also a number of other immutable items, often but not always function words/f-morphemes. This applies to most, but not all, of the lexical mutation triggers listed in §§4.2–4.7. For instance *mor* ‘so, EQTV’, *dy* ‘your.GEN’, *dyma* ‘here.DEM’, *gan* ‘by’, and *pan* ‘when.AFF’ are immutable, but *dwy* ‘two.F’, *prif* ‘main’, and *tan* ‘until’ are all subject to regular mutation.

We see from this short survey of immutable forms then that, while certain lexical categories make it very likely that an item is immutable, category alone is not a good predictor of mutability in most cases (personal names perhaps being the sole exception): on the one hand, items may be mutable even though they fit a category where nearly all the other items are immutable, while on the other, items may be immutable despite not belonging to any of these categories. What is striking is that that a target’s variation regarding mutability appears to be entirely binary: either an item can take part in the mutation system fully, or it is completely immune to mutation. What we do not find is that an item is only susceptible to a

19 Note that words with a final obstruent-sonorant sequence usually undergo copy-epenthesis, e.g. [bɔbɔl] < /bɔbl/ (cf. e.g. Awbery, 1984a). I’ve omitted copy-epenthesis here for clarity of exposition.

20 For illustration, a Google search on 9 April 2019 for {“o fobl” OR “o fobol”} finds 4,760 examples, compared to 973,000 for {“o bobl” OR “o bobol”}. There are three instances of {fobl} in the Siarad corpus (Deuchar et al., 2009, 2018), notably each with a different trigger (*gan* ‘by’, *hen* ‘old’, and, *o* ‘of’).

specific pattern of mutation, e.g. an item that can be mutated by **NM** and **AM** but not by **SM**.

4.9.2.2 *Exceptional mutation*

To conclude our review of target variation, let us now briefly consider the case of exceptional mutation, i.e. items that do or do not show mutation in a specific context where that behaviour would not otherwise be expected. One case of this we have already noted in section 4.6, namely that *blynedd* ‘year’, *blwydd* ‘year (of age)’ and *diwrnod* ‘day’ appear in their **NM** forms following numerals from five upward, despite these higher numerals not triggering **NM** on any other item whatever. What seems to happen in cases such as these is that the target item has acquired two allomorphs, one of which is a fossilised mutated form, and the other being the etymological radical. The fossilised mutated form is selected in a specific context, and the etymological radical form appears elsewhere. So for instance the word *blynedd* /blənɛð/ ‘year’ has an additional allomorph *mlynedd* /mlənɛð/, diachronically derived from /blənɛð/ via **NM**, which is selected when c-commanded by a **Num** head valued at five or above; everywhere else the form /blənɛð/ appears.

The alternative analysis of this type of exceptional mutation is to posit that the trigger varies depending on its target, i.e. to stipulate that numerals above five are lexical **NM** triggers specifically when they c-command one of the three words *blynedd*, *blwydd* or *diwrnod*. An analysis as target suppletion is preferable to this for three reasons. First, it is more economical in that the lexicon only has to store three additional forms with their environmental specification rather than listing two of every numeral above seven. Second, since the higher numeral can be of arbitrary size (say 1,382,428), the mechanism of encoding this cannot simply be one directly to do with the numeral itself and a solution in which each numeral has one version triggering **NM** and one not triggering mutation seems ultimately unsatisfactory. Third, I know of no case of exceptional mutation which has been extended to a novel item; if the exceptional mutation in such a context were a property of the trigger, however, we would expect that this can be widened to include additional items. If it is a property of the items themselves however and no actual mutation is posited to take place, no such prediction is made.

Of course it is possible to assume any number of variations of the suppletion account, for example the suppletive forms are not specified for their context but rather that the Num head subcategorises for the specific form—but whatever specific implementation this takes will ultimately depend on the which theory one subscribes to, and is at this point not of much further concern to us.

The other attested case of exceptional mutation is what we may perhaps term exceptional non-mutation or exceptional immutability: where an item that is mutable appears in an environment that triggers mutation, yet it unexpectedly resists that mutation. As is clear from this very definition of exceptional non-mutation, this also is a case associated with specific target forms and does not appear to be a (synchronic) property of the trigger itself.

One well-known case of exceptional non-mutation is that of *da* ‘good’ following *nos* ‘night’, a feminine noun which should trigger mutation on *da*. The usual realisation is unmutated *nos da* [nɔs da] however, and **nos dda* [nɔs ða] is considered ungrammatical by most speakers. The same phenomenon occurs with *diwethaf* ‘last’ in the phrase *wythnos diwethaf* [ʋiθnɔs diwεθav] (*[ʋiθnɔs ðiwεθav]) ‘last week’. I propose that such cases of exceptional non-mutation are essentially parallel to cases of exceptional mutation such as *blynedd/mlynedd* following higher numerals, namely that a form such as *da* has two allomorphs, one of which is marked as immutable and one which is mutable. The immutable suppletive form is selected in a specific context, and the mutable form appears elsewhere.

There is again evidence that this analysis is more economical than analysing this as trigger variation. Namely, *da* resists mutation also following a small number of other items that should trigger its mutated form, such as the feminine noun *ewyllys* /εwɪɪs/ ‘will’ in *ewyllys da/*dda* [εwɪɪs da/*ða] ‘good will’, while other forms mutate regularly in the same environment, for instance we have *nos ddewisedig* [nɔs ðewisεdɪg] ‘chosen night’, with regular mutation of *dewisedig* /dewisεdɪg/ ‘chosen’. There again appear to be no cases where the non-mutation has been extended to novel items.

As Ball and Müller (1992, p. 205) note, there is a close connection here with phonological shape in that such exceptional non-mutation mostly

affects /d/-initial items following /s/-final words. However, as they point out this cannot be the conditioning factor as in the majority of cases /d/-initial items do mutate following /s/-final triggers, as they illustrate with the example of *ynys ddu* ‘black island’ [in̪is ð̪i:] (< *du* /d̪i:/ ‘black’), which juxtaposes a /d/-initial next to a feminine noun, analogous to *nos da*, but where mutation takes place in the regular way.

We have seen then that target variation can take one of two forms, complete immutability of an item in all environments, or exceptional (non-)mutation of an item in a specific morphosyntactic environment, which I have proposed is by way of a suppletive exceptional form conditioned by those specific environments.

4.10 SUMMARY

In this chapter I have undertaken a comprehensive survey of ICM in Welsh. From this survey we can see, firstly, that the number of triggering environments is quite limited in number. All in all, the survey has identified around 73 lexical triggers and 2 structural triggering environments.²¹ This means that the systemic burden of mutation is quite small if it is borne by the triggers, compared to the assumption of Green (2006, 2007) and Hannahs (2013a,b) that mutation is encoded on the target.

We have further seen that the vast majority of lexical triggers is constituted by functional items, or f-morphemes, while only a very small number are l-morphemes—perhaps as few as the 7 items in (83). This asymmetry is highly interesting given that it mirrors the well-known asymmetry between f-morphemes and l-morphemes in regard to suppletion: f-morphemes are known to be frequently highly suppletive cross-linguistically, while suppletion in l-morphemes (aka root suppletion) tends to be much more limited.

Lastly, we saw that variation is common this is common in triggers but very limited in targets. MM is an admixture of AM and SM, and PVA sometimes overlaps with AM and sometimes doesn’t. We also saw that

²¹ The total number of lexical triggers listed above breaks down as follows:

| PATTERN | SM/LSM | AM | MM | NM | PVA |
|---------|--------|----|----|----|-----|
| TALLY | 55 | 7 | 3 | 3 | 5 |

The two structural cases are both found with SM.

Vocative case marking has been counted as a lexical trigger.

both *SM* and *AM* are known to have “defective” variants, i.e. subpatterns that don’t apply to the full range of consonants normally targeted by *SM* and *AM* respectively, the most prominent instantiation of this being *LSM*. In stark contrast to the variety and extent of variation in the triggers, we saw that target variation comes in two simple kinds: fossilised mutated forms occurring in specific environments, such as *mlynedd* (< *blynedd*) ‘year’ following high numerals, or immutability, where a target we would expect to undergo mutation consistently resists mutation. Notably, target immutability is neither sensitive to the mutation pattern at hand nor usually to the morphosyntactic environment, other than exceptional immutability whereby very few items, such as *da* in *nos da* ‘good night’, resist mutation following specific triggers (but not a generalisable class of triggers). This clearly demonstrates that the locus of variation in Welsh mutation is the trigger, and not the target as one might expect if mutation is encoded as a form of target suppletion à la Green (2006, 2007) and Hannahs (2013a,b).

Overall then, we see that the mutation system is clearly highly dependent on the triggers, which are lexically highly restricted and form the locus of variation, while targets essentially show little to no variation apart from either taking part in the mutation system or not taking part. These insights should be clearly reflected by our theory of mutation and will be fundamental to my account of mutation in Chapter 6 as well as my account of immutability in Chapter 7.

Previous accounts of mutation

5.1 INTRODUCTION

At the outset of this work in Ch. 1, I have argued that previous accounts of Welsh ICM—insofar as they have anything to say about the morphophonological implementation of the mutations—prove unsatisfactory empirically, theoretically, or often both. In this chapter, I will further substantiate this claim by reviewing accounts of the morphophonology of Welsh ICM in more depth, giving consideration especially to their implications with regard to strict modularity. I will argue from this that there are certain requirements an account of the morphophonology of mutation should meet but which none of the previous accounts satisfy. In brief summary, the main criteria I argue for are that an account should cover the entire breadth of mutation patterns without producing paradoxes or contradictions, explain the productivity of mutations, not rely on any morphosyntactic or phonological mechanisms not independently motivated, and not rely on any kind of ad-hoc morphophonological diacritic. This will lead on directly to Ch. 6, where I propose an alternative account of Welsh ICM, based on floating elements and phonologically conditioned allomorphy, which I argue fits all of these requirements.

“The question that arises is why does Welsh lenition (i.e. SM) present such a seemingly complicated appearance, when changes such as this regularly appear in natural language [...]? One answer may well be that it is the theory that is the complicating mechanism, and that alternative approaches to phonology may well provide us with other formulations that can collapse still further the phonological changes of SM.”

—Ball and Müller (1992, p. 92)

5.2 MORPHOPHONEMES AND JUNCTURE PROSODIES

One of the first attempts at an account of the morphophonology of Celtic mutation was Hamp (1951). Taking inspiration from the long established practice of Celtic grammarians to annotate triggers in grammars and dictionaries with some mnemonic symbol,¹ Hamp (1951) proposes that the various mutations are triggered by abstract morphophonemes which

¹ A long standing practice that is still common, and primarily meant to assist learners and L2 speakers of the language. For instance ° at the end of a word in King (2007) indicates

are typically situated at the right edge of a trigger, with one such morphophoneme each for mutation, depending on the language at hand (Hamp discusses not just Welsh, but all of the Brythonic languages).

Under Hamp's proposal, Welsh Soft Mutation, Aspirate Mutation, and Nasal Mutation are represented underlyingly by the morphophonemes /L/, /S/, and /N/, respectively. Consequently, an SM trigger such as *ar* 'on' would have an underlying form /arL/, an AM trigger such as *ei* 'her.GEN' would have an underlying form /iS/, and an NM trigger such as *fy* 'my.GEN' would have an underlying form /vəN/. The morphophonemes /L, S, N/ then lead to various phonetic changes, often more than one depending on the adjacent sounds. Hamp (1951, p. 233) gives the following description of their effects:²

- (133) /L/ converts a following voiceless stop into a homorganic voiced stop;
 converts a following /d/ into /ð/;
 converts a following /b/ or /m/ into /v/;
 converts a following /g/ into zero;
 converts a following voiceless liquid into a voiced liquid.
 /S/ converts a following voiceless stop into a homorganic voiceless fricative.
 /N/ converts a following voiceless stop into a homorganic voiceless nasal plus /h/;
 converts a following voiced stop into a homorganic nasal.

Though it is difficult to precisely pinpoint the formal identity of such morphophonemes in current theories—keeping in mind that this account predates both the development of feature theory and the definitive division of representational levels—it is notable that Hamp (1951) very much views them as part of the phonological representation of words (i.e., as phonemes, in the terminology of the day), rather than as some sort of independent diacritic. In this way, Hamp (1951) perhaps foreshadows later developments such as Lieber's (1983) floating feature account and the floating element account I propose in Ch. 6.

that it is a trigger of SM (viz. *ar*^o), and at the beginning of a word it indicates that this is the SM reflex of some other word, (e.g. °*gath* is the SM reflex of *cath* 'cat').

² I have updated the phonetic terminology for simplicity here. Hamp (1951) uses the labels *surd* for voiceless/fortis categories and *spirant* for fricatives.

Another interesting observation made by Hamp (1951), despite his making no reference to grammatical mutation (and possibly being unaware of the issues later arising from gender and direct object mutation), is that some vocabulary items might well consist solely of a morphophoneme /L, S, N/, again foreshadowing Lieber (1983), who proposes that some grammatical mutations are prepositions consisting solely of a floating feature.³

Albrow (1966) makes a proposal very similar to Hamp (1951) in nature. Working in a Firthian framework (Firth, 1948, 1957, et inter ea), he proposes an analysis in terms of juncture prosodies (Firthian prosodies being reminiscent of an autosegment, in that they relate features of phonetic form to a unit or span of units in the phonology). He posits three juncture prosodies, reminiscent of Hamp's (1951) morphophonemes, for which he uses the labels ^S (SM), ^H (AM), and ^N (NM). Similar to Hamp (1951), Albrow's (1966) juncture prosodies are associated with the right edge of a trigger, such as *fy* /və^N/ 'my.GEN'.

Noting the averse effects of SM on fortis and lenis stops and its interaction with the oppositional fortis–lenis contrast between some radicals and SM forms, Albrow (1966) however goes further than Hamp (1951) and proposes that the word-initial fortis–lenis contrast is encoded by a pair of oppositional prosodies ^h (fortis) and ^{h̃} (lenis). Thus, lenis *brawd* 'brother' is underlyingly /^{h̃}prauð/ while fortis *pen* 'head' is underlyingly /^hpɛn/. This allows Albrow to argue for greater systematicity in the behaviour of the juncture prosodies triggering mutation. The prosody ^S has the effect of spirantisation in the context of ^{h̃}, but that of voicing in the context of ^h—or in other words, the combined prosody ^{Sh̃} is phonetically expounded as voiced spirantisation, while the combined prosody ^{Sh} is phonetically expounded as voicing only. Thus /i^{Sh̃}prauð/ 'his.GEN brother' will surface as [i vrauð], while /i^{Sh}pɛn/ 'his.GEN head' will surface as [i bɛn]. Similarly, ^H spirantises only in the context of ^h but can be said to be neutralised by ^{h̃}, while ^N nasalises regardless of whether it combines with ^h or ^{h̃}, the latter prosody retaining its fortis/lenis effect more-or-less independently.

³ Zwicky (1984), among other criticisms, voices concern over this possibility. While he proposes that the same mutation is triggered by a case feature on the target, rather than an adjacent "empty" preposition, this ultimately leaves him in the same position though: the exponent of his accusative feature must be some sort of floating feature in Welsh, where other languages would have either zero exponence or a full-flung affix.

In contrast to [Hamp \(1951\)](#) (and also [Oftedal, 1962](#), who refines [Hamp's](#) proposal in some respects), who very clearly seems to conceptualise of his morphophonemes as an integral part of the underlying representation of the trigger, the Firthian paradigm [Albrow \(1966\)](#) operates in leaves the question of the prosodies' structural affiliation wide open. [Albrow \(1966\)](#) doesn't explicitly address the issue, but Firthian prosodies are not necessarily tied to phonological units only and may be associated with syntactic entities or constituents just as they may be associated with phonematic units. This conceptualisation of prosodies makes them much more similar to the diacritic features later employed by the accounts of [Awbery \(1973, 1975, 1976\)](#), [Ball and Müller \(1992\)](#), and others, discussed presently in §5.3, which assign some diacritic marking the mutation either in the lexicon or in the morphosyntax and then trigger a phonological rule effecting mutation in the context of that diacritic.

5.3 RULES & DIACRITICS

The first rule-based analysis of mutation in an [SPE](#)-style framework was developed by [Awbery \(1973, 1975, 1976\)](#). She proposes that the systematicity and regularity of the alternation must be accounted for by phonological rules. This, she argues, is further corroborated by the two observations that (i) each alternations involves the switching of the value of precisely one phonological feature, and (ii) the alternations must be inter-ordered with other phonological rules of Welsh.

[Awbery \(1975, pp. 16ff\)](#) proposes the following set of rules to capture each of the mutation patterns. Let us first turn to [SM](#), for which she suggests the set of rules in (134).

(134) SOFT MUTATION:

- $$\begin{array}{l}
 \text{(a)} \quad [-\text{voice}] \rightarrow [+ \text{voice}] / \# \left[\begin{array}{c} \text{---} \\ -\text{cont} \end{array} \right] \\
 \\
 \text{(b)} \quad [-\text{cont}] \rightarrow [+ \text{cont}] / \# \left[\begin{array}{c} +\text{voice} \\ \text{---} \\ -\text{nas} \\ -\text{liq} \end{array} \right]
 \end{array}$$

(cont'd overleaf)

$$(c) \quad [-\text{cont}] \rightarrow [+cont] / \# \left[\begin{array}{l} +\text{voice} \\ \text{---} \\ +\text{nas} \\ -\text{comp} \\ +\text{grave} \end{array} \right]$$

Rule (134a) changes /p, t, k, t̪, t̪^h/ to [b, d, g, l, r], assuming that both the liquids are [-cont], rule (134b) targets /b, d, g/ which become [v, ð, ʝ], and rule (134c) changes /m/ to [v]. Awbery assumes that an additional set of “realisational” rules are responsible for subsequently deleting [ʝ] and also for the other adjustments necessary, such as PoA in the spirantisations of /b, d, m/ and the denasalisation of /m/. These realisational rules, she submits, are justified especially because (for the most part) they are not specific to mutation contexts.

For NM and AM, Awbery suggests a single rule each, given here as (135) and (136) respectively.

(135) NASAL MUTATION:

$$[-\text{nas}] \rightarrow [+nas] / \# \left[\begin{array}{l} -\text{cont} \\ \text{---} \\ -\text{liq} \end{array} \right]$$

(136) ASPIRATE MUTATION:

$$[-\text{cont}] \rightarrow [+cont] / \# \left[\begin{array}{l} -\text{voice} \\ \text{---} \\ -\text{liq} \end{array} \right]$$

As with SM, rules (135) and (136) only maintain their simplicity in the context of a number of realisational rules taking care of differences in PoA.

Awbery assumes that the various mutation rules are conditioned directly by the relevant morphosyntactic environment. For instance, rules (134a–c) will apply to an item immediately preceded by the preposition *ar* ‘on’, to the leftmost item in a DP in direct object position, &c.

Awbery (1975) reasons that the rules in (134–136) cannot be the first set of phonological rules that apply, because they need to refer to redundant feature specifications such as $[\pm\text{voice}]$ which are lexically underspecified in segments such as word-initial central liquids (i.e. $[\text{r}/\text{r}^{\text{h}}]$) which, at least in native word stock, are always voiceless in this position. This means that the mutation rules must be ordered after (some) redundancy rules and be followed by realisational rules, so they must form an integral part of the phonological computation and cannot be extracted from this place. On the other hand, while contact mutation could take place based on syntactic surface structure, Awbery (1975) argues that grammatical mutation must refer to a stage in syntactic computation following reordering transformations but preceding other transformations such as those deleting certain material.

“Not all of [the relevant] syntactic environments are still available in surface structure, and so some of the phonological rules must reach back further in the derivation. A clear split between syntax and phonology does not seem to be justified.”

—Awbery (1975, p. 14)

Given the above situation, Awbery (1975) concludes that phonology must be able to access syntactic information to a degree much deeper than thought at the time, much beyond the then commonly accepted view named the Principle of Superficial Constraints by Zwicky (1969), which allowed access only to certain aspect of surface structure, and certainly an outright rejection of strict modularity.

Apart from the modularity concerns, the direct conditioning by a morphosyntactic environment also leads to an undesirable proliferation of rules. Consider rule (135), repeated in (137) with the inclusion of a list of the triggering environments.

(137) NASAL MUTATION:

$$[-\text{nas}] \rightarrow [+nas] / \# \left[\begin{array}{l} -\text{cont} \\ \text{---} \\ -\text{liq} \end{array} \right] \left\{ \begin{array}{l} \text{following a 1SG.GEN determiner} \\ \text{following the preposition } yn \text{ 'in'} \\ \text{on nouns denoting years or days:} \\ \quad \text{i) following the numeral 5} \\ \quad \text{ii) following numerals } \geq 7 \end{array} \right.$$

Following the expansion metric in Chomsky and Halle (1968), (137) is equivalent to (at least) 4 underlying rules when we expand the environments. Our ability to denote them together is more due to notational sugar than to any insight that there is a unity of process/singular mental

entity corresponding to rule (137) in the grammar. Multiplying the rules in (134–136) by the counts of conditioning environments (cf. §4.10), we have something on the order of approximately 245 rules when we expand all the environments for each rule.⁴ This is evidently uneconomical. Moreover, given such a large spread of expanded environments, and the potential for each of these to diachronically change individually, the homogeneity of process found in mutation is somewhat surprising.

Although they state themselves that their aim is to explore different possibilities rather than to develop a definite account, Ball and Müller (1992) by and large adopt the rule based approach of Awbery (1973, 1975, 1976). They further develop the rule-based account in two principal ways however.

First, they refine this in several respects and add much detail to deal with the finer differentiation of MM, LSM, contextually restricted mutation (e.g. *blynedd* ‘years’ after numerals), rule ordering effects, and so forth.

Second, and perhaps more importantly in the fact of the considerations of modularity as well as the rule explosion through expansion of environments, they introduce the idea that the lexicon and syntax may assign features such as [+→SM] and [+SM]. Features of the type [+→SM] are associated lexically with mutation triggers and result in the syntax assigning the feature [+SM] to a string adjacent word to its right. Mutation features such as [+SM] can also potentially be assigned by non-lexically triggered syntactic rules, say to a direct object. Crucially, these features are then part of the syntactic surface structure. The consequence of this is two fold. First of all, phonology no longer has to refer to stages of syntactic derivation preceding surface structure. For instance, it matters not whether the triggering context is removed by deletion or another type of transformation, as long as the mutation feature has been assigned beforehand it will be present in the right context at SS. This restores the mild sense of modularity encompassed by such formulations as the Principle of Superficial Constraints. Secondly, most of the rules required for mutation now have only a small set of conditioning environments. For instance, rules (134a–134c) apply to words with a feature [+SM] and/or a feature [+LSM], while an additional rule unmutating [l, r] applies only in the context of [+LSM]. Rule (135) applies to words marked [+NM], and rule

⁴ Treating LSM and MM as SM for simplicity (Awbery does not differentiate them), we have $78 \times 3 = 234$ for SM, $7 \times 1 = 7$ for AM and $4 \times 1 = 4$ for NM.

(136) applies to words marked [+AM]. Mixed Mutation on the other hand, is effected by marking a target word with both [+SM, +AM], triggering both sets of rules. Rule-ordering ensures that the AM rules apply first in this situation.

Ball and Müller (1992) thus greatly streamline the rule-based approach to mutation and bring it in line with the common interface assumptions of the time, though of course it still falls short of strict modularity in that even syntactic information present at SS should not be accessible to phonology. Alternatively, we could understand the mutation features as proper module-transcending diacritics, which is how they are treated in most subsequent accounts. This provides no remedy however: at best it introduces an unfalsifiable domain-general information type without having properly rejected the possibility that the information conveyed by them need not persevere across the interface, at worst it is simply a device that hides the fact we are indirectly still referring to syntactic contexts which we would normally assume the phonology should not be able to refer to. The latter criticism is perhaps less strong but still highly relevant even if these features do not transcend the module boundary: as long as such diacritic features in the morphosyntax play a role anywhere outside the morphosyntax, they serve to expone something that generally is not present at the interface stage of computation. This is highly problematic because the ad-hocness of these diacritics means that, in principle, any morphosyntactic information whatsoever could be carried to the interface. For instance, we are quite certain that syntactic movement is invisible to phonology. Yet we could assign a diacritic feature [+X] to the head of constituents that undergo movement, and then have some phonological rule voice the initial segment of any item marked [+X], essentially creating a phonological rule that is triggered by syntactic movement.

The diacritic approach also fails to derive the adjacency condition of the Trigger Constraint in (109). One problem is that we can arbitrarily assign such features in syntactic contexts without an over trigger. This is perhaps not a great wrong depending on our understanding of grammatical mutation, but is also what gives rise to the ad-hocness critique above. On another front, the diacritic approach easily allows for remote triggers. For instance we could have a rule assigning the feature [+SM] to any noun c-commanded by a 2SG.GEN determiner, no matter the intervening

material that would normally block the mutation. It could be argued that this applies in the case of feminine gender mutation, where any adjective modifying a singular feminine noun undergoes mutation. However, given that we already know that the feature bundle [+fem, -pl] itself percolates within the DP, there will always already be a feature configuration present locally that is associated with triggering the feminine gender mutation, so why should we have an ad-hoc rule assigning an ad-hoc feature to duplicate this work? Lastly, a node should in principle be able to pick up a mutation feature from an adjacent category preceding a movement operation, either one including the node itself or the node from which it obtained the mutation feature. This should result in a form of “mutation stranding”, another phenomenon that has never been observed and is wholly incompatible with the Trigger Constraint.

5.4 LEXICAL PHONOLOGY AND READJUSTMENT

Kibre (1997) further refines the “rules & diacritics” approach of Awbery (1973, 1975, 1976) and Ball and Müller (1992). Working within Lexical Phonology (Mohanan, 1982, 1986; Kiparsky, 1982b, 1985), he places mutation in the lexical rule component of the phonology. In the dichotomy of rule components assumed in Lexical Phonology, one set of rules, *lexical rules*, apply to items in the lexicon on an individuistic basis and are thus assumed to allow morphological conditioning, while the other set, *postlexical rules*, apply later and whenever their structural description is met, i.e. they are sensitive only to phonological structure and not to morpho-lexical information.

Kibre (1997) proposes that triggers carry a morphological diacritic marking the type of mutation they trigger, e.g. *ar* /ar_{LEN}/ ‘on’ is an SM trigger, *ei* /i_{ASP}/ ‘D.3SGF.POSS’ is an AM trigger, and *yn* /ən_{NAS}/ ‘in’ is an NM trigger. The lexical rules responsible for mutation are triggered by a diacritic on a preceding word. This can be seen for instance in Kibre’s (1997) AM rule, given in (138).

(138) ASPIRATE MUTATION:

$$[-\text{voice}] \rightarrow [+cont] / \text{ASP} [_____]$$

Similarly, *NM* is captured by a rule sensitive to the *NAS* diacritic, as shown in (139).

(139) NASAL MUTATION:

$$C \rightarrow [+nas] / \text{NAS} [____]$$

Kibre (1997, p. 32) proposes that the mutation rules function in conjunction with a set of structure preservation rules, which specifically ban the segment [ʏ], nasal continuants, and laterals with non-agreeing sonorant and voicing features (the latter militating against derived [l̥]). This is what allows Kibre's rules to be significantly simpler in terms of their structural description compared to those of Awbery and Ball and Müller.

When it comes to *SM*, Kibre (1997, pp. 62ff) proposes that the unified behaviour of process in spite of requiring several separate rules is best captured by a device he terms a *rule block*. He conceptualises rule blocks as consisting of an internally ordered set of rules that outwardly behave as though they were a single rule. Rule blocks are monolithically conditioned by a structural environment. In the case of *SM*, the conditioning environment for the rule block is /LEN][____. Kibre's *SM* rule block is shown in (140).

(140) SOFT MUTATION RULE BLOCK:

Applies in the environment /LEN][____, in the order listed.

$$(a) \quad \begin{array}{c} C \\ \left[\begin{array}{l} +\text{voice} \\ / - \text{cor}/ \end{array} \right] \rightarrow \left[\begin{array}{l} +\text{cor} \\ / - \text{nas}/ \end{array} \right] \end{array}$$

$$(b) \quad g \rightarrow \emptyset$$

$$(c) \quad \begin{array}{c} C \\ \left[\begin{array}{l} +\text{cont} \\ -\text{voice} \end{array} \right] \rightarrow \left[+\text{voice} \right] \end{array}$$

$$(d) \quad \begin{array}{c} C \\ \left[\left\{ \begin{array}{l} +\text{cont}, +\text{son} \\ +\text{lateral} \end{array} \right\} \right] \rightarrow \left[\begin{array}{l} +\text{voice} \\ +\text{son} \end{array} \right] \end{array}$$

The rules in (140) depart significantly from the approach taken by Awbery (1975) and followed by Ball and Müller (1992). Here rule (140a) deals only with the voiced stops, spirantising them and also adjusting non-coronals from nasal to oral. Rule (140b) deletes /g/ directly, rather than leaving this to a later realisational rule. Rule (140c) voices only the voiceless stops, and is separate from rule (140d) which voices both sonorant continuants (i.e. approximants) and the laterals (i.e. this is really two rules undergoing an expansion), both of which are adjusted to voiced sonorants.

It is this latter split of rules (140c) and (140d) that allows Kibre to deal with LSM in a much better way than, say, Ball and Müller (1992) who had a separate rule to undo the mutation of the liquids in this context. Rather than undoing the previous rule, Kibre (1997, p. 63) proposes a “lenition blocking rule”, given here in (141).

(141) SOFT MUTATION BLOCKING RULE:

$$\left[\begin{array}{c} \text{C} \\ \left\{ \begin{array}{l} +\text{cont, +son} \\ +\text{lateral} \end{array} \right\} \end{array} \right] \rightarrow \quad / \text{LIM}] [____$$

The blank structural description of the rule essentially encodes a “do nothing rule” here. Rule (141) works in conjunction with the Elsewhere Condition. Kibre (1997) argues that, because (141) refers to a proper subset of the rule block (140), iff a trigger is marked for both LEN and LIM, then rule (141) will take precedence. While this seems coherent, it is not quite clear why, given the grammatically monolithic status of rule blocks, the remaining rules in that block should still apply. Nonetheless, the approach conceptually at least captures the idea that LSM is about the non-applicability of the alternation to the liquids, something the earlier accounts did not capture.

Similar to triggers specified with the two diacritics LEN and LIM triggering LSM, MM is triggered by items specified with the two features LEN and ASP. Extrinsic ordering of (138) before (140) ensures that voiceless stops are voiced first. As with LSM, we have to tacitly assume that this pre-empts application of the sub-rule in (140a), rather than the whole rule block and also rather than both applying, since the latter would lead to a chain shift and predict /p, t, k/ surfacing as [v, ð, ø], a technical issue not explicitly addressed by Kibre. As Kibre (1997) points out, the

combinatory approach of triggers, while perhaps predicting the possibility of unattested types of mixed mutation (e.g. **NM+AM**), is what allows for the actual diachronic development of modern **MM**: In Middle Welsh, the **MM** triggering negative complementisers *nid* and *nad* triggered **SM** in relative clauses, but **AM** elsewhere; **MM** arose from the merger of these two conditions (Evans, 1964, p. 61).

Because Kibre's (1997) diacritics are a lexical feature of the triggers, rather than being assigned to the target as in Ball and Müller (1992), his account makes two crucial predictions which, apart from Hamp (1951), Albrow (1966), Lieber (1983) and my own account, all the other accounts discussed here fail to make. First, they predict that every mutation must correspond to a lexical item, and thus be the spellout of some morphosyntactic terminal note. This means that grammatical mutation also must be the spellout of an actual morphosyntactic entity such as [**ACC**] for direct object mutation and [+fem, -pl] for feminine gender mutation, as discussed in §4.8.2. Second, it correctly derives the Trigger Constraint in (109), since the environmental description of the rules would not be met if there wasn't exactly one domain boundary between the trigger and the target.

Pyatt (1997), assuming a **DM** architecture (cf. §2.3), makes a proposal not dissimilar in nature to Kibre (1997) in terms of the phonological implementation. Pyatt (1997) proposes that mutation triggers are marked with a morphological diacritic such as {**L**}, {**N**}, {**S**}, {**M**}, {**H**} (which trigger **SM**, **NM**, **AM**, **MM** and **PVA**, respectively). Mutation itself is effected by a set of phonological readjustment rules sensitive to these morphological diacritics, such as the block of **SM** readjustment rules in (142) (from Pyatt, 1997, p. 260).

(142) **SOFT MUTATION READJUSTMENT** (crucially ordered):

- | | | | |
|-------|-------------------------|---|---------------------------|
| (i) | $m \rightarrow v$ | / | M [# _____ |
| (ii) | [+son, -nas] → [-s.g.] | | |
| (iii) | [-son, -s.g.] → [+cont] | | [{ L }] |
| (iv) | [-son, -cont] → [-s.g.] | | |

The block of ordered readjustment rules in (142) is activated whenever a morpheme **M** carrying the morphological feature {**L**} precedes the vocabulary item that has been inserted. Similar to the **SM** rules of other accounts,

(142) is divided into a number of rules targeting the different changes applied to various underlying natural classes of segments. Rule (142i) changes /m/ to [v], (142ii) changes /t, t^h/ to [l, r], (142iii) changes /b, d, g/ to [v, ð, ɣ], and finally (142iv) changes /p, t, k/ to [b, d, g].

As with all the other rule and diacritic accounts place adjustments and the deletion of [ɣ] are left up to later rules manifesting some kind of repair mechanism. For this, Pyatt (1997) adopts Calabrese's (1993; 1995) Marking Statement framework, which posits that permitted segment inventories and processes are restricted by a set of universally endowed phonological markedness constraints, a subset of which is active in any single language and determines the specific limitations at hand. This goes hand in hand with repairs of disallowed structures, taking care of the adjustments in Welsh necessary to avoid the output of non-phonemic segments. Not only does this take care of the adjustment/repair rules of previous accounts, but Pyatt (1997, Ch. 3) further derives from Calabrese's (1993; 1995) framework the constraint that phonological readjustment rules can only operate on contrastive features, which for the first time limits the potential power of the kind of rules effecting mutation, and rules out "crazy mutations" such as a pattern in which fortis stops surface as ejectives (Pyatt, 1997, p. 196).

There are two potential issues with the marking statement account however. First, the fortis nasals [m^h, n^h, ŋ^h] only exhibit surface contrast in mutation contexts, and there is otherwise no evidence for an underlying nasal fortis/lenis contrast in the lexicon. This means that the set of active rules cannot be determined solely by the contrastive relationship of segments established across the lexicon (i.e., the vocabulary list). Secondly, changing continuancy on [d] gives rise to the intermediate segment [z] before being repaired to [ð]. This is problematic in dialects of South Welsh that have imported underlying /z/ in recent loans from English such as sŵ [zu:] 'zoo': this segment is now lexically contrastive and the marking statement that disallows [z] must be deactivated in these dialects, predicting that the SM reflex of underlying /d/ in these dialects should indeed be [z], which is not the case.⁵

⁵ In a way, this is also a problem for the specific sets of rules adopted by the other accounts discussed in this section, where additional modifications must be made to account for the issue with [z]-bearing dialects. However, while the adjustment will be arbitrary in any case, only Pyatt (1997) predicts that without some additional mechanism or pressure on the learner, the dialects should diverge in the mutation outputs.

Pyatt (1997) also further develops Ball and Müller's (1992) idea that the mutation diacritics may be assigned/manipulated by morphological rules. Pyatt (1997) proposes that in the Celtic languages, there is a requirement that every terminal carries some mutation feature before vocabulary insertion takes place. Where an item does not trigger mutation, she suggests, it is assigned an additional non-triggering default diacritic {z}. Now, while some triggers may be specified with a mutation diacritic in the Formative List (meaning they will enter the morphosyntactic derivation with that feature), the vast majority of items (both triggers and non-triggers) are not specified with a mutation diacritic, but assigned it at MS. For instance, she observes that a large number of what Pyatt terms "conjunctive prepositions" (and which she assigns the feature [+conj]) trigger mutation, though some do not (e.g. *rhwng* 'between'). The vast majority of the mutation-triggering prepositions in turn trigger SM, though some trigger AM (e.g. *â* 'with') and one triggers NM (namely *yn* 'in'). Pyatt (1997, pp. 128ff) proposes the following: non-trigger prepositions such as *rhwng* 'between' are specified in the Formative List with the diacritic {z}, AM triggering prepositions such as *â* 'with' are specified with the diacritic {s} in the Formative List, and NM trigger *yn* 'in' is specified with the diacritic {n} in the Formative List. Thus, these three groups or prepositions enter the derivation with a mutation diacritic specification in-situ. The "regular" SM triggering items however have no underlying specification for any mutation, and rather receive their {L} diacritic from a morphological rule such as that in (143).

(143) [P, +conj] → [{L}]

To avoid non-SM triggering prepositions such as *â* being assigned {L} in addition to {s}, Pyatt (1997) proposes that terminals may be specified only with a single mutation diacritic, with the effect of blocking rules such as (143) where the underlying item is already specified with a mutation diacritic. This is what allows Pyatt to have many more generalised diacritic assignment rules as opposed to previous accounts, and she essentially claims that in most cases where a common morphosyntactic feature can be found between two or more triggers of the same mutation pattern, such a rule applies. Exceptions can always be accounted for by underlyingly specifying the divergent triggers with an alternate diacritic. All terminals that are not assigned a diacritic through such a rule are subject to a default

diacritic assignment rule which simply assigns {z} to any terminal not assigned a mutation diacritic either underlyingly or by any other rule.

The benefit of this approach is that it significantly lowers the number of items that are “lexically” specified as mutation triggers. Though no precise enumerations are available, we might estimate that it reduces the number of required underlying specifications by just over half, though of course at the expense of memorising a number of rules. On the flip side, it leads to the proliferation of diacritics both in distribution and in types.

In terms of distribution, the fact that every terminal must be specified with some diacritic or other during the derivation seems to create a parallel computational system at MS that is vastly more elaborate than what might seem warranted or is otherwise attested cross-linguistically; a cynic could almost be tempted to speak of an additional level of mutation representation.

In terms of proliferation of types, the account requires the presence of the non-mutation diacritic {z}, the sole purpose of which is the blocking of diacritic assignment rules—a very strange beast indeed, which never receives exponence and which carries no informational content whatever. Since terminals can only carry one diacritic, any variant mutation pattern such as LSM and MM must also come with its own diacritic; these mutations cannot possibly reflect a combination of other diacritics as in Ball and Müller (1992) and Kibre (1997), thus significantly increasing the type count of diacritics.

One might point out an insightful inconsistency here: the only exception to the single-diacritic constraint in Pyatt (1997) is the combination of the diacritics {s} (AM) and {h} (PVA). We have seen already in §4.7 that there is a double dissociation between AM and PVA: some items might trigger both, but some trigger only AM and others only PVA. However, triggers in these three categories together are more numerous than LSM and MM triggers respectively, which seems to motivate Pyatt (1997) here to analyse “combined” AM/PVA triggers as indeed featuring both {s} and {h}. Whether we’d adopt this analysis or instead propose a third diacritic, the possibility of this inconsistency itself arises from the morphological status of the single-diacritic constraint: it would be quite inconsistent to assume that universal grammar is endowed with some knowledge grouping together a specific set of *language-specific, ad-hoc diacritic fea-*

tures, thus it is implausible that they form some kind of inherent category. This means that the single-diacritic constraint must actually be a set of language-specific morphotactic constraints, one for each pair of mutation diacritics (for some reason with the exception of {s} and {H}).⁶ Not only is this yet another element the learner must acquire and memorise, but it might also lead us to expect that there might exist variation in terms of which specific constraints a speaker has here: just like all Welsh speakers miss the *[{s},{H}] constraint, we might expect levelling by loss of the *[{s},{H}] -exception, or in the reverse the diachronic loss of another constraint in some dialect (e.g. *[{N},{L}], which should give rise to new types of mixed mutations due to the assignment rules not being blocked wherever one of the constraints is absent. This never appears to be the case, however.

Pyatt (1997) argues that the possibility to formulate morphological diacritic assignment rules such as that in (143) makes the readjustment analysis significantly more efficient than what could be realised in a floating feature account such as Lieber (1983) (discussed shortly), which posits that mutation is effected by a floating phonological feature at the right edge of a trigger. Pyatt reasons that a floating feature analysis implies that all the items which are assigned a diacritic by her rules have to be underlyingly specified with the the floating phonological feature at the right edge, thus increasing the amount of information that must be memorised. However, while this may have been the case in many of the frameworks in which such proposals have previously been formulated, in the DM framework adopted by Pyatt and myself, this objection is not valid. In DM, wherever a diacritic can be assigned to a terminal based on a specific set of morphosyntactic features either on that terminal or an adjacent head, it is also in principle possible to spell out that feature combination as a separate morphological piece. This is precisely what the process of fission, discussed in §2.3.2, does. For instance, the rule in (143) inserting an {L} diacritic into a terminal containing the feature combination [P, +conj], could be reanalysed instead as a morphotactic constraint * [P, +conj] leading to the fission of the terminal containing [P, +conj] into two terminals, one carrying [P] and the other [+conj]. The [+conj]-terminal can sub-

⁶ For Welsh, this means that we have *at least* $\binom{7}{2} - 1 = 20$ mutation-specific morphotactic constraints, increasing in dialects with more trigger variation requiring more diacritic types.

sequently be spelled out as a floating feature. Thus, there is no inherent reason that readjustment analyses should be more efficient in this way than floating feature analyses, and in many instances I will in fact go on to propose precisely such an analysis (see §§6.8–6.9).

In terms of modularity, neither Kibre's (1997) nor Pyatt's (1997) account are satisfactory. In §2.3.3 I have already argued extensively against phonological readjustment as a component of DM. In spite of all its advantages over previous rule and diacritic accounts then, the crucial reliance of Pyatt's (1997) account on the phonological readjustment component means that it depends on a highly questionable and undesirable theoretical mechanism and is ultimately incompatible with strict modularity. In a similar way to phonological readjustment, the lexical rule component of Lexical Phonology in which Kibre's (1997) mutation rules take place is incompatible with the notion of strict modularity, because it involves a dedicated phonological computation device that can see and respond to non-phonological information. In a strictly modular world, neither lexical nor phonological readjustment rules of the kinds we see in these two accounts should exist.

5.5 TARGET SUPPLETION ACCOUNTS

In all of the rule-based models of mutation discussed in §§5.3–5.4, and depending on interpretation possibly also in the earlier accounts discussed in §5.2, the eventual surface form of a mutation target is phonologically derived in the context of a trigger specified with some diacritic feature. One possible alternative to this type of account is the possibility that all the various surface forms of items undergoing mutation are stored lexically, i.e. that they are allomorphs similar in nature to English suppletive *go/went*. This possibility seems to have been first entertained by Boyce et al. (1987), who found significant word–word priming between radical and mutated forms in Welsh comparable to that usually found in affixal morphology (e.g. English *pour–pouring–poured*), rather than the behaviour of less-phonologically transparent, non-concatenative alternations (such as the English irregular past tenses in e.g. *shake–shook*). Importantly, they found that priming was ambidirectional. That is, radicals had a comparable priming effect for mutated forms than mutated forms had

for radicals. [Boyce et al. \(1987\)](#) concluded that this symmetry is incompatible in models where mutated forms link back to a singular lexical entry in form of the radical, making mapping of radicals direct but that of mutated forms indirect. Consequently they propose that the lexicon is split into a morphological and a lexical level, where the morphological level contains all the surface forms (including the radicals) and these link back, possibly via an intermediary node, to a single lexical entry containing non-phonological/non-morphological information. While they were aware of [Lieber's \(1983; 1984\)](#) work on an autosegmental account of ICM in Welsh and Fula, and conceded that such accounts would in principle be compatible with their findings, they concluded that conversely to [Lieber's](#) success with Fula, [Lieber's](#) approach would ultimately not be able to account for the entire range of mutations in Welsh and therefore be insufficient. However, they do suggest that it might be possible that the two-level lexical organisation does resemble the autosegmental approach to a degree, in that perhaps the lexical level stores a form underspecified for features that vary across the mutation, which are then stored at the morphological level.

More recently, suppletion accounts have been proposed by [Green \(2006, 2007\)](#) and [Hannahs \(2013a,b\)](#) (and by [Stewart, 2004](#) for Scottish Gaelic). [Green \(2006, 2007\)](#), who like [Pyatt \(1997\)](#) attempts to present a relatively unified account of mutation across all of the Celtic languages, takes the view that mutation is entirely non-phonological, i.e. that there is no active phonological alternation involved, whether in the form of a rule, some morphophoneme, or floating features. [Green](#) sets out a number of arguments for why he believes mutation cannot be phonological, and must instead be accounted for by suppletive allomorphy.

One of his principal arguments is that all derivational accounts rely on some sort of adjacency, but that there are a number of phenomena in Irish that appear to violate adjacency. I have discussed these extensively in §4.8.1, where I also showed that the situation is actually much more fine grained than [Green](#) recognises and reasoned that his objections on these ground are not entirely valid and unable to arbitrate between different proposals. Crucially, I have shown in §4.8.1 that [Green's \(2006; 2007\)](#) own model is unable to account for the issues he raises in relation to adjacency.

Another argument put forth by Green is that treating mutation as phonological appears to produce what we may term a harmonic (or optimality) paradox in Manx. Manx has both a “lenition”-type ICM pattern and true intervocalic lenition, but the two alternations exhibit a different pattern, as shown in Table 19. Under ICM Lenition, Manx plosives are spirantised or debuccalised but retain their fortis–lenis contrast, while intervocalic lenition involves loss of fortisness in addition to spirantisation and no debuccalisation. Intervocalic lenition also does not target [m, f] which spirantise and are deleted respectively under ICM, but it does spirantise, debuccalise or delete [x], which remains unaffected by ICM in Manx. Green (2007, pp. 80–86) argues that, if ICM were part of phonology, then the outputs of ICM would need to be more harmonic under certain conditions than the respective radicals. He then reasons that, while in principle this can be done for ICM, the disjoint pattern of ICM and intervocalic lenition in Manx contradict such an analysis. This is because they firstly show that output segments such as [ð, ɣ] which do not occur underlyingly are available on the surface, meaning that there should be no reason for debuccalisation under ICM. According to Green, it is implausible to assume that ICM is structure preserving while true lenition is not, because ICM of [d, g] also yields non-structure-preserving [ɣ]. Secondly, he argues that the disjoint output trajectories (e.g. voice under intervocalic lenition, retain voicelessness under ICM) induce ranking paradoxes, meaning that it cannot be the case that both phenomena are phonologically optimising in the same grammar.

Green’s discussion of the Manx data however entirely neglects consideration of the different structural environments of ICM and intervocalic lenition. ICM Lenition applies only word-initially, while intervocalic lenition never applies word-initially. It seems that neither process is structure preserving in Manx, but given that the different outputs are conditioned by different environments, this is not problematic. For instance, many languages have intervocalic voicing processes without showing voicing word-initially. The occurrence of the segment [ð] may well be restricted to the intervocalic context, and such positional restrictions of segments are well-attested cross-linguistically. This makes it plausible that word-initial segments which hypothetically should surface as [θ, ð] undergo debuccalisation, while the same input segments do not undergo debuccalisation

| RADICAL | ICM LENITION | TRUE LENITION |
|--------------------|----------------------|---------------|
| p | f | b~v |
| t ^(j) | h~x ^(j) | d~ð |
| k ^(j) | h~x ^(j) | g~ɣ |
| b | w~v | v |
| d / d ^j | ɣ / j | ð |
| g / g ^j | ɣ / j | ɣ |
| m | w~v | |
| f | (deleted) | |
| s / s ^j | h / h~x ^j | ð~z |
| x | | ɣ~h~(deleted) |

Table 19: Manx ICM Lenition pattern versus Manx V_V lenition.
Based on Green (2007, pp. 78, 80).

in the intervocalic context. There is consequently no inherent contradiction in a phonological treatment of both processes in the same grammar; they may both lead to more harmonising outputs *in their respective environments*. Ultimately, just because both phenomena have been termed “lenition” does not mean that there need be any identity of process.

Yet another issue that Green (2006, 2007) raises (as do others, e.g. Zwicky, 1984) is that analyses of mutation as synchronically derived alternations appear to require phonologically empty triggering morphemes for which there is no evidence other than the mutations themselves. Welsh feminine gender mutation has been named previously as *suspect* under these criteria by Pyatt (1997), and Green (2007, pp. 91ff) alludes to a related phenomenon in Irish. In Irish, adjectives modifying a nominative or accusative feminine singular noun undergo Lenition (a mutation pattern related to SM, and very similar to the Manx ICM Lenition pattern in Table 19). Much like in Welsh, adjectives modifying masculine singular nouns do not show mutation. However, unlike Welsh, adjectives modifying plural nouns also undergo Lenition, but only if the noun ends in a palatalised consonant. Green (2007, p. 92) argues that it is “virtually impossible to conceive of a functional element that could be found in

the [L]enition environments” described above. However, we have seen already in our survey in Ch. 4 that Welsh occasionally exhibits explicit number and gender morphology on adjectives (e.g. *gwyn* ‘white.SG.M’, *gwen* ‘white.SG.F’, *gwynion* ‘white.PL’). These morphological pieces must be the exponence of some morphosyntactic terminal, thus lending strong evidence to the hypothesis that the mutations are triggered by terminals in the morphosyntax which also host overt number and gender morphology on adjectives. Irish similarly shows overt agreement morphology on adjectives. For instance *imníoch* ‘anxious’ takes the regular plural suffix *-a* (i.e. *imníocha* ‘anxious.PL’) in the nominative (and in the genitive on nouns with a so-called *strong plural*). We also see an overt suffix *-e* in the genitive singular feminine, i.e. *imníoch* ‘anxious.GEN.SG.F’. The suffix does not appear in the masculine, plural, or any other case, thus seems to expone a terminal containing all three of these features. In any case, these morphemes presuppose that there is a terminal facilitating this agreement and available to be spelled out as one of the suffixes, quite independent of such assumptions as the universal presence of a categorising head *a* or the like in DM. The only assumption under which positing the presence of the triggering morphemes here could be argued to be fictitious is one where terminals are not present in the morphosyntax unless they actually receive a phonologically overt, discrete concatenative piece in the spellout, hardly a view that anyone could maintain amidst any current morphosyntactic theories. Green’s inclusion here of the special case where Lenition is triggered on adjectives modifying a masculine plural noun ending in a palatalised consonant is somewhat misleading: while under all the other conditions any adjective with the right agreement features will undergo Lenition, even if it is several positions removed from the noun (just as in Welsh), the palatal-triggered case requires direct adjacency to the noun. That is, in the phrase *fir mhóra dubha* ‘big dark men’, the adjective *móra* ‘big.PL’ undergoes Lenition, but *dubha* ‘black.PL’ appears as the radical, compared to e.g. *bean mhór dhubh* ‘a big dark woman’ where both *mór* and *dubh* undergo Lenition (data from Green, 2007, p. 92). This last case then appears to be conditioned directly by string adjacency to a suitable triggering noun, and we are not at all in need of finding some hidden morpheme to explain the mutation.

Other cases Green (2007) puts forth in this respect are Direct Object Mutation in Welsh, already discussed together with Feminine Gender Mutation in §4.8.2, and the Lenition of definite nouns functioning as a genitive modifier of other nouns, e.g. *muintir Sheáin* ‘Seán’s family’. Here too, Green argues that we have no evidence of a morpheme realising the genitival Lenition on *Seán* ‘Seán’ unless we presuppose the presence of a segmentless preposition akin to English *of* in these cases. In fact, English also shows the genitival marker *’s* as an exponent on such nouns, and in Welsh we often find an overt definite determiner *y* ‘the’ intervening, e.g. in *Comisiynydd y Gymraeg* ‘Welsh Language Commissioner’ (lit. ‘Commissioner the Welsh Language’), making it plausible that the genitival modifier in such clauses is a full DP. This is further corroborated by the fact that such modifiers consistently receive a semantic interpretation as definites. On the common presumption that definiteness is hosted on D, the terminal must be present in the morphosyntax, suggesting further that the Lenition on *Seán* in *muintir Sheáin* may well expone a genitive definite determiner D, if not some preposition such as English *of*.

Finally, Green (2006, 2007) argues that variation in mutation speaks against active derivation and is difficult to account for in derivational accounts, especially those using floating features. His examples here include Welsh MM as well as Mixed Mutation in Ulster Irish, which is not dissimilar to Welsh MM and involves a blend of Lenition on fortis stops and Eclipsis elsewhere, and a few other examples where triggers only cause mutations under specific morphosyntactic conditions. For instance, the Irish preposition *thar* ‘over’ does not cause Lenition on indefinite nouns, the numerals 3–6 don’t cause Lenition on nouns that exceptionally appear in the plural after the numeral (typically, Irish nouns appear in the singular when they are counted, just as in Welsh), Irish consonant-initial non-autonomous past tense verbs are Lenited but vowel-initial ones receive a prefix *d’* unless another pre-verbal particle is present, the Irish preposition *le* ‘with’ inserts [h] on vowel-initial targets but (in some western dialects) inserts [n] instead on verbal nouns expressing telicity. What all these examples have in common is that they (a) can be characterised precisely by either their morphosyntactic or phonological environment, and (b) involve variation in the trigger, rather than the target. This mirrors what I have already discussed regarding variation in the Welsh mutation

system in §4.9, and what is predicted by the account I will propose. Nonetheless, Green (2006, 2007) is correct in asserting that these cases are problematic for the derivational accounts we have discussed so far, because they would in many of these cases have to posit some additional diacritic to account for the specific variant pattern. However, as we shall see in outline shortly, and as will become increasingly problematic when we turn to exceptional non-mutation in Ch. 7, a suppletion account which fully lists the alternating target forms, such as proposed by Green, does not actually fair any better in this regard, as it still relies on diacritics and additionally makes exactly the opposite prediction to what we find, namely that the locus of variation should be the target when in reality it is the trigger.

In summary then, while Green (2006, 2007) raises many important issues affecting any account of mutation, when considered in more detail these arguments do not appear to present a serious challenge to derivational accounts of mutation or give any reason to favour the suppletion hypothesis per se. Nonetheless, let us now briefly consider the actual analysis proposed by Green (2006, 2007). Green proposes that the alternation involved in mutation involves full lexical listing, in a way highly reminiscent of Bybee's (1988; 2001) usage-based model. In Green's model, the lexical entry for each potential mutation target (i.e. the vast majority of items in the lexicon of any ICM language) contains a list of all the possible variants, each annotated with a diacritic mark linking it to the relevant mutation grade reflected by that entry. For instance, for Green (2006, 2007) a word such as Welsh *tŷ* [ti:] 'house' would have a lexical entry similar to (144).⁷

- (144) *tŷ*:
- /ti:/_{RAD}
 - /di:/_{SM}
 - /ni:/_{NM}
 - /θi:/_{AM}

In addition to the lexical listing of alternants in (144), Green proposes that mutation triggers are marked with a diacritic feature such as [+SM],

⁷ If we take into account the various deviant patterns, such as LSM, MM, AM with PVA, and AM without PVA, we actually require numerous additional entries in addition to those shown.

which subcategorises for a complement with the correct mutation grade. This subcategorisation process is conceptualised as a requirement for a complement to agree in the mutation grade with the diacritic of its syntactic governor (a mechanism that is actually problematic under standard assumptions about syntactic government, as discussed already in §4.8.2). For instance, Green (2007, p. 116) proposes that the Welsh feminine singular determiner *y(r)* is marked with a diacritic feature [+SM], and thus will select the nominal complement “/di:/SM” from the lexical entry in (144). Similar to Pyatt’s (1997) default {z} diacritic, items that do not trigger mutation are marked with a diacritic [+RAD] in Green’s system. This is necessary to ensure that only the radical form can be selected in that context, since where a syntactic governor doesn’t bear such a diacritic even the “wrong” form would otherwise not lead to an agreement violation.

Remarkably, Green (2006, 2007) proposes that this agreement requirement is not part of the (morpho-)syntactic component, but rather is enforced by a constraint within the phonology, MUTATIONAGREEMENT (MUTAGREE). Assuming an OT architecture with multiple inputs, MUTAGREE assigns a violation whenever the selected form does not agree in mutation grade with its syntactic governor. For illustration, consider the selection of RAD and SM forms for masculine noun *tʲ* ‘house’ and the feminine noun *ton* ‘wave’ following the definite article in Tableaux (4.8.2) and (146), respectively (cf. Green, 2007, p. 116).

(145) Selection of radical after masculine singular article:

| $\emptyset_{+RAD} \{tʲ:_{RAD}, di:_{SM}, \dots\}$ | MUTAGREE | IDENT(cont) |
|---|----------|-------------|
| $\text{☞ } \emptyset tʲ:$ | | |
| $\emptyset di:$ | *! | |

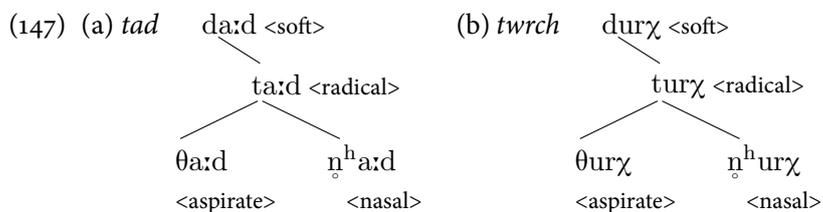
(146) Selection of SM grade after feminine singular article:

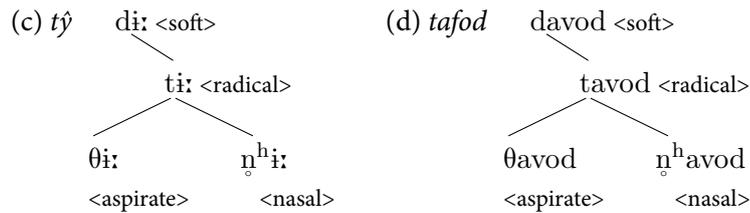
| $\emptyset_{+SM} \{tɔn_{RAD}, dɔn_{SM}, \dots\}$ | MUTAGREE | IDENT(cont) |
|--|----------|-------------|
| $\emptyset tɔn$ | *! | |
| $\text{☞ } \emptyset dɔn$ | | |

Because MUTAGREE selects between different input forms, none of the lexically listed candidates will involve violations of identity constraints. This, it is argued, is what resolves the apparent paradoxical lenition behaviour involved in Manx ICM Lenition and Manx intervocalic lenition,

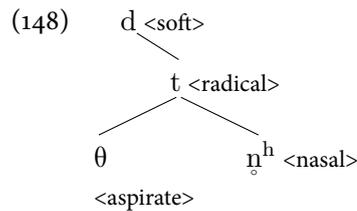
though as I have already argued this may plausibly be analysed as a positional effect even in a standard OT analysis. It is also wholly unproblematic if we were to assume a model where the correct mutation form is selected *before* phonology even takes place, as for instance in DM. The reason that MUTAGREE must be phonological for Green is that in Irish coronal-final mutation triggers fail to trigger mutation on coronal-initial targets. Green (2006, 2007) analyses this as a constraint CORHOM which outranks MUTAGREE, thereby overruling selection of the “correct” allomorph when phonological considerations outweigh agreement in the mutation grade. Green’s analysis of this fact builds on Ní Choisáin (1991), who, working in a floating feature paradigm, has similarly analysed this as a configuration that triggers place-sharing, and reasons that as a consequence mutation cannot take place. Notably, there are no other cases in Green’s account where phonology seems to overrule mutation. Clearly, integrating constraints referring to not just module-transcending diacritic features but even syntactic government relations into the phonology is not compatible with strict modularity. Especially in the latter sense it might be directly susceptible to Zwicky’s (1969) criticism of Awbery (1973) that pushed accounts toward diacritics, namely that it is surely undesirable that phonological “rules” make direct reference to syntactic environments. Green’s model may well face double-indictment in the court of modularity here.

Hannahs (2013a,b), while in agreement with Green’s (2006; 2007) assessment that mutations are not in any sense derived online, takes issue with the full listing approach of Green. Instead of fully listing suppletive mutation alternants, Hannahs (2013a,b) proposes a novel mechanism of pattern extraction, whereby the initial consonant only is lexically stratified. The central idea behind pattern extraction is that speakers build associations between the forms that appear in the various mutation contexts, as illustrated for /t/-initial items in (147) below (examples from Hannahs, 2013a, p. 7).





From repeated occurrences of the associations in (147), he proposes, speakers are then able to extract a more generalised pattern applicable to items with word-initial /t/, as shown in (148).



Speakers are able to infer from the generalised schema in (148) that the extracted pattern will apply to all words with initial /t/, and Hannahs (2013a, p. 8) claims that this is what enables speakers to apply mutation to neologisms such as *teledu* ‘television’, while a full listing system such as that of Green (2006, 2007) does not predict their participation. It is somewhat unclear whether the extracted patterns such as that in (148) exist as independent lexical entities which are then linked to by other lexical entries, or whether the other lexical entries all have their own stratified initial consonant. The former option is similar in nature to the assumption that initial consonants are in some sense dismembered from the stem and only inserted when the form is actually used, reminiscent perhaps of templatic morphology or an obligatory class-prefix. The latter option, which appears to be more consistent with the empirical facts surrounding exceptions to mutation (cf. Ch. 7 for an extended discussion of the issue), is to assume that the pattern is used in setting up the individual lexical entries, so that individual entries themselves are stratified. That is, an entry for *tad* has the initial consonant lexically associated with the various mutation reflexes, as does the entry for *bwlch*, &c., rather than these having a single-line entry linked to the generalised schema. Whichever of these two options we adopt, the crucial differentiating factor in Hannahs’ (2013a; 2013b) model is that only the initial consonant is subcategorised for individual mutation environments, and not the entire word form. This

is lexically much more economical, and does not make the odd prediction that we might find suppletive forms in some mutation environment that differ in more than just the initial consonant. The pattern extraction mechanism also enforces more uniformity across the lexicon, though still predicting that the locus of variation will be the target, and requiring that any form of trigger variation lead to another diacritic and an extra branch in the extracted schemata.

In terms of the implementation at the morphosyntax–phonology interface, Hannahs (2013a,b) proposes that mutation triggers are associated with specific subcategorisation frames, requiring a form of a specific mutation grade. For instance, the preposition *â* ‘with’ will have a lexical entry such as (149) (cf. Hannahs, 2013a, p. 13).

(149) *â*: Prep, [____ X_{<aspirate>}]PP

As per (149), when an item such as *tŷ* [tʰi:] ‘house’ is inserted as the complement of *â*, the initial consonant is subcategorised to appear in the AM reflex, i.e. as [θi:]. This means in turn that every vocabulary item, whether it takes part in a particular type of mutation or not, must at some point be associated to all the possible mutation reflexes. Were this not so, then an item such as /b/-initial *bwlch* ‘gap’ (recall that AM does not apply to /b/) would end up being ineffable whenever it is subcategorised for a mutation grade it does not have.

More controversially to (149) perhaps, Hannahs (2013a,b) proposes that subcategorisation frames may also exist independently of specific lexical entries. This, he proposes, is the case for instance in Direct Object Mutation. Subscribing to the XP Trigger Hypothesis in (125), Hannahs (2013a, p. 13) proposes the lexically entirely independent subcategorisation frame in (150).

(150) [...]_{XP} [____<soft> ...]_{XP}

Unbound subcategorisation frames such as (150) are extremely powerful devices, because they are neither triggered by the presence of a specific morphosyntactic terminal nor are they bound to a specific domain of reference or specific morphosyntactic features. Allowing such subcategorisation frames opens the door to many kinds of potentially highly undesirable and problematic suppletion patterns, such as for instance suppletion triggered across phase boundaries (quite possible the case with

(150), actually),⁸ suppletion conditioned by position within phrase (rather than adjacency to some category), suppletion that skips intermediate heads, and others which in many theories are specifically ruled out by locality requirements. Apart from the theoretical issue at stake here, this also means that the model makes little prediction about where mutation can possibly take place and dismisses entirely the grammatical status of the Trigger Constraint in (109). In comparison, approaches requiring adjacency (such as Hamp, 1951, Lieber, 1983, and myself) make the strong prediction that every mutation must be the spellout of some entity actually present and adjacent in the morphosyntax.

A great benefit of implementing the subcategorisation process at the point of vocabulary insertion rather than in the phonology as with Green (2006, 2007) is that this avoids interaction across the morphosyntax–phonology interface in violation of the strict modularity hypothesis. It also means that the diacritics used by Hannahs (2013a,b) are of the much less problematic non-module-transcending kind. On the flip side however, the proposed pattern-extraction process empowers the lexical component to meddle with the make-up of phonological forms. Whatever theory of the lexicon we adopt, if it is to be compatible with the strict modularity hypothesis then it cannot be able to interpret or carry out computations on the phonological forms of individual items. Pattern extraction is thus a modularity offending device and in this regard merely shifts the environment of the violations from the morphosyntax–phonology interface to the lexical interfaces.⁹

A crucial empirical problem with suppletion accounts such as that of Green (2006, 2007) and Hannahs (2013a,b) is that they misplace the locus of variation, which they put on the mutation target rather than the trigger. However, in Ch. 4 we have seen that the locus of variation in the Welsh

⁸ This is highly problematic during spellout, because phase theory assumes that a phase is sent off to the respective interfaces as soon as computation on it is complete. This means that vocabulary insertion in the completed phase must take place at this point and subsequent suppletion should be impossible. Conversely, allowing such problematic subcategorisation frames seems to imply that matters outside the completed phase can still condition suppletion in the already completed phase even after it should have been shipped off to the interface and undergone vocabulary insertion.

⁹ DM of course does not subscribe to the notion of a lexical component beyond simple translational lists, and therefore the notion of lexical interface is not applicable in the framework. It is not clear how, if at all, the pattern extraction approach could be implemented in frameworks that conceptualise lexical storage as non-computational, list-based only.

system is in all but a handful of cases clearly the trigger, and not the target. The only significant way in which targets vary is that they either take part in the mutation system or they do not. Proposing that the way mutations are implemented is by selection of an appropriate target form from a diversified lexical entry listing all the mutation variants is clearly at odds with these facts. It predicts that individual target forms may be amiss or divergent, which is never the case, and it does not account for the fact that triggers of the mutations may be defective or irregular in a large variety of ways; to the contrary it would lead us to expect that triggers are the constant factor diachronically, and targets the variable factor—the precise opposite of the situation we can observe. Quite independently of these facts, placing the burden of alternation on the mutation targets is also problematic conceptually: all the evidence we have points to the fact that suppletion is found mainly on *f*-morphemes, and comparatively rare on *l*-morphemes. The suppletion accounts however flip this observation on its head by claiming that every single *l*-morpheme in any ICM language is highly suppletive, while few *f*-morphemes are, at odds with what is attested elsewhere.

Another problem with the suppletion accounts is how they deal with productivity. The model proposed by Green (2006, 2007) does not predict the productivity of the mutation system, though he suggests that this could be accomplished by Bybee's Word Formation Strategies (WFSs): given high repetition and regularity, speakers will be able to establish WFSs for the various mutation patterns which allow them to “fill in the blanks” even for items where they have not explicitly seen all the mutated forms. A similar mechanism is inherent in Hannahs' (2013a; 2013b) pattern extraction, but neither account covers the issue in sufficient detail to answer basic questions such as why /*g*/-initial loanwords should be barred from the mutation process. Even if this were explained by a constraint militating against segmental loss unless the speaker has explicit evidence from perception that a segment in that target form may be lost, then it would still predict those forms to take part in all the mutations other than SM, which is not what we observe.

An empirical problem common to the rule-based accounts of Ball and Müller (1992), the lexical phonology account of Kibre (1997), the readjustment account of Pyatt (1997), the suppletion account of Green (2006,

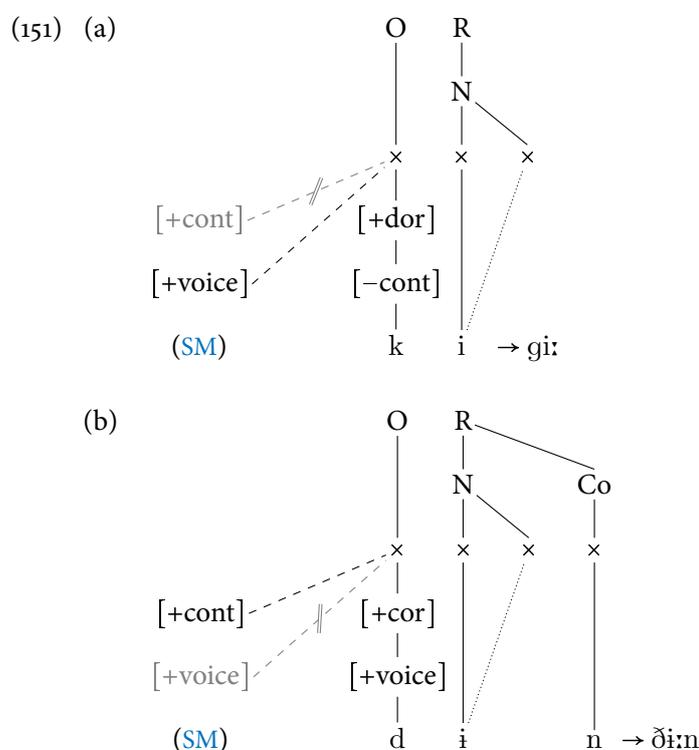
2007), and the pattern extraction account of Hannahs (2013a,b), is that they all have to stipulate the existence of a ‘custom-made’ morphological diacritic feature (whether module-transcending or not), specific to that particular language, for each of the language’s mutation patterns, without any evidence of their existence other than the mutations themselves, and no effect beyond triggering insertion of the right target form or a set of adjustment rules. Surely it would be preferable if we could do away with the need to invoke the creation of any number of essentially completely arbitrary, syntactically, semantically and phonologically unmotivated, morphological diacritic features whose sole purpose it is to account for whatever alternations we find in a given language. Not only is there no independent evidence for their cognitive existence, but they also offer no insight into the processes themselves, and make, by their very nature, no falsifiable predictions at all.

Diacritic accounts also inherently make predictions about system change that do not fit the empirical record: since all the triggers for any given mutation pattern share the same diacritic, the prediction is that when the system changes by altering one of the patterns triggered by a specific diacritic, then this change should always be system-wide for all triggers associated with that diacritic. What is rather unexpected is the change of the triggered alternation for only a subset of the triggers of that pattern (or even for only a single one), as we have for instance in the break between full SM and LSM, in the fusion of SM and AM giving rise to MM as a separate pattern, or in the gradual decay we see in some of the triggers of AM; in fact under the diacritic accounts, every time the system changes in such a way, a new diacritic feature with its own adjustment rules or set of suppletive forms has to be created to account exactly for those triggers that have broken with the larger pattern.

5.6 FLOATING FEATURE ACCOUNTS

An alternative to both the rule-based and suppletion accounts is presented by floating feature analyses, which posit that the mutations are the effect of incorporating a floating autosegment into the initial consonant of mutated words. Such an account was first proposed for Welsh by Lieber (1983). Lieber proposed that in languages with mutation, the susceptible

segments are underspecified for exactly those phonological features which vary with the mutations. The underspecified features are then provided either by incorporating features from a floating autosegment, or, in the absence of such an autosegment, receive a default value in the phonology. For instance, Lieber (1983) suggests that Welsh *SM*, which affects voicing and continuancy, is effected by an autosegment containing the features [+cont, +voice]. An adjacent form will associate any floating features from the autosegment unless it is already specified for that feature. Since *SM* involves the voicing of voiceless stops and the spirantisation of voiced stops, voiceless stops must be underspecified for [\pm voice] but not [\pm cont], while voiced stops will be underspecified for [\pm cont] but not for [\pm voice]. This is illustrated for the items *ci* /ki:/ ‘dog’ and *dyn* /di:n/ ‘man’ in (151).



As can be seen in (151a), the presence of [$-$ cont] in the underlying representation of *ci* prevents the floating [+cont] from associating to that segment, while [+voice] can freely associate with that position, resulting in the voicing of the initial underlying /k/ to give the surface form [gi:]. Conversely, in (151b), association of [+voice] is blocked by the presence of the (in this case identical) specification [+voice] on the initial underlying /d/ of *dyn*, while the feature [+cont] can associate freely with the

segment, resulting in the surface form [ð̥i:] (assuming of course some phonological adjustment for PoA).

Welsh AM and NM can be realised in a similar way through autosegments consisting of the single features [+cont] and [+nasal], respectively. The floating feature approach has also been applied quite successfully to Irish (Massam, 1983; Ní Choisáin, 1991, 1994; Kelly, 1994) and Fula (Paradis, 1986; Lieber, 1987; Wiswall, 1989), as well as a number of simpler mutation systems such as Nuer (Lieber, 1983, 1987).

The floating feature approach offers several advantages over the rule based and suppletion accounts. Like the morphophonological diacritic accounts of Hamp (1951), Oftedal (1962), and Albrow (1966), it correctly predicts that trigger and target must be string adjacent, i.e. it aptly encodes the Trigger Constraint. In turn, this of course also predicts that every mutation has morphemic status. That is, every mutation must be the spellout of some morphosyntactic object, rather than the much more general reference to any type of morphosyntactic environment possible in most other accounts. It is therefore more constrained in its predictions about possible mutation contexts.

In terms of modularity, the floating feature approach appears to be the only satisfactory analysis. The autosegment represents the phonological translation of a morphosyntactic object, and is therefore, differently to diacritic features, compatible with strict modularity: only morphosyntactic information in the morphosyntax, and only phonological information in the phonology, and no direct or indirect reference to information contained in the adverse module.

Although a floating feature account would clearly be the preferred solution from the modularity standpoint, Lieber's (1983) account of Welsh has unfortunately been shown to be ultimately untenable. This is because it requires paradoxical underlying specifications for mutation targets, something that becomes apparent when we consider the whole breadth of mutation patterns. For instance, voiced plosives are spirantised under SM, so they must be underspecified for [±cont] or otherwise they could not incorporate the floating [+cont] feature. However, under AM, voiced plosives remain unaffected (i.e. they resist spirantisation), meaning that they must already be specified as [−cont] underlyingly. Similarly, voiceless plosives resist spirantisation under SM, so must be specified [−cont]

underlyingly, but they do get spirantised under *AM*, so cannot be specified for $[\pm\text{cont}]$. *MM* raises the same problem here in requiring underlying specifications for $[\pm\text{cont}]$ which are incompatible with those required by *SM*. *LSM* would require that the liquids $/\text{ɫ}, \text{r}^{\text{h}}/$ are underlyingly specified for $[-\text{voice}]$, since they resist voicing in these instance; but in order to take part in *SM*, $/\text{ɫ}, \text{r}^{\text{h}}/$ must incorporate floating $[\text{+voice}]$, so cannot possibly be specified for $[\pm\text{voice}]$.

Although the floating feature approach has been quite successful elsewhere, including Irish, no such paradox arises in the Goedelic languages, and no satisfactory solution has been put forward for the issue raised by the more complex Brythonic mutation patterns such as those found in Welsh. The account I propose in Ch. 6 sets out to resolve this problem by assuming that incorporation happens regardless of underlying specification, and instead disambiguating the averse effects of mutation patterns by combining the floating feature paradigm with phonologically conditioned allomorphy. Non-well-formed phonological forms that arise from non-discriminatory incorporation of the floating features are resolved by regular application of phonological processes.

5.7 GOVERNMENT PHONOLOGY

Within *GP*, Welsh mutation has been treated by *Buczek (1995)* and *Cyran (2010)*. Both of these analyses are primarily concerned with an analysis of the melodic changes involved in the various mutations and do not attempt to account for the morphophonological implementation. While this is somewhat unclear in the case of *Buczek (1995)*, *Cyran (2010)* (citing *Green, 2003*) in fact makes it quite clear that he assumes that mutation does not involve active phonological derivation and must be implemented in some other way. *Buczek's (1995)* primary insight was that *SM* and *AM* involve loss of melodic material, while *NM* involves both the loss of some melodic material and the gain of material. She concludes that overall this makes Welsh mutations consistent with lenition phenomena, in the sense of involving a reduction in complexity. *Cyran (2010)*, taking *Buczek's* work as a starting point, refines the representations of the Welsh consonants that are assumed, taking into account evidence from the mutations and the Welsh consonantal system more generally (in fact, the representations

| SM | Buczek (1995) | Cyran (2010) |
|--------------------|---------------|--------------|
| p > b | -H | -H |
| t > d | | |
| k > g | | |
| b > v | -ʔ, -h | |
| d > ð | -ʔ | -ʔ |
| g > ∅ | -ʔ, -h | |
| ʔ > l | -h | -H |
| r ^h > r | | |
| m > v | -N | -L |

| AM | Buczek (1995) | Cyran (2010) |
|-------|---------------|--------------|
| p > f | -ʔ | -ʔ |
| t > θ | | |
| k > χ | | |

| NM | Buczek (1995) | Cyran (2010) |
|--------------------|---------------|--------------|
| p > m ^h | +N, -H | +L |
| t > n ^h | | |
| k > ŋ ^h | | |
| b > m | +N, -h | |
| d > n | | |
| g > ŋ | | |

Table 20: Melodic difference between Welsh radicals and mutated forms in Buczek (1995) and Cyran (2010) (adapted from Cyran, 2010, p. 62).

I have argued for in §3.6 in turn take Cyran's representations as a starting point and refine them taking into account an even broader set of considerations). In doing so, Cyran was able to further simplify the changes involved, such that every mutation could be analysed as the loss of a single element (for SM and AM), or the acquisition of a single element (for NM). Table 20 shows the melodic difference between radical (underlying) and mutated forms in both Buczek's (1995) and Cyran's (2010) account.

An interesting issue raised by Cyran (2010) is that GP assumes that when a representations gains elements, there must be a local source for these. This makes it interesting to note that in NM, the only mutation pattern to involve element composition in the two accounts, the triggers all either end in a nasal or (in the case of *fy* 'my.GEN') at least have an allomorph with a final nasal. On the other hand, element loss must be conditioned by a phonological environment, and the typical weak environments in which such lenition type phenomena are found notably do not include the word-initial site. Even if they did though, and Cyran (2010) notes that it might be possible to analyse at least some triggers as synthetic domains that then involve lenition across a word boundary, the fact that SM and AM appear to induce different lenition paths in otherwise identical environments is ultimately incompatible with a synchronic lenition analysis. Both of these factors will prove insightful for the account I propose below, where in all of the mutation patterns a floating feature provides the local source for melodic composition (through incorporation of the floating feature), but it is precisely the acquisition of new melodic material that itself triggers the loss of some manner elements in the SM and AM patterns, quite in line with the analysis of Cyran (2010). As Buczek (1995) had already observed with regards to NM, this leaves us with the perhaps somewhat counter-intuitive but theoretically quite consistent conclusion that Welsh mutations may involve simultaneous analogues of lenition and fortition, i.e. some elements are gained and others are lost, as I will propose in the next chapter is in fact the case.

"Usually elements don't just fall out of the blue skies. [But diachronically,] sometimes blue-sky elements just seem to drop from heaven when needed."

—Cormac Anderson¹¹

¹¹ Anderson, C. (2013) *The Representation of Insular Celtic Fortition*. Talk presented at APAP 2013, Lublin, 21 June 2013.

5.8 SUMMARY

In this chapter we have seen the sheer breadth of approaches that have been taken to Welsh ICM.

One of the main problems that we saw occur among these, often recurrently, is that they frequently make the wrong predictions about variation: predicting that idiosyncratic variations should be mainly a property of mutation targets when such variation is largely unattested, and failing to predict that triggers might show idiosyncratic variation when there is ample evidence of such variation.

Another major issue was the reliance of most accounts on ad-hoc diacritic features, for which there is no empirical evidence and which are extremely powerful, to the extent that it is difficult to see whether they make any hard and fast predictions about possible and impossible mutation systems. They also present us with the problem of diacritic-proliferation: for every minor variant of mutation patterns found in some environment, we need additional diacritics.

In terms of the major theme in which this work is situated, modularity, most of these accounts fared similarly poorly. Most of the proposed attempts to somehow limit cross-modular interaction have been shown to still require modularity violations, typically simply under a different guise or displaced to another interface. Approaches that we have seen which do not violate modularity, such as Lieber's (1983) floating feature account, have unfortunately proven themselves unable to adequately account for Welsh ICM. In the next chapter, I will propose a new floating element account of mutation, which I argue addresses all of these issues.

6

A floating element account of mutation

6.1 INTRODUCTION

In Ch. 5 we have seen that current accounts of the morphophonology of mutation are unsatisfactory in numerous ways, and through this have also seen what a new account should ideally look like. To be empirically adequate any account of Welsh ICM must reflect the actual locus and type of variation that we find, it must derive the Trigger Constraint, it must cover the entire breadth of the mutation patterns without deriving contradictions or paradoxes, and it must explain the productivity of the system, while ideally not relying on the supposed existence of empirically unverifiable ad-hoc diacritic features. Moreover, the ideal account fits within the simplest, most minimal theory of linguistic computation required, and does not rely on a mechanism that violates strict modularity or on some novel theoretical machinery unless such machinery is both empirically justified and necessary.

In this chapter I will outline an account of Welsh ICM which I argue fits the above requirements. Adopting the minimalist perspective laid out in Ch. 2, I assume that Syntax proper is followed by post-syntactic morphological computation in line with DM (Halle and Marantz, 1993; Halle, 1997; Marantz, 1997), which operates on the syntactic representation at the time of spellout, and interfaces in turn with a post-morphological phonology component as characterised by GP (Kaye et al., 1985, 1990; Kaye and Harris, 1990; Kaye, 2000; Charette, 1990, 1991; Harris, 1990, 1994). Crucially however, the version of DM I assume is curtailed in that I will assume neither the existence of diacritic features nor that of phonological readjustment rules, so ensuring that strict modularity is respected across the morphosyntax–phonology interface. Following Kaye (1995), I assume that the interface with morphosyntax is strictly modular in that

“For a moment [Lara] rediscovered the meaning of her life. She was here on earth to make sense of its wild enchantment and to call each thing by its right name, or, if this were not within her power, then, out of love of life, to give birth to heirs who would do it in her place.”

—Boris Pasternak²

² From the Hayward and Harari translation of *Doctor Zhivago*.

phonology consists of precisely two functions $\text{concat}(\alpha, \beta)$ and $\varphi(\alpha)$, the first of which takes as an argument two phonological objects and returns a single phonological object that is the linear concatenation of the two inputs, and the latter of which takes as its input a single phonological object, applies phonological computation to that object, and returns the computed phonological object, as detailed in §2.4.4. Convergence at PF simply means that $\varphi(\alpha)$ has been successfully applied to everything that was passed to it by morphosyntax. Phonological computation itself adheres to what is known as the phonological minimality principle in GP, i.e. that any phonological process applies whenever the conditions for it are met; that means there can be no strata or rule-ordering of any kind. Phonology simply sees a phonological object, checks whether there are any phonological operations for which the conditions are met, applies them, and returns the object to which all applicable operations have been applied.

I assume that Vocabulary Insertion (VI) and application of the phonological functions proceed cyclically from the bottom up, and that morphology can see the phonological objects that it has already inserted (and that result from application of the phonological functions to them), but it cannot intervene or manipulate them once they have been passed to phonology. This is to precisely allow inward-sensitive phonologically conditioned allomorphy, i.e. the selection of items from the vocabulary list which is sensitive to the phonological shape of an item that has already been inserted, as for instance in the selection of *a* before consonants and *an* before vowel-initial forms in *a cab* and *an apple*. Outward-sensitive phonologically conditioned allomorphy (referring to the phonological shape of an item not yet having undergone VI) is not possible.

It should be noted that, while the phonological side of the account presented here is couched in GP, it is by no means incompatible with other frameworks. Any phonological framework that makes the same restrictive assumptions about the morphosyntax–phonology interface (or is in principle capable of dealing with them), allows a phonological mechanism for the incorporation of floating material, and can encode phonological co-occurrence constraints should in principle be able to mirror the account presented here.

My proposal, in simple terms, is this: Each of the mutation triggers has several allomorphs, some of which have floating elements at their right edge. Which of a trigger's allomorphs is selected during spellout is phonologically conditioned by the item to its right. Any floating material introduced into the phonology by such an allomorph is incorporated into the closest available onset position. Because syllable structure universally consists of Onset–Rhyme pairs, this is always the onset of the item directly following the trigger. The loss of some melodic material caused by certain mutation patterns is due to language-wide licensing constraint violations triggered by the newly incorporated material.

For purposes of illustration, let me give a very brief sketch of this process. As we have seen in (102), the first person singular possessive *fy* [və] triggers NM, which causes a target with an initial oral stop to appear instead with an initial nasal stop. I propose that a trigger such as *fy* contains a number of entries in the Vocabulary List, as shown in (152):

(152) VOCABULARY ENTRY FOR *fy* 'D.1SG.GEN':

(a) [D, 1, -pl, gen] ↔ /və L / / ___ [ʔ]

(b) [D, 1, -pl, gen] ↔ /vən / / ___ V

...

(c) [D, 1, -pl, gen] ↔ /və /

The first entry, (152a), is phonologically conditioned by an object that begins with a segment containing [ʔ], the occlusion element. If this entry is selected, a floating [L] is introduced, which gives rise to nasality in stops. Entry (152b), with a final consonant [n], is selected before a vowel initial object, and entry (152c), without any phonological conditioning factor, is the elsewhere form, selected in all other cases. Now let us see what happens if we spell out the structures in (153):

(153) (a) [DP [D, 1, -pl, gen] [NP $\sqrt{\text{road}}$]] ($\sqrt{\text{road}}$ ↔ /fɔrð/)

(b) [DP [D, 1, -pl, gen] [NP $\sqrt{\text{aeropl}}$]] ($\sqrt{\text{aeropl}}$ ↔ /avɪrɛn/)

(c) [DP [D, 1, -pl, gen] [NP $\sqrt{\text{pride}}$]] ($\sqrt{\text{pride}}$ ↔ /balχdɛr/)

In all three cases, VI proceeds bottom-up, so that [NP $\sqrt{\text{road}}$], [NP $\sqrt{\text{aeropl}}$], and [NP $\sqrt{\text{pride}}$] are spelled out as the phonological objects /fɔrð/, /avɪrɛn/, and /balχdɛr/ first. Following this, the head D, i.e. the

first singular possessive determiner, is spelled out. In the case of (153a), the phonological object to the right begins neither with a vowel nor with a segment containing [ʔ], so that the elsewhere form /və/ is inserted. The two strings are concatenated and passed to the phonological function as $\varphi(\text{concat}(v\bar{\alpha}, f\bar{o}r\bar{\delta}))$, which returns the phonological object [vəforð]. In the case of (153b), the phonological object to the right begins with a vowel, so that **D** is spelled out as /vən/. Again this is concatenated and passed to the phonological function as $\varphi(\text{concat}(v\bar{\alpha}n, a\bar{v}i\bar{r}\bar{\epsilon}n))$, which returns the phonological object [vənaviren]. Now, in the case of (153c), where **NM** is applicable, **D** is spelled out as /və L / with the floating element at its right edge, since the initial [b] in [balχdɛr] contains [ʔ]. This is concatenated and passed to phonology in the usual way as $\varphi(\text{concat}(v\bar{\alpha} L, bal\chi d\bar{\epsilon}r))$. $\text{concat}()$ passes on to $\varphi()$ the phonological object [və L balχdɛr]. Because all melodic material has to be affiliated to (licensed by) a segmental position, the phonology now incorporates the floating [L] in the string into the onset position currently occupied by [b], which contains the melodic material [U, ʔ] (= [b]) before incorporation, and [U, ʔ, L] (= [m]) after incorporation. Thus phonology returns the phonological object [vəmalχdɛr].

This proposal makes a number of crucial predictions: First, mutations are entirely contained in the Vocabulary List. This means that there are no possible triggers that are not the spellout of something that is contained in the Vocabulary List, as opposed to, say, an account such as Pyatt, 1997, which can assign diacritic features arbitrarily during morphosyntax. Second, the trigger of the phonological alternation of any mutation is contained in the vocabulary entry of the trigger, not the target. This correctly predicts that the locus of variation is the trigger, and not the target. Third, mutations are phonologically non-arbitrary (cf. Kaye et al.'s 1990 non-arbitrariness condition), that is, their phonological effects are the consequence of regular phonological processes that apply in the language's phonology whenever their conditions are met, such as the incorporation of floating material and the resolution of constraint violations. The fact that these conditions came about due to specific conditions that obtained during spellout is phonologically irrelevant. This predicts that all the necessary processes can be motivated purely from the language's phonology, and that mutation systems or mutation patterns which cannot come about in this way should be an impossibility. It further predicts

| RADICAL | SM | RADICAL | SM |
|----------------|----|---------|-----------|
| p | b | b | v |
| t | d | d | ð |
| k | g | g | (deleted) |
| ʈ | l | m | v |
| r ^h | r | | |

Table 21: The pattern of Soft Mutation (repeated)

that phonology never has a need to make reference to non-phonological information to derive a mutation, in line with strict modularity and with [Kaye's \(1995\)](#) concurrent hypothesis that morphosyntactic information is entirely invisible to the $\varphi()$ function.

Above I have proposed that the Welsh mutations are due to floating elements at right edge of triggers, and that those triggers show allomorphy with regard to that floating element, conditioned phonologically by the item to its immediate right. In the next few sections, I will flesh out my proposal, accounting for each of the mutation patterns in turn. Assuming the representations argued for in §3.6, I will show how each of the mutation patterns *SM/LSM*, *NM*, and *AM* is implemented in the proposed floating element account. I will not look at variation and exceptions in depth here, but rather turn to those specific issues later on in Ch. 7.

6.2 SOFT MUTATION AND LIMITED SOFT MUTATION

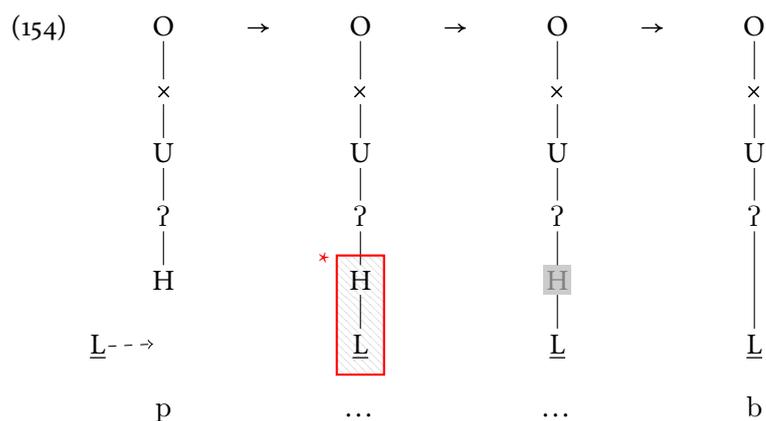
Let us first turn to the most common of the mutation patterns, *SM* and its reduced version *LSM*. As we have seen in §4.2 this involves the voicing of the aspirated plosives, /r^h/, and /ʈ/ (except in *LSM*), and the spirantisation of the voiced plosives and /m/, with the exception of /g/, which is deleted. This is repeated in Table 21.

To effect the first of these changes, turning fortis plosives and liquids into their lenis counterpart, *SM* triggers must have an allomorph that is sensitive to the natural class {p, t, k, r^h, ʈ}. Given the representations I have argued for, this natural class is delimited by the presence of dependent [H].

Although this natural class is slightly larger in that it includes the fortis nasals $\{m^h, n^h, \eta^h\}$ in addition to $\{p, t, k, r^h, \ddot{\imath}\}$, this presents no problem since $\{m^h, n^h, \eta^h\}$ occur solely as the result of **NM**. Since they never occur in the underlying representation of Welsh words in the Vocabulary List then, even if the natural class $[H]$ includes them, $\{m^h, n^h, \eta^h\}$ will never present in an environment where they are adjacent to an **SM** trigger.

I propose that the element that is inserted to induce the fortis-to-lenis change in $\{p, t, k, r^h, \ddot{\imath}\}$ is headed $[\underline{L}]$, which I argued occurs word-internally in (most) lenis stops and which may also occur in the liquids. If $[\underline{L}]$ is inserted in these representations, which all contain $[H]$, the consequence is that the $*[\underline{L}, H]$ constraint in (63a) is triggered. In order to repair the representation containing this illegal combination phonology has two options: It can delete $[\underline{L}]$, or it can delete $[H]$. Given that heads are phonologically stronger, I submit that the preferred solution in such a case is always the deletion of the dependent element rather than the head. Consequently, when $[\underline{L}]$ is inserted into a fortis plosive or liquid, it displaces $[H]$ in that segment's representation. The resulting segment is then one in which the aspiration element $[H]$ has essentially been replaced by the voicing element $[\underline{L}]$.

This process is illustrated in (154) for the fortis bilabial plosive $/p/$. First floating $[\underline{L}]$ is incorporated into the adjacent onset. This gives rise to an illicit segment that violates the $*[\underline{L}, H]$ constraint. Consequently $[H]$ is decomposed to repair the illicit structure. The resulting representation with headed $[\underline{L}]$ and no $[H]$ is eventually interpreted as lenis $[b]$.



While this neatly captures the voicing change in **SM** with an allomorph sensitive to a single natural class $[H]$, the fact that in **LSM** the two liquids

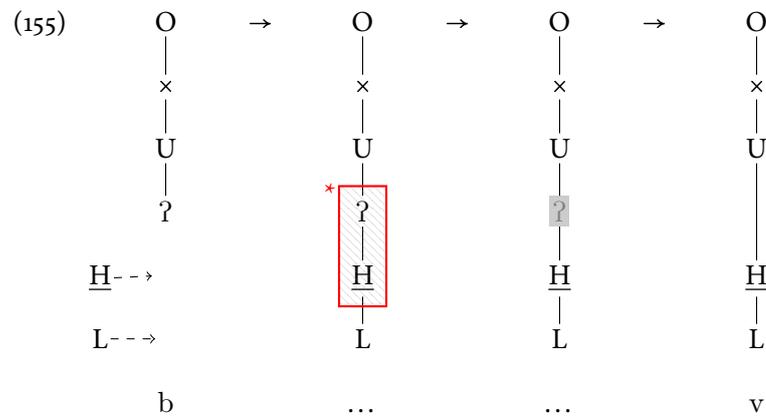
$/\underset{\circ}{t}^h, \underset{\circ}{k}/$ are excluded requires a modification of the above analysis. For LSM to work, there must be a natural class capturing $\{p, t, k\}$ to the exclusion of the liquids, and an allomorph sensitive to this class. Such a class exists in the segments which have both dependent $|H|$ and $|\underset{\circ}{?}|$, i.e. the natural class $|H, \underset{\circ}{?}|$. Since $/\underset{\circ}{t}^h, \underset{\circ}{k}/$ do not contain the stop element $|\underset{\circ}{?}|$ they are excluded from selection of that allomorph. The process is otherwise identical: insertion of $|\underline{L}|$ in the same way as illustrated in (154) above.

Clearly LSM triggers do not have an allomorph sensitive to just $|H|$, but the question is whether full SM triggers have both an allomorph sensitive to $|H|$ and one to $|H, \underset{\circ}{?}|$, or whether they only have an allomorph sensitive to the former but none sensitive to the latter. I suggest that full SM triggers have both; one allomorph with floating $|\underline{L}|$ that is inserted before $|H, \underset{\circ}{?}|$ and one allomorph with floating $|\underline{L}|$ that is inserted before $|H|$. The reason this must be so is that, as we shall see presently, the second change in SM (spirantisation of the lenis plosives) is sensitive to only the less specific natural class $|\underset{\circ}{?}|$, which includes both the fortis and the lenis stops. By what mechanism however can we guarantee that a subset of the natural class of all stops, namely the lenis stops, is treated differently? If one of the allomorphs of SM is sensitive to the two-component natural class $|H, \underset{\circ}{?}|$ and another one only to the single-component natural class $|\underset{\circ}{?}|$, then this means that the former allomorph is a more specific item. Following the morphological Subset Principle in (5), when items compete for vocabulary insertion it is always the most specific item available that is selected. This thus guarantees that $\{p, t, k\}$ (characterised by $|H, \underset{\circ}{?}|$) are paired with floating $|\underline{L}|$ under all circumstances, and the second change (conditioned by $|\underset{\circ}{?}|$) can only take place where this more specific allomorph is not selected.

Let us turn to the implementation of this second change then. The effect of this is to spirantise the lenis stops and $/m/$ (I will turn to the deletion of $/g/$ shortly). This means the SM trigger must be sensitive to the natural class $\{b, d, g, m(\underset{\circ}{\eta})\}$. Note that $/\underset{\circ}{\eta}/$ is given here in parenthesis, since its non-occurrence word-initially means that whether it is included in the natural class or not makes no difference; as such I will simply ignore it for purposes of discussion here. Although there is no natural class constituted by only those segments, there is a larger natural class delimited by the

presence of the stop element [ʔ], which word-initially consists of {p, t, k, b, d, g, m} (recall that word-initial /n/ never contains [ʔ]). Since, as I have argued above, {p, t, k} are already targeted by a more specific allomorph however, namely the one which inserts [L] in the context [ʔ, H], an allomorph targeting the larger (and less specific) natural class delimited by [ʔ] will effectively only be selected in the context of {b, d, g, m}, the precise set of segments which are affected by the spirantising change.

The element that is introduced by this allomorph must be headed [H], which I have argued is the active element in fricative manner. Since I've argued that initial lenis plosives do not contain the voicing element [L] but voiced fricatives must contain dependent [L],³ the floating material cannot only be [H] but rather must consist of the two elements [H, L]. When headed [H] is added to representations containing the stop element [ʔ], this triggers the *[H, ʔ] constraint in (63b). Again, in the ensuing repair process it is the head [H] which is preserved, and dependent [ʔ] is decomposed to give us a representation where [ʔ] has essentially been displaced by [H]. This process is illustrated for the lenis bilabial plosive /b/ in (155).



This analysis of the SM spirantisation has two interesting properties: First, since the place elements of /d/ and /ð/ are identical in the underlying representations we have proposed, no alveolar-specific place adjustment rules are necessary to account for the fact that /t, d/ always spirantise to [θ, ð] and never to [s, z]. Second, since the interpretation of

³ Fricatives cannot contain headed [L] since the combination [L, H] would violate the SOHC, cf. §2.4.3.

dependent $|L|$ is context-sensitive, giving rise to nasality in the context of $|\text{?}|$ but to voicing elsewhere, the denasalisation of $/m/$ to $[v]$ instead of $[\tilde{v}]$ likewise requires no further additions, it is simply a consequence of how $|L|$ is interpreted in the different contexts it appears in.

One issue that this analysis leaves us with however is that that $/g/$ is not deleted by the introduction of floating material; rather we initially derive the representation $|\underline{H}, L|$,⁴ which does not map to any segment in the inventory of Welsh. Like many of the previous feature based accounts, it is thus a matter of stipulation that there is a deletion process active here. Positing a direct “ $/g/$ -deletion rule”, as has sometimes been done in the past literature, would be problematic in that it does not satisfy Kaye’s (1995) phonological minimality principle—namely that a phonological process takes place *whenever its conditions are met*. Instead I posit a process that targets precisely an onset with the melodic representation $|\underline{H}, L|$ and obliterates the onset’s entire skeletal slot. If it were to erase the melody only but leave the skeletal slot in tact, we would incorrectly predict the appearance of $/h/$ under the right conditions here, which is never the case; items with a deleted $/g/$ do not behave any different phonologically to similar items without underlying $/g/$. Since such a representation cannot surface anywhere in Welsh at all, we can assume that the deletion process is entirely phonological and it applies whenever the phonological component of Welsh encounters that condition (i.e. the onset $|\underline{H}, L|$), in line with the phonological minimality principle.⁵

To sum up then, I have proposed here that a full SM trigger has four allomorphs: one with a floating $|\underline{L}|$ sensitive to the phonological context $|\text{?}, H|$, one with a floating $|\underline{L}|$ sensitive to the phonological context $|H|$, one with floating $|\underline{H}, L|$ sensitive to the phonological context $|\text{?}|$, and an elsewhere allomorph without any floating material. The full SM trigger *dy* $/d\text{ə}/$ ‘D.2SG.GEN’ would thus have the following entries in the vocabulary list:

4 Initial $/g/$ consists of $|\text{?}|$ alone. Incorporation of floating $|\underline{H}, L|$ gives the representation $|\text{?}, \underline{H}, L|$. $*|\underline{H}, \text{?}|$ triggers the loss of $|\text{?}|$ to arrive at $|\underline{H}, L|$.

5 To be precise, in the formalisation proposed in Breit (2013), the Welsh γ -obliteration process targets the whole segment $\langle O, \langle \times, \{\{H\}, \{H, L\}\} \rangle \rangle$ and maps it to a pointless onset $\langle O, \emptyset \rangle$.

- (156) VOCABULARY ENTRY FOR *dy* ‘D.2SG.GEN’:
- (a) [D, 2, -pl, gen] ↔ /də L / / ____ |ʔ, H|
 - (b) [D, 2, -pl, gen] ↔ /də L / / ____ |H|
 - (c) [D, 2, -pl, gen] ↔ /də H, L / / ____ |ʔ|
 - (d) [D, 2, -pl, gen] ↔ /də/

When *dy* precedes one of /p, t, k/ the item in (156a) is inserted; preceding /r^h, ʔ/ the item in (156b) is inserted; and preceding /b, d, g, m/ the item in (156c) is inserted. The item in (156c) is never selected for /p, t, k/ due to the Subset Principle requiring the insertion of the most specific item from the Vocabulary List. If none of the conditions for any of these three items is met, the elsewhere item, (156d), is inserted.

By comparison, a trigger of the ‘defective’ LSM such as *un* /in/ ‘#1.num.F’ has the following vocabulary items:

- (157) VOCABULARY ENTRY FOR *un* ‘#1.num’:
- (a) [num, #1, +fem] ↔ /in L / / ____ |ʔ, H|
 - (b) [num, #1, +fem] ↔ /in H, L / / ____ |ʔ|
 - (c) [num, #1] ↔ /in/

Two things are notable about the vocabulary entry for *un* in (157). First, it is simply missing an allomorph sensitive to the phonological context [H], which has the effect that the elsewhere item (157c) is selected preceding /r^h, ʔ/. Second, the first two items are more specific not only in their phonological conditioning, but also in the fact that they spell out a feminine gender feature on *num*, while the elsewhere item is not specific to gender (i.e. the elsewhere item is syncretic in terms of the gender feature). This derives the correct behaviour of *un*, namely that it triggers LSM when it c-commands a feminine gender noun (the ϕ -features of which percolate to *num*), but no mutation when either the gender is masculine or the phonological context for neither of the floating-feature allomorphs is met. This situation, where a variant mutation pattern is missing one of the allomorphs compared to its fuller relative and shows syncretism with a non-trigger homophone is precisely what I have argued is a central property of Welsh ICM, namely that the main locus of variation in the system is the trigger, not the target of mutation.

| RADICAL | AM |
|---------|----|
| p | f |
| t | θ |
| k | χ |

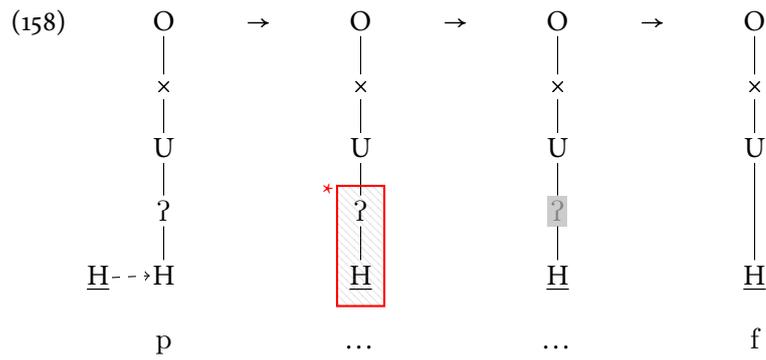
Table 22: The pattern of Aspirate Mutation (repeated)

6.3 ASPIRATE MUTATION

AM targets only the three fortis oral stops /p, t, k/, which are turned into the respective fricatives [f, θ, χ] as shown in Table 22. As we have already seen in the analysis of **SM**, the natural class {p, t, k} is delimited by [ʔ, H].

To effect the change from oral plosive to fricative the trigger must insert a floating headed [H]. Given that elemental representations are set-like in nature, i.e. elements cannot recur, the effect of incorporating a headed [H] into a representation already containing dependent [H] is essentially one in which the dependent [H] is overwritten with headed [H] (or, in different words, it is promoted to headhood). The incorporation of a new head [H] then triggers the *|[H, ʔ] constraint in (63a), which causes loss of the dependent element [ʔ], thus deriving the correspondent fricative segment for each of the plosives. As was the case with **SM**, the fact that bilabial /p/ corresponds to labiodental [f] follows from the fact that their elemental representation in regard to place is the same, i.e. they both contain [U]. Analogously, /t/ corresponds to dental [θ] rather than alveolar [s], which follows from the fact that both /t^h/ and /θ/ have the place elements [A, I], while /s/ has only [A].

The effect of **AM** on the onset /p/ is illustrated in (158). Here, first floating headed [H] is incorporated, which then triggers the *|[H, ʔ] constraint. Consequently, [ʔ] is decomposed from the segment, leaving behind the representation that is ultimately interpreted as [f].



In terms of trigger allomorphy, AM is relatively straightforward in that it requires only two allomorphs, one with floating headed $|\underline{H}|$ and an elsewhere allomorph without any floating material. Thus a trigger such as the third singular feminine possessive *ei* /i/ would have the two vocabulary entries in (159):

- (159) VOCABULARY ENTRY FOR *ei* 'D.3SGF.GEN':
- (a) [D, 3, -pl, +fem] ↔ /i \underline{H} / | ____ |?, H|
- (b) [D, 3, -pl] ↔ /i/

Vocabulary item (159a) is selected preceding /p, t, k/ while (159b) is inserted elsewhere. In a similar way to the numeral *un* '√1.num', we see in (159b) that the third singular possessive shows gender-related syncretism in the elsewhere form (recall that the third singular masculine possessive does not trigger any mutations). As we might expect if mutation is related closely to suppletion in f-morphemes, we find here again that some forms show additional allomorphy, such as the coordinating conjunction *a*, which appears as /a/+ $|\underline{H}|$ before /p, t, k/, as /ak/ before vowels, and as /a/ elsewhere. The vocabulary entry for *a* 'and' is given in (160) below:

- (160) VOCABULARY ENTRY FOR *a* 'and':
- (a) [Conj] ↔ /a \underline{H} / | ____ |?, H|
- (b) [Conj] ↔ /ak/ | ____ V
- (c) [Conj] ↔ /a/

The kind of variation we find in this regard, with some of the triggers showing additional phonologically context-sensitive allomorphs as in (160), or further syncretism as in (159), is of course exactly what we would expect of an account where mutation is caused by trigger allomorphy, and

in a way vocabulary entries such as (160) present the opposite case to the absence of one of the forms in *LSM* compared to *SM* we have seen in the previous section.

6.4 MIXED MUTATION

As we saw in §4.5, Welsh has a pattern that combines the behaviours of both *SM* and *AM*, where all the oral stops are spirantised while /ʈ, r̥^h/ are voiced (recall that I analyse /ʈ/ simply as a fortis lateral), as shown in Table 23. As we have seen in Ch. 5, one of the traditional analyses of this behaviour is that *AM* is applied where possible, and this is supplemented by *SM* in those cases where *AM* does not apply. Although it is wrong to speak of supplementation under the proposed account, this is none-the-less broadly what the situation is here. What this means translated into the floating element account is that, in *MM* triggers, the allomorph which in *SM* introduces floating headed [L] in proximity to targets with the natural class [ʔ, H] (= {p, t, k}) is simply supplanted by an allomorph with floating [H], akin to the relevant *AM* allomorph. The remaining allomorphs are the same as under *SM*: one sensitive to just dependent [H] (= {ʈ, r̥^h}) introducing headed [L], one sensitive to [ʔ] (= {(p, t, k), b, d, g, m(, ŋ)}), where again /p, t, k/ are pre-empted by the Subset Principle and /ŋ/ is not found word-initially) introducing [H, L], and an elsewhere allomorph without any floating feature material.

A full trigger of *MM*, such as the negative complementiser *ni* (*nid* before vowels) thus has a vocabulary entry as shown in (161):

| RADICAL | MM | RADICAL | MM |
|-----------------|----|---------|-----------|
| p | f | b | v |
| t | θ | d | ð |
| k | χ | g | (deleted) |
| ʈ | l | m | v |
| r̥ ^h | r | | |

Table 23: The pattern of Mixed Mutation (repeated)

(161) VOCABULARY ENTRY FOR *ni* 'COMP.NEG':

- (a) [C, neg] ↔ /ni H / / ___ |ʔ, H|
 (b) [C, neg] ↔ /ni L / / ___ |H|
 (c) [C, neg] ↔ /ni H, L / / ___ |ʔ|
 (d) [C, neg] ↔ /nid/ / ___ V
 (e) [C, neg] ↔ /ni/

The behaviour of a trigger such as *ni* in (161) is the following. Before /p, t, k/ the Subset Principle guarantees that the allomorph (161a) with floating [H] is inserted. This in turn triggers the *|H, ʔ| constraint in (63a), which is resolved by decomposition of dependent |ʔ| to derive a fricative. Before /t, r^h/ item (161b) with floating [L] is inserted, which triggers the *|L, H| constraint in (63b). This leads to the decomposition of dependent |H| and thus the derivation of the voiced liquids [l, r]. Preceding /b, d, g/ the third allomorph, (161c), with floating [H] is inserted. This triggers the *|H, ʔ| constraint, |ʔ| is decomposed and voiced fricatives are derived. As was the case with *SM*, the eventual deletion of /g/ is due to the process deleting any onset with precisely the representation [H, L] (the outcome of incorporating [H, L] into the representation of /g/). Again the Subset Principle ensures that this final allomorph is not available for /p, t, k/ since there is a more specific allomorph sensitive to that natural class. Preceding vowels, allomorph (161d) with a final /d/ is selected. Finally, anywhere else the elsewhere item in (161e), which has no contextual specification, is inserted. Note that the complementiser system is in fact more complex, and also more insightful, than presented here—I will return to this issue in §6.8, where I present a more in-depth analysis of the spellout of the Welsh pre-verbal system.

Once again we can observe here that the locus of variation in Welsh *ICM* is the trigger, and *MM* can be put down to a difference in one of the allomorphs of what otherwise corresponds to the same underlying structure of *SM*. Note especially that we have now seen three ways in which triggers may vary already: the absence of one of the allomorphs, the addition of additional allomorphs, and in this case simply variation in what floating element accompanies one of the allomorphs (we have also observed that some triggers show syncretism directly linked to their mutation behaviour).

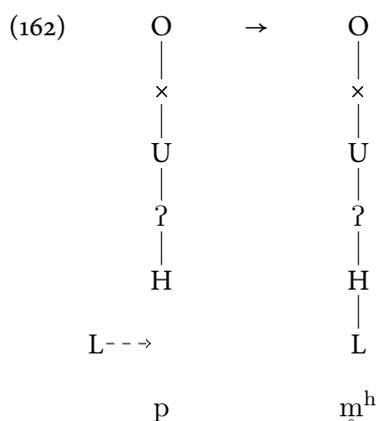
| RADICAL | NM | RADICAL | NM |
|---------|----------------|---------|----|
| p | m ^h | b | m |
| t | n ^h | d | n |
| k | ŋ ^h | g | ŋ |

Table 24: The pattern of Nasal Mutation (repeated)

6.5 NASAL MUTATION

NM affects all of the oral stops, i.e. /p, t, k, b, d, g/, which are turned into their respective nasal stops, crucially preserving laryngeal contrast in the process, as shown in Table 24. This means NM triggers must be sensitive to a natural class {p, t, k, b, d, g}. Given the representations I have argued for, this means that NM triggers are sensitive to the natural class [ʔ], which also includes /m/ word-initially (since /ŋ/ does not occur word-initially, and I've argued /n/ does not contain [ʔ] word-initially, these are both inherently excluded from the process). Obviously proposing that a nasal is nasalised by incorporation of floating material is always vacuously true, so that inclusion of any of the nasals in that natural class is unproblematic.

In terms of the change that takes place, this is effected simply by the insertion of floating dependent [L]. As I have argued in §3.6, the interpretation of [L] is context sensitive in the sense of Botma (2004b), and it is interpreted as nasality in the context of [ʔ]. This means that all the segments in the natural class [ʔ] are nasalised by the incorporation of floating [L]; the co-occurrence of [L] and [H] in the fortis plosives gives rise to the fortis nasals which are found exclusively as the result of NM. This is illustrated for the fortis bilabial plosive /p/ in (162).



In summary then, Nasal Mutation is straight forward in that **NM** triggers have two allomorphs: one with a floating dependent $[\text{L}]$ which is selected in the context preceding the natural class of stops, $[\text{?}]$, and an elsewhere allomorph without any floating material selected elsewhere. The full vocabulary entry for an **NM** trigger such as the preposition *yn* /əɲ/ ‘in’ would thus look as follows:

(163) VOCABULARY ENTRY FOR *yn* ‘in’:

in ↔ /əɲ/ $[\text{L}]$ / $___$ $[\text{?}]$
 in ↔ /əɲ/

Recall that one of the interesting properties of *yn* is that it shows nasal place assimilation to the item to its right, while the homophonous (and not mutation triggering) aspectual marker *yn* /əɲ/ ‘**IPFV**’ does not show any place assimilation of its nasal. This follows from the fact that the aspectual marker *yn* forms its own phonological domain and so no assimilation process can take place, while the preposition *yn* is synthetic and does not constitute its own phonological domain. Consequently it shows the same kind of nasal place assimilation we find word-internally in Welsh.

The other **NM** trigger, the first singular possessive *fy* ‘**1SG.GEN**’ shows a slightly more complex behaviour compared to *yn*. Although there is a lot of dialectal, register and inter-speaker variation here, one of the behaviours we have discussed in §4.6 was the following: *fy* is realised as /əɲ/ before immutable sounds (i.e. /əɲ/ is the elsewhere item), while before mutable sounds we find /ə/ with floating $[\text{L}]$ when the possessive appears without a postnominal reflexive pronoun *fi*, and no phonological material other than the floating $[\text{L}]$ when it appears together with the postnominal reflexive pronoun. This means that the first singular possessive

has one allomorph that is sensitive *both* to a phonological context *and* to a syntactic context. Again here, the morphological specificity condition means that the allomorph which is sensitive to both types of contextual specification is selected over that with overt /ə/ when the conditions for it are fulfilled. This particular variant is shown in (164) below (compare this to the higher register variant sketched in (152) above):

- (164) VOCABULARY ENTRY FOR *fy* '1SG.GEN':
- (a) [D, 1, -pl, gen] ↔ / L / / ___ |ʔ| / [___ [1, -pl, refl]]
 - (b) [D, 1, -pl, gen] ↔ /ə L / / ___ |ʔ|
 - (c) [D, 1, -pl, gen] ↔ /ən/

As we have seen then NM is very simple in terms of implementation under the proposal I've made. Finally, here too, the idiosyncratic behaviour of triggers such as the first singular possessive gives a clear indication that an analysis with multiple allomorphs—even one that is sensitive to phonological context—is necessary independently of the fact that it also causes mutation, and we have seen yet another way in which this happens: by additional context sensitivity in comparison with other triggers.

6.6 PRE-VOCALIC ASPIRATION

As we saw in §4.7, PVA is interesting especially in relation to AM. We saw there a kind of double dissociation with some items triggering both PVA and AM (e.g. *ei* /i/ 'her.GEN'), some triggering only AM and no PVA (e.g. *tri* /tri/ 'three.M'), and some triggering PVA but no AM (e.g. *eu* /i/ 'their.GEN'). In terms of representation, PVA triggers simply have an allomorph with a final floating skeletal point × and no melodic material, which when attached to a pointless onset preceding a vowel will be interpreted as /h/ phonetically, as illustrated in (165).

- (165)
- | | | |
|-------|---|---|
| O | → | O |
| | | |
| × - > | | x |
| | | |
| ∅ | | h |

Although it might be possible to suggest that such floating segments in Welsh are always part of the elsewhere form and fail to be associated

to onsets which already have a skeletal point, thus saving an additional allomorph, I suggest that they come as part of a separate allomorph selected specifically before vowel-initial items. There are two reasons for this. First, in an analogous case of whole-segment alternation with /n/, namely in the case of the first singular possessive *fy* ‘my.GEN’, we have seen that there is variant behaviour across dialects and registers, with the additional /n/ sometimes only appearing before vowels, sometimes before all immutable targets. This suggests that there is no limitation on associating additional skeletal slots to existing positions so long as this does not lead to ill-formed constituents (cf. §2.4.1). Second, the always-present analysis would predict that such floating material is inserted into the pointless onsets that form part of word-initial sC(C)-sequences. In addition to the problem with sC(C), I propose in Ch. 7 that immutable words also begin with a pointless empty onset, and this would likewise result in such items receiving the floating item.⁶

Let us now have a look at the vocabulary entries for the three items mentioned above, *ei* /i/ ‘her.GEN’, *tri* /tri/ ‘three.M’, and *eu* /i/ ‘their.GEN’. An excerpt of the vocabulary list giving the relevant entries is shown in (166), where a floating whole segment (i.e. one with its own skeletal slot) is shown in italics.

(166) VOCABULARY LIST (excerpt):

- (a) [D, 3, -pl, +fem, gen] ↔ /i H / | ___ | ?|
- (b) [D, 3, -pl, +fem, gen] ↔ /i *h* / | ___ V
- (c) [D, 3, -pl, +fem, gen] ↔ /i/
- (d) [num, #3, -fem] ↔ /tri H / | ___ | ?|
- (e) [num, #3, -fem] ↔ /tri/
- (f) [D, 3, +pl, gen] ↔ /i *h* / | ___ V
- (g) [D, 3, +pl, gen] ↔ /i/

We can clearly see here the full double dissociation of the various allomorphs proposed to account for different alternations under my account, with the combined AM plus PVA trigger *ei* ‘her.GEN’ showing three allomorphs: (166a) with a floating [H] which will result in AM, (166b) with a

⁶ Although, given that there is also an empty rhyme following the onset, this may not be problematic for /h/ if we assume that the position will only be interpreted adjacent to another overt position. It would still be problematic for other similar segments, such as the /r/ of the definite article *y* ‘the’ or the /k/ of the conjunction *a* ‘and’.

floating /h/ which will result in PVA, and an elsewhere item (166c) that does not give rise to any alternation. The pure AM trigger *tri* ‘three.m’ in (166d–e) simply lacks an allomorph with floating /h/, while the pure PVA trigger *ei* ‘her.GEN’ in (166f–g) lacks an entry with floating [H]. Once again, this is exactly the type of variation we expect if these alternations are encoded through extensive suppletion of the triggers, while in all diacritic approaches—whether suppletive or not—AM and PVA must be treated independently and often by different mechanisms (for instance, Kibre, 1997, has allomorphy for PVA but a lexical rule for AM).

6.7 TRIGGER SUPPLETION AND CHANGE

In the last few sections we have already seen how the model proposed here encodes many types of variation and system change. Some triggers may be “deficient” in that they are missing an allomorph associated with other related triggers, this is what we saw with SM and LSM. Alternatively, an allomorph associated with one type of pattern might supplant an allomorph in a trigger otherwise reflecting a different pattern, this is what we saw with MM, where the allomorph targeting the fortis plosives inserts the same material as AM triggers instead of that found with regular SM. In the discussion of PVA and AM in the previous section, we saw that two allomorphs may be entirely dissociated, with some triggers featuring both an AM allomorph and a PVA allomorph, and others featuring either of these in isolation; in fact, we saw already that many of the triggers show suppletive forms with other phonological material beyond the allomorphs required for mutation

All of the above types of trigger variation either involve the presence/absence of an allomorph, or variation in terms of the material that is inserted. But given that they are conditioned by a phonological environment at insertion, we might expect that this, too, may vary. In fact, we have already seen one such case with the final nasal on the first singular possessive *fy*, which may variously be found only before vowels or before all immutable forms, depending on dialect and register. When the final nasal is found only before vowels in higher registers, but in some dialects generalised to appear everywhere another allomorph doesn’t take preference, this can be seen as a reduction in specificity, i.e. erosion of the phonological

conditioning factor. Other types of change to the mutation system discussed in Ch. 4 can be analysed in a similar way. For instance, we saw in §4.4 that in some dialects, speakers have extended AM to apply to the nasals. One way to analyse this is that speakers at some point separated the components of the conditioning environment for AM—occlusion and laryngeal specification—and apply AM to any item with a dependent laryngeal specification, which includes the nasals and the voiced fricatives (spirantisation of which is of course phonologically vacuous in any case). Similarly, in some dialects, AM triggers have become restricted to only apply to fortis stops with specific PoAs. This can be analysed as a type of hyperspecification, the opposite of a decaying conditioning environment, where new material is included, such as in this case the resonance elements [A, I, U]. Such changes are consistent, and perhaps expected, with the trigger-suppletion view, but quite surprising perhaps in other types of accounts, where each pattern is seen as a unitary entity, and should not be subject to such types of variation which effectively break the unitary patterns into distinct parts.

6.8 A NOTE ON COMPLEMENTISERS

In Ch. 4, the attentive reader may have noticed that complementisers (*aka* pre-verbal particles) exhibit an interesting behaviour. All three of the negative complementisers, *ni*, *na* and *oni* trigger MM and also have an allomorph with a final /-d/ preceding vowels. Both the non-negative interrogative complementiser *a* and the affirmative complementiser *mi* (*fe* in South Welsh) trigger SM. In addition to these, Welsh has two further complementisers. *Mai* (*taw* in South Welsh) is used for focus in relative clauses, and *y* (*yr* before vowels) is used as an affirmative complementiser in relative clauses and in periphrastic main clauses (main clauses of the form AuxSVO). *Mai* does not trigger mutation, but *y* typically triggers SM.⁷

One of the arguments advanced in favour of morphologically manipulable diacritics by Pyatt (1997) was that this allows her to capture systematic distributions of mutation triggers. That is, assigning diacritics

⁷ Most inflected auxiliaries are not mutable, except for bare *bod* 'be', which occurs in relative clauses and is there frequently mutated in this context. For this reason I assume that *y* is a trigger of SM, in spite of relatively sparse evidence.

by rule is a neat way of capturing the fact that items with overlapping morphosyntactic features trigger the same mutation. For instance, the behaviour of the complementisers described above could be captured by proposing that *ni*, *na* and *oni* are not lexically specified with a mutation diacritic, but rather receive it from a rule such as (167).

(167) [C, neg] → [{M}]

Additionally, each of them would have two allomorphs in the Vocabulary List, one with and one without a final /d/. The complementisers *a* and *mi* would presumably be specified lexically with the diacritic {L}⁸, and *mai* and *y* would later received the diacritic {z} by Pyatt's default diacritic assignment rule.

In contrast, the vocabulary entry for *ni* given in (161) in §4.5 had five allomorphs. If this were to be replicated across the negative complementisers, we would need to list 15 vocabulary items for *ni*, *na* and *oni*, 8 for *a* and *mi* (I argued in §6.2 that SM forms have at least 4 allomorphs), 1 for *mai* and 2 for *y/yr*. That's a total of 26 vocabulary items to account for what appears to be a relatively systematic distribution of MM and SM among the complementisers, versus 11 vocabulary items and 2 rules (counting the default rule) in Pyatt's (1997) system. Now, given all the other arguments for and against the various modalities at play in different accounts, it is not necessarily the case that this relatively poor economic balance on the side of the floating element accounts presents much of an issue. However, the system is not as uneconomical as the above tally would make it seem at first if we allow ourselves to pursue a further analysis of the complementiser system.

First, let us consider the negative complementisers. *Oni* finds use in negative interrogatives and in negative counterfactual conditionals, *na* is uses in relative clauses and in non-counterfactual conditionals, and *ni* is used in all other cases of negative complementisation. In terms of the featural specification of these three, it is clear that they all share the features [C, neg], but what unifies the apparently cross-pollinating conditional cases of *oni* and *na*? It has been suggested that conditionals involve an interrogative (e.g. Grice 1989, p. 75f, Bhatt and Pancheva, 2006,

⁸ Memorising a rule only becomes more efficient once at least three items are grouped, as in any case otherwise the same amount of information (or even more) must be memorised to effect the rule.

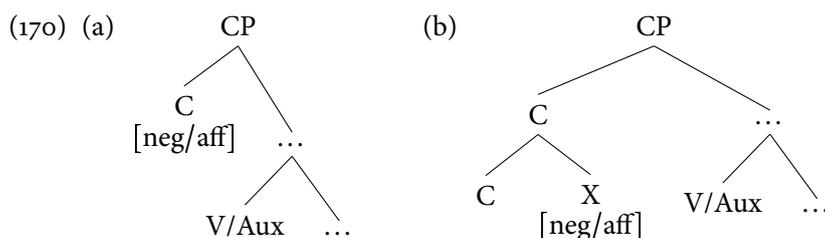
pp. 653ff, [Williamson 2019](#)), which would mean that both of the conditions under which *oni* surfaces carry a feature [int], but so would the non-counterfactual conditional *na*. What I will suggest is the primary disambiguating mark between *oni* and *na* is that *na* is realis (let us use a single feature [\pm realis] for convenience; the representational reality of realis/irrealis may be more complex), while *oni* in the interrogative use is unmarked for realis and in the counterfactual sense is perhaps [$-$ realis]. If this is the case, presumably *ni* will also be marked [$+$ realis]. This would leave us with the various feature compositions and their associated spellout as indicated in (168).

| | | |
|-------|---------------------------------|------------|
| (168) | [C, neg, +realis] | <i>ni</i> |
| | [C, neg, +realis, rel] | <i>na</i> |
| | [C, neg, +realis, int, cond] | <i>na</i> |
| | [C, neg, $-$ realis, int, cond] | <i>oni</i> |
| | [C, neg, int] | <i>oni</i> |

We further have the specifications in (169) for the remaining complementisers.

| | | |
|-------|-------------------------|-------------|
| (169) | [C, aff, +realis] | <i>mi</i> |
| | [C, aff, +realis] + AUX | <i>y(r)</i> |
| | [C, aff, +realis, rel] | <i>y(r)</i> |
| | [C, int, rel] | <i>a</i> |
| | [C, int] | <i>a</i> |
| | [C, foc, rel] | <i>mai</i> |

What then if MM and SM on complementisers are the spellout of [neg] and [aff], respectively? In fact, what I want to propose is that the head [C] cannot host [neg] and [aff], and so when these features are combined undergoes fission, where [neg] and [aff] are then hosted on a separate head X. That is, the structure in (170a) undergoes fission and so gives rise to (170b).



Now let us briefly neglect the realisation of the head **C** and focus on **VI** in the fissioned head **X**. I propose that [neg] here is realised principally as **MM**, but that the final /d/ of pre-vocalic *nid*, *nad*, *onid* likewise expones [neg], as shown in (170).

(171) VOCABULARY ENTRY FOR [neg] / [C] ____:

- (a) [neg] ↔ / H / / ____ |?, H|
- (b) [neg] ↔ / L / / ____ |H|
- (c) [neg] ↔ / H, L / / ____ |?|
- (d) [neg] ↔ /d/ / ____ V

It should be quite clear by now how (170a–d) take effect. Not shown here is the fact that [neg]’s elsewhere item is zero exponence. Since there is no competition to spell out [neg] apart from (170a–d), it may be assumed that where none of the contextual specifications there are met it succumbs to default zero exponence.

In parallel to (170), [aff] will be realised as **SM**, with the vocabulary entries in (172).

(172) VOCABULARY ENTRY FOR [aff] / [C] ____:

- (a) [aff] ↔ / L / / ____ |?, H|
- (b) [aff] ↔ / L / / ____ |H|
- (c) [aff] ↔ / H, L / / ____ |?|

Again, the effects of (172a–c) should be clear by now, and any remaining [aff] node likewise undergoes default zero exponence.

Let us now consider the vocabulary entries for **C**. For simplicity of exhibition, these are all given in (173), and I have restricted myself here to give the forms in their orthographic representation, and to collapse *y/yr* into a single entry, more on which presently.

(173) VOCABULARY ENTRY FOR C:

- (a) [C, foc, rel] ↔ *mai*
- (b) [C, +realis, rel] ↔ $y(r)$ / [____ [aff]]
- (c) [C, +realis, rel] ↔ *na* / [____ [neg]]
- (d) [C, +realis, cond] ↔ *na* / [____ [neg]]
- (e) [C, +realis] ↔ $y(r)$ / [[____ [aff]] Aux]
- (f) [C, +realis] ↔ *mi* / [____ [aff]]
- (g) [C, +realis] ↔ *ni* / [____ [neg]]
- (h) [C, int] ↔ *oni* / [____ [neg]]
- (i) [C, int] ↔ *a*

Now how does (173) effect insertion of the correct forms in the feature complexes we saw in (168) and (169)? Let us take each in turn, beginning with the negative complementisers and now excluding the features [neg] and [aff]. The negative complementisers are all adjacent to [neg], therefore rule out items (173b, e, f). Negative [C, +realis] will thus be inserted as (173g) *ni*. Next we have negative [C, +realis, rel] and [C, +realis, int, cond] which should both be expounded as *na*. [C, +realis, rel] will be expounded by (173c) and [C, +realis, int, cond] will be expounded by (173d). Note that the latter cannot be expounded by (173h) because (173d) expones more features, therefore the Subset Principle mandates that this feature complex must be expounded by (173d). Finally, [C, –realis, int, cond] and [C, int] are both expounded by (173h): the latter has no other features so competes only with (173i) but is more specific than (173i) due to the contextual specification, the former cannot undergo insertion with (173b-g) because it is specified [–realis], so must equally fall back to (173h) *oni*. This gives us the correct exponents for all the negative complementisers.

Among the remaining affirmative complementisers the items in (173c, d, g, h) are ruled out by their contextual specification. Affirmative [C, +realis] will thus be expounded by (173e) $y(r)$ preceding an auxiliary and by (173f) *mi* otherwise. [C, +realis, rel] will be expounded by (173b) $y(r)$ as there is no other candidate that is specified for [rel] and precedes [aff]. The non-negative interrogatives [C, int, rel] and [C, int] will both fall to item (173i) *a* since the only other item that expones [int], (173h), is contextually specified for [neg]. Finally, [C, foc, rel] is expounded by (173a),

| PERSON | AFFIRMATIVE | NEGATIVE | INTERROGATIVE |
|--------|---------------|---------------|---------------|
| 1SG | <i>rydw</i> | <i>dydw</i> | <i>ydw</i> |
| 2SG | <i>rwyt</i> | <i>dwyt</i> | <i>wyt</i> |
| 3SG | <i>mae</i> | <i>dydy</i> | <i>ydy</i> |
| 1PL | <i>rydyn</i> | <i>dydyn</i> | <i>ydyn</i> |
| 2PL | <i>rydych</i> | <i>dydych</i> | <i>ydych</i> |
| 3PL | <i>maen</i> | <i>dydyn</i> | <i>ydyn</i> |

Table 25: Paradigm for the present tense of *bod* ‘to be’ in spoken “standard” Welsh.

which matches its feature content precisely. Note that this cannot be reduced to [C, foc] because that would incorrectly predict the appearance of *mai* in focused main clauses.

There are two items that may appear only unsatisfactorily accounted for among the items (173), namely *na* and *y(r)*. These could possibly be collapsed to a single entry if criteria were found to link relatives to conditionals and to appropriately characterise how complementisers differ in synthetic versus periphrastic clauses in Welsh. Both of these topics (as in fact the internal make-up of the complementiser system as a whole) warrant much further research, and it is to be hoped that the system could be further simplified by insights from such inquiry.

Now as can be seen, the fission analysis of the complementisers allows for the same sort of generalisation and relative economy as Pyatt’s (1997) diacritic model. But simply positing such a fission process here for the sake of making that generalisation alone may appear somewhat stipulative. In fact, the fission account offers further advantages. In general, in colloquial Welsh periphrastic clauses the complementisers are not used before the initial auxiliary (recall that periphrastic clauses have the order AuxSVO). However, in colloquial Welsh, the paradigms of the auxiliary *bod* shows an initial /d/ on negative forms, and an initial /r/ on affirmative forms and no initial consonant on other forms. This is illustrated in Table 25 for the present tense in spoken “standard” Welsh, as typically taught in schools. Many varieties of South Welsh follow this pattern quite closely as well, while other varieties also show the same pattern but typically

with a few more exceptions in the present tense. The pattern is also found very consistently for past tenses of *bod* across all dialects (e.g. *roedded* ‘be.PST.2SG.AFF’, *doedded* ‘be.PST.2SG.NEG’, *oedded* ‘be.PST.2SG.INT’). For an account without complementiser fission, this is surprising and needs to be accounted for independently. But under the fission account presented here, this is exactly what we expect. All we need to add to the system is that colloquial Welsh varieties have a rule that obliterates *C* after fission (this is presumably tied in with register), and we derive the correct forms in the negative. This also suggests that the affirmative particle *y(r)* found before auxiliaries, i.e. vocabulary item (173e) above, is in fact split in the same way as /d/ on *nid*, *nad*, *onid*, so that *y* is the exponent for *C* and /r/ expones [aff] in periphrastic clauses. There is some interesting dialectal variation with regard to the paradigm in Table 25, for instance in many dialects the first and second person do not take part, or the present tense affirmative as a whole does not show initial /r/. I will not go into the details much further here, but such variation is quite systematic and can be accounted for straightforwardly by dialect-specific impoverishment rules.

Where the fission analysis really comes to shine is if we consider an important type of variation with regard to main-clause complementisers found in colloquial Welsh. Namely, there are three realisational variants we find: (i) they may be spelled out in their full form (*ni*, *onid*, *mi*, &c.) including the mutations they cause, (ii) no overt complementiser but the mutation remains, and (iii) neither complementiser nor mutation appears. All three variants are attested and appear to be conditioned largely by sociolinguistic factors (Awbery, 1984b, 2004; Powers, 1989). Cases (i) and (iii) are arguably unproblematic for any account: the morpheme is overt and we find mutation, the morpheme is not overt and we don’t find mutation—no further explanation warranted. However, case (ii) is surprising under all of the non-fission accounts. In a floating feature account (or one of the early accounts with morphophonological diacritic) where the floating feature is tied to the complementiser, the mutation should disappear with the complementiser. In the suppletion accounts the conditioning for subcategorisation is lost, so similarly we would expect there to be no mutation. Most of the other diacritic accounts argue against assigning mutation-inducing diacritics to morphosyntactic nodes that

are not overt, which likewise is problematic in case (ii). In all these cases, an additional mechanism would need to be posited for main-clauses that have undergone complementiser deletion. The fission account presented here however predicts exactly this three-fold variation: there is a complementiser obliteration rule, conditioned by sociolinguistic factors or perhaps optional, and this may apply either to the complementiser after fission has taken place, giving rise to (ii), or it may obliterate the complementiser even before fission has taken place, giving rise to (iii).⁹

Although there are clearly a number of issues to be resolved in regard to the Welsh complementiser system, the preliminary analysis in this section shows that the floating element account proposed here is not as inept in accounting for morphosyntactic generalisations across environments that trigger the same mutation pattern as proponents of diacritic accounts would sometimes make it out. In fact, it forces an analysis that has been shown here to be more insightful in accounting for complex phenomena related to the spellout of mood in pre-verbal position, where the mutation allomorphs form just another part of an already complex and highly suppletive system.

6.9 THE DP AND FEMININE GENDER MUTATION

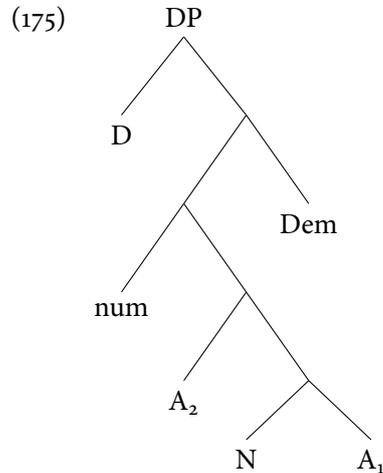
6.9.1 *Gross Anatomy of the Welsh DP*

The Welsh DP featured prominently among the various triggers discussed in Ch. 4. Before discussing the often quite intricate issues of mutation in the DP, let us first briefly consider the gross anatomy of the Welsh nominal projection. The general linear order of the Welsh DP is $D > \text{num} > A_2 > N > A_1 > \text{Dem}$, where A_2 is a highly restricted set of adjectives that may occur in prenominal position (cf. example (83) in §4.2).

- (174) *y tri hen ddyn neis 'na*
 D num A_2 N A_1 Dem
 the three old man nice there
 ‘Those three old nice men there’

⁹ An alternative account for (iii) is to suppose that obliteration can target a higher up node, i.e. the node dominating both of the fissioned complementiser heads. An analysis with another optional rule obliterating only the fissioned head is unwarranted, as it would predict a fourth case in which the complementiser is overt but mutation has undergone optional obliteration.

Assuming non-antisymmetric DP hierarchy in line with [Abels and Neeleman \(2009\)](#) (see also [Willis, 2006](#), for arguments specifically against an antisymmetric analysis of Welsh), I propose that the DP has roughly the structure in (175).

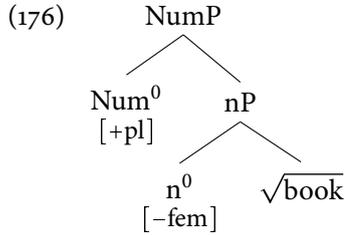


In (175), the correct order of the DP derives from the assumption that the A_1 and *Dem* constituents being right-branching, while the remaining constituents are left-branching. However, there is no universal A_2 position in the DP, as distinct from the general point where A_1 adjectives are inserted. Likewise, left or right branching in this case cannot be an idiosyncratic property of specific adjectives; allowing such idiosyncratic left or right branching constituents would, on the one hand, be incompatible with the basic observations of [Greenberg's \(1963\) Universal 20](#), and on the other not explain the semantic specificity associated with adjectives in the A_2 position. I will return to this issue in due course, but let us first look in more detail at the structure of the nominal projection lower down.

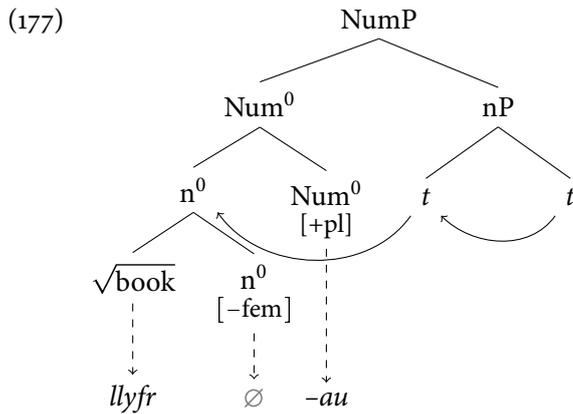
6.9.2 Nouns and postnominal adjectives

Welsh nouns show overt number morphology (e.g. *llyfr* ‘book.SG’, *llyfrau* ‘books.PL’) but there is no overt marking for gender (for instance *ffon* ‘stick.F’ is feminine, while *ffôn* ‘phone.M’ is masculine). Gender can be determined however from agreement with other morphemes that show gender, such as the numeral ‘two’ which is *dau* for masculine nouns and *dwy* for feminine nouns, as well as through mutation: feminine nouns are subject to LSM when they are adjacent to the definite article (this of course

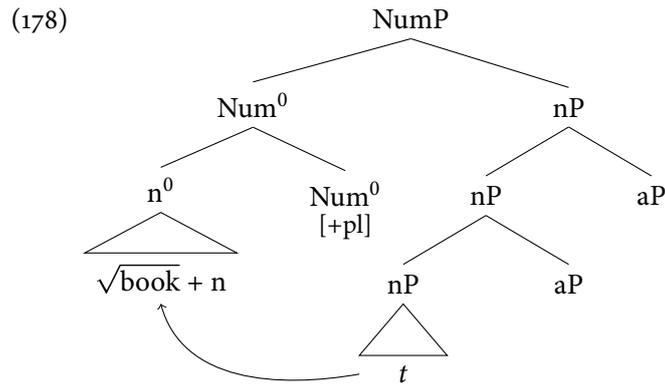
only expones gender on nouns beginning with a consonant susceptible to LSM). I will make the relatively standard assumption that number on the noun is introduced by a Num head sitting above nP, while gender is introduced by the categoriser n itself, as shown for *llyfrau* ‘books’ in (176).



Of course the structure in (176) is subject to head movement in the same way we have seen for English nominal phrases in (11), which ultimately gives us the structure in (177), with Num to the right of the noun stem where it will be exposed as the plural suffix *-au*.



Let us now turn the postnominal adjectives. Adjectives in position A_1 are adjuncts to an extended projection of nP, and n raises to num across any number of intervening aPs much in the same way as in (177). This is illustrated further in (178), which shows the position of two possible postnominal aPs.



Adjectives agree with the noun both in gender and number, and I propose that ϕ -agreement is situated on the categoriser head *a*.¹⁰ Not all adjectives overtly expone gender, but for those that do, gender is exclusively reflected through a change in vowel quality. Although this change is fairly regular, it is restricted to around ten adjectives (fewer for many speakers) and shows no signs of productivity (cf. King, 2003, p. 83). For this reason I will assume that these forms simply involve root suppletion, rather than, say, a floating element |A| analogous to Lowenstamm's (2012) floating |I| of German umlaut. That is, adjectives such as *gwyn* 'white' and *tlws* 'pretty' with a feminine gender form *gwen* and *tlos* will have vocabulary entries such as those in (179).

(179) VOCABULARY ENTRIES FOR *gwyn* and *tlws*:

- (a) $\sqrt{\text{white}} \leftrightarrow \text{gwyn}$
- (b) $\sqrt{\text{white}} \leftrightarrow \text{gwen} / [__ [+fem]]$
- (c) $\sqrt{\text{pretty}} \leftrightarrow \text{tlws}$
- (d) $\sqrt{\text{pretty}} \leftrightarrow \text{tlos} / [__ [+fem]]$

Like gender, most adjectives do not have an overt exponent for number, but among those that do plural is expounded either by a suffix (e.g. *gwyrd* 'green', *gwyrdion* 'green.PL'), by a change in vowel quality (e.g. *ifanc* 'young', *ifainc* 'young.PL'), or both (e.g. *dall* 'blind', *deillion* 'blind.PL') (cf. King, 2003, p. 84). As with the vowel change in the feminine adjectives, I will assume that the non-productive change of a root vowel reflects root suppletion, but I propose that the plural suffix *-ion* is the spellout of plural

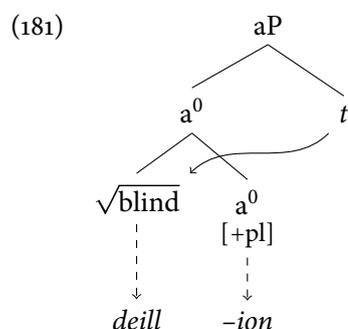
¹⁰ The analysis remains essentially unchanged if one assumes one or more *Agr* projections on the adjective instead. I assume that ϕ -features are hosted on *a* simply because that is the most economical yet empirically sufficient analysis.

on the categoriser *a*. Thus, an adjective such as *dall* that shows both a root vowel change will be realised by the vocabulary items in (180).

(180) VOCABULARY ENTRIES FOR *dall* ‘blind’:

- (a) $\sqrt{\text{blind}} \leftrightarrow \text{dall}$
 (b) $\sqrt{\text{blind}} \leftrightarrow \text{deill} / [__ [+pl]]$
 (c) $[a, +pl] \leftrightarrow \text{-ion} / \{ \sqrt{\text{blind}}, \sqrt{\text{green}}, \sqrt{\text{wise}}, \dots \} __$

Note that, like many other languages, Welsh shows no gender distinction in the plural. I assume that this is due to a constraint $*[+pl, fem]$ resulting in impoverishment of $[\pm fem]$. Thus, the plural form *deillon* ‘blind.PL’ reflects the structure shown in (181), with only the feature $[+pl]$ on *a* (a non-plural adjective would have a head *a* with both the features $[-pl]$ and $[\pm fem]$).



In (181), the root $\sqrt{\text{blind}}$ has undergone head movement and adjoined to the categoriser *a* to form an M-word, in parallel to movement of the root to *n* and *n* to *Num* in (177).

We are now in a position to begin discussing the first of many mutation phenomena in the DP, namely feminine gender mutation. This type of mutation affects postnominal adjectives, which receive LSM if they modify a feminine gender noun. The traditional account of this is to say that the noun triggers LSM on the first adjective, which in turn triggers LSM on an adjective following itself, and so on. That is to say, both feminine nouns and feminine adjectives are seen as mutation triggers. While nouns are unambiguously masculine or feminine, this is slightly problematic for theories with a morphophonological diacritic or a final floating feature, because they would have to propose that every adjective has two allomorphs: a feminine one which triggers mutation, and a masculine one which does not trigger mutation; Kibre (1997) calls this type of theory the

noun-trigger analysis. My principal objections to the noun-trigger analysis are that (i) it is inelegant in that it fails to make any deeper connection with the clearly implicated percolation of gender, (ii) it is uneconomical in having to propose that every adjective in the language has at least two allomorphs, and (iii) it makes the wrong predictions in terms of variation, namely that some adjectives might miss a mutation-triggering alternant and should thus interrupt mutation when no such cases are known. Pyatt (1997, pp. 346ff) discusses a number of additional issues with the noun-trigger analysis. Proponents of diacritic theories have put forward two alternative proposals, let us consider these in turn now.

First, Pyatt (1997, pp. 346ff) proposes that [+fem, -pl] adjectives are assigned the diacritic feature {L} by rule (Pyatt, 1997, pp. 121ff fails to distinguish between SM and LSM here), so that both feminine singular nouns and feminine singular adjectives are specified {L} throughout. An adjective then mutates because it is preceded by a morpheme that has been specified {L} itself. This keeps alive the idea that the noun and adjectives themselves are mutation triggers while at the same time taking advantage of ϕ -feature agreement in the DP and drawing an appropriate connection with gender agreement. However, one ought to wonder why a diacritic {L} is necessary in such cases when clearly it simply recapitulates an already percolated bundle of ϕ -features. This is especially puzzling given that Pyatt (1997, p. 122) objects to the idea that a mutation diacritic itself might percolate—the proposed rule does the same in all but word. Apart from this redundancy issue, it also makes the curious prediction that the final adjective in a series of adjectives should itself be a mutation trigger. Because adjectives are final, and because one wouldn't expect that they trigger mutation on something outside the DP, this might not readily appear to be an issue as long as we assume that mutation is not triggered across phases (or outside specific types of c-command relations). However, even within the DP, the final adjective will be both c-commanded and in the same phase as a demonstrative such as 'ma /ma/ 'there.DEM'. But 'ma, although meeting the phonological inclusion criteria for LSM is never mutated to *[va], whether it directly follows a feminine singular noun or a feminine singular adjective. We have to consequently propose that demonstratives are inherently immutable. This might be correct on the surface, but it is really only a patch for the issue at hand here, because

demonstratives' distribution is syntactically restricted in such a way that this is the only environment where they possibly could undergo mutation, so a learner presumably has relatively little evidence that they should be lexically marked as an exception (see Ch. 7 on how exceptionality might be encoded lexically). A much more elegant solution would be one in which this singular problematic environment for demonstratives did simply not trigger mutation, either. Note that Welsh also allows phrases in demonstrative function, for instance *y ferch y mynydd*, lit. 'the girl the mountain', which are in effect similar to English PPs such as 'of the mountain'. Since these must always be definite however they cannot shed light on the issue. An interesting, and to my knowledge entirely open, question is whether some quantifying phrase with a clearly mutable phonological form could be found in this position which further clarifies the situation.

Kibre (1997) makes a similar proposal, where a lenition diacritic is associated with feminine singular APs. However, rather than this lenition diacritic being located on the adjective and triggering mutation on subsequent adjectives, he proposes that it is a phrase-level marker, sitting at the start of every feminine singular AP, where it triggers mutation on the adjective in that same AP. Of course Kibre (1997) suffers the same problem of replicated efforts as Pyatt (1997), but his analysis avoids the phrase-finality problem highlighted for Pyatt's (1997) account above, even if it is somewhat unclear exactly what the morphosyntactic identity of such a phrase-level marker is. In any case, Zwicky (1984) and Pyatt (1997) have both criticised morphemes inserted only to host a mutation diacritic without there otherwise being evidence for their presence.

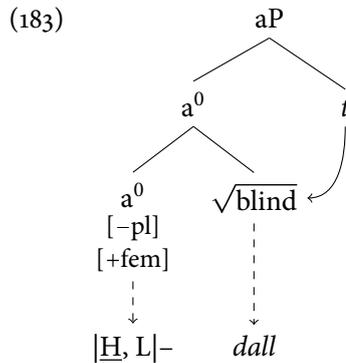
What I propose is that LSM on feminine singular adjectives is the direct prefixal spellout of the categoriser [a, +fem] (since I have proposed impoverishment of [±fem] in the context of [+pl], it is not necessary to refer to [-pl] under my analysis). We can reject the null-morpheme critique because we have already seen that [a, +pl] receives an overt spellout, so why should [a, +fem] not be available any more at VI? In fact, because of the feminine gender root suppletion in items such as *gwyn—gwen* 'white' seen in (179), [a, +fem] must be present during VI in the aP or we would predict incorrectly that there can be no suppletion for feminine gender adjectives. What I propose is that feminine gender mutation is the result of the vocabulary entries in (182).

(182) VOCABULARY ENTRY FOR feminine a:

(a) [a, +fem] ↔ / L - / / ____ |?, H|

(b) [a, +fem] ↔ / H, L - / / ____ |?|

The entries in (182) result in a spellout where the floating elements responsible for LSM are prefixed to the adjective, as shown in (183).

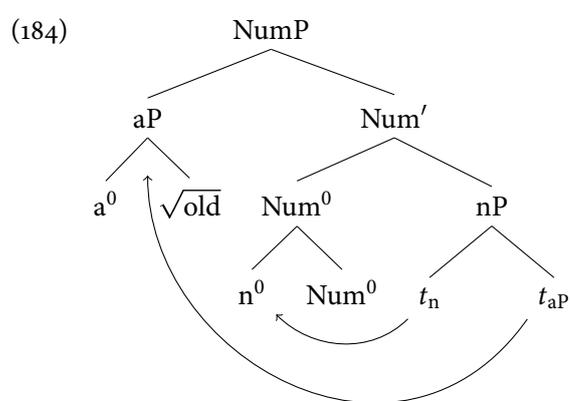


6.9.3 Numerals and prenominal adjectives

Having completed a basic outline of the lower part of the nominal projection, let us now turn to prenominal modification. Here we find both the limited set of prenominal adjectives in (83), which all trigger LSM, and numerals, which may trigger idiosyncratic mutation depending on the value of the numeral. What I propose is that *aP* is dominated by a functional projection that hosts numerals and the prenominal adjectives. While it seems that such a projection is well warranted, the precise nature of such a projection is not clear. Willis (2006) argues for a series of distinct adjectival projections, two of them labelled as direct-adjective-modification projections and one an indirect-adjective-modification, where prenominal material is hosted by the heads of the respective projections. Sadler (2003) and Mittendorf and Sadler (2005, 2011) propose that numerals are part of an extended NumP projection and suggest that prenominal modification involves a type of lexical adjunction on the *nP* (possibly with recategorisation to *N*). Duffield (1996), who follows an analysis where *N* raises to Num, likewise implicates an extended NumP projection but assumes the presence of an additional numeral projection. What I will assume here is that prenominal adjectives, while base-generated as adjuncts

to **nP** in the same way as postnominal adjectives, move to Spec,**NumP**, while numerals occupy a separate numeral projection which I label **numP**. I assume that numerals are functional items with a non-complex head **num** which agrees in gender with **n**. Recall that in Welsh, nouns and adjectives modified by a numeral are always singular (e.g. *tair merch gwerdd* ‘three.F girl.F.SG green.F.SG’, **tair merched gwyrddion*). This means there must be some clear interaction between **num** and **Num**, an issue I will not address here.¹¹

Given the above assumptions, a phrase such as *hen ddyn* ‘old man’ containing a prenominal modifier and a noun will have the structure in (184), where the internal structure of **n⁰** has been omitted for clarity.



I propose that the movement in (184) is optionally allowed for any adjective, but in those regularly occurring prenominally is principally motivated semantically. A root such as $\sqrt{\text{old}}$ which has a separate semantic interpretation in prenominal and postnominal position will have two entries in the Encyclopædic List. One entry will assign the semantic interpretation $\llbracket \text{old} \rrbracket$ specifically in Spec,**Num** position, while the elsewhere item will assign the postnominal interpretation $\llbracket \text{ancient} \rrbracket$. In order to derive the interpretation $\llbracket \text{old} \rrbracket$, the adjective must move to Spec,**Num**. In the same way, roots which may only occur prenominally can be analysed as missing an encyclopædic elsewhere item: a root like $\sqrt{\text{main}}$ cannot receive any semantic interpretation unless it is situated in Spec,**Num**. Adjectives without

¹¹ An exciting possibility however might be an analysis of the functional projection hosting Welsh numerals and prenominal adjectives in terms of a weak quantifier and a classifier projection in the manner argued for by Gebhardt (2009), where presence of a classifier would imply the absence of **NumP** and force a singular/individuating noun phrase.

an additional entry sensitive to Spec,Num position in the Encyclopædic List may optionally move, but presumably such vacuous movements incur a cost, so that optional movement is generally only made use of for poetic or ludic purposes, similar to the situation in French.

In terms of mutation, prenominal adjectives consistently trigger SM. Because the number of adjectives that can appear in this environment is limited and their semantics are different from postnominal counterparts, one possible analysis is to say that they are lexical triggers and have an allomorph either with a mutation diacritic or with floating elements conditioned by the position in Spec,Num, parallel to how they acquire their special semantic interpretation. However, this does not account for the fact that even poetically preposed adjectives not normally found preminally trigger SM. This can be seen for example in (185), a verse from the lyrics to *Iesu Yw* (Christ the King) by Gareth Glyn.

- (185) *Dim ond siffrwd awel a thyner fŷmurmur nant*
 not but rustle wind and gentle murmur stream
 ‘Only the rustling of the wind and the gentle murmur of the stream’

In (185), the adjective *tyner* ‘gentle’ has been moved to prenominal position, where it causes SM on *murmur* ‘murmur’, despite not being one of the adjectives typically found in prenominal position. What I propose instead of prenominal adjectives being lexical triggers is that the head *a* in this environment is spelled out as a set of floating elements at the right edge, perhaps via a set of vocabulary items such as those in (186).

(186) VOCABULARY ENTRY FOR [*a* [Num]]:

- (a) [*a*] ↔ /- L / / ____ |?, H| / [____ [Num]]
 (b) [*a*] ↔ /- L / / ____ |H| / [____ [Num]]
 (c) [*a*] ↔ /- H, L / / ____ |?| / [____ [Num]]
 (d) [*a*] ↔ ∅ / [____ [Num]]

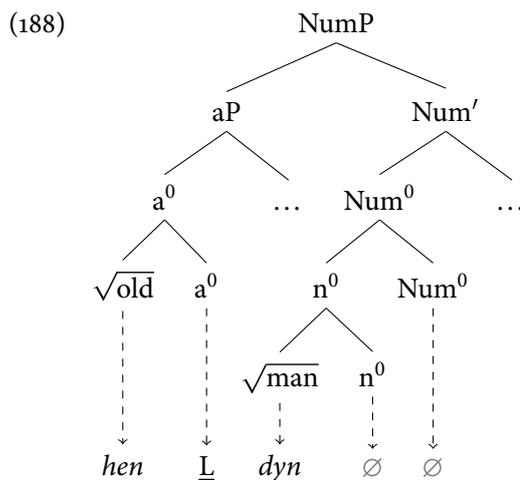
This proposal where the head *a* exhibits promiscuity in prenominal position also addresses another interesting problem that occurs with accounts that link mutation to the features [+fem, -pl]. As Iosad (2010, p. 124) points out, such accounts generally predict that a prenominal feminine adjective should itself undergo SM as long as it has the correct feature bundle. He gives the example in (187), taken in turn from Morgan

(1952, p. 12), which shows clearly that a poetically preposed adjective can still inflect for gender, so that the features should be present (the situation in terms of number is not clear).

- (187) *llom*/**lom* *aelwyd*
 poor.F hearth.F
 ‘poor hearth’

If *a* is responsible for the mutation on feminine singular adjectives, as well as the mutation following prenominal adjectives, then the absence of feminine gender mutation on prenominal adjectives is explained straightforwardly—while the adjective can still be subject to root suppletion reflecting the gender feature on *a*, *a* itself can only be spelled out once and so is unable to expone the mutation features on the left edge of the adjective itself.

Following the analysis proposed here, the phrase *hen ddyn* ‘old man’ will be the realisation of the structure in (188), showing here only the positions after all head movement has taken place.



Let us now turn to numerals, which form part of the *numP* projection dominating *NumP*. Numerals trigger various mutations, idiosyncratic to the specific numeral at hand, both on adjectives and nouns that follow them. For instance the feminine numeral *un* ‘one.F’ triggers *LSM*, both masculine *dau* and feminine *dwyr* trigger *SM*, *chwe* ‘six’ and masculine *tri* ‘three.M’ trigger *AM*, and numerals from five up trigger *NM* only on the words *blynedd* ‘year’, *blwydd* ‘year (of age)’, *diwrnod* ‘day’. As with adjectives, it is clear from obviously suppletive forms such as *tri* ‘three.M’

~ *tair* ‘three.F’ that **num** is also subject to ϕ -agreement, but the mutations are clearly a “lexical” property of the individual items at hand. This, the numerals mentioned above are accounted for simply by vocabulary entries such as those in (189).

(189) VOCABULARY ENTRIES FOR VARIOUS NUMERALS:

- (a) [num, #1, +fem] ↔ /in L / / ___ |?, H|
- (b) [num, #1, +fem] ↔ /in H, L / / ___ |?
- (c) [num, #1] ↔ /in/
- (d) [num, #2, +fem] ↔ /dvi L / / ___ |?, H|
- (e) [num, #2, +fem] ↔ /dvi L / / ___ |H|
- (f) [num, #2, +fem] ↔ /dvi H, L / / ___ |?
- (g) [num, #2, +fem] ↔ /dvi/
- (h) [num, #2] ↔ /dai L / / ___ |?, H|
- (i) [num, #2] ↔ /dai L / / ___ |H|
- (j) [num, #2] ↔ /dai H, L / / ___ |?
- (k) [num, #2] ↔ /dai/
- (l) [num, #6] ↔ /χwe H / / ___ |?, H|
- (m) [num, #6] ↔ /χwe/

...

The spellout of mutation with items such as those proceeds along the familiar lines we’ve seen repeatedly in the previous sections: the items are simply inserted and the floating element(s) incorporated into an item linearly adjacent to their right.

What however about the case of **NM** with temporal expressions and high numerals? I propose that these have been fossilised and represents actual root suppletion rather than synchronic mutation: a root such as $\sqrt{\text{day}}$ has two allomorphs, one nasal-initial allomorph sensitive specifically to higher order numerals, and an elsewhere item with the regular voiced plosive. I suggest that **num** carries a feature linked to subitability, the cognitive ability to instantly and accurately asses the quantity of small sets of objects, typically in the range of 1–4 items (cf. [Wiese, 2003](#), pp. 95ff). Numerals of small cardinalities (i.e. 1–4) carry a feature [+subitisable], while larger cardinalities are marked [–subitisable], which conditions allomorphy in the fossilised items, as shown in (190).

(190) VOCABULARY ENTRIES FOR *diwrnod* 'day':

- (a) $\sqrt{\text{day}} \leftrightarrow /dju\text{r}n\text{od}/$
 (b) $\sqrt{\text{day}} \leftrightarrow /nju\text{r}n\text{od}/$ / [num, -subitisable] ____

6.9.4 Determiners and mutation

Let us now turn our attention to the determiner. The Welsh definite determiner triggers LSM on feminine singular nouns. While not phonologically distinct, the definite determiner does not trigger any mutation in the masculine or plural. In addition, the determiner itself appears in three distinct surface forms: As an enclitic *'r* when preceded by a vowel-final item, *yr* if it otherwise precedes a vowel-initial item, and *y* if it otherwise precedes a consonant-initial item. The surface form of the determiner has no influence on whether it triggers mutation or not. These facts can all be gleaned from the examples in (191).

- (191) (a) *dyma* =*'r* *f*er*ch*/**merch*
 there the girl.F
 (b) *yr* a*f**r*/**ga**f**r*
 the goat.F
 (c) *y* *f*er*ch*/**merch*
 the girl.F
 (d) *y* *l**l*e*u**a**d*/**l*e*u**a**d*
 the moon.F
 (e) *y* *r**h*o*s*/**r*o*s*
 the moor.F
 (f) *y* *d**y*n/**d*d*y**n*
 the man.M
 (g) *y* *m**e**r**c**h**e**d*/**f*e*r**c**h**e**d*
 the girls.F.PL

Examples (191a–c) show that the surface realisation of the determiner does not play a role, (191d–e) show that we are dealing here with LSM and not regular SM, and (191f–g) show that the mutation does not apply in either the masculine or plural.

The standard assumption made in the literature is that the definite determiner itself is a mutation trigger. As [Hannahs and Tallerman \(2006\)](#) point out, this assumption leads to a paradox at [VI](#) in the case of *g*-initial mutation targets such as *gafr* ‘goat’ in [\(191b\)](#). The shape of the definite article is based on the post-mutation form of the target *gafr*, i.e. vowel-initial *afr*. However, if the definite article is responsible for triggering the mutation, no mutation can take place until the definite article is inserted. This in turn means that the definite article cannot be sensitive to the post-mutation form, counter to fact.

[Hannahs and Tallerman \(2006, pp. 804ff\)](#) propose that this can be resolved by making two assumptions: First, that content words are spelled out before function words. Second, that mutations can be triggered by not-yet-filled lexical slots. While they have other reasons for the first assumption which I will neglect here, in the structure of the [DP](#) argued for here bottom-up [VI](#) will derive the same result: any noun, adjective or numeral following the definite article will be inserted before the definite article itself. The second assumption is incompatible with accounts that assume a floating feature or morphophoneme at the right edge of a trigger, but is actually very much compatible with diacritic accounts such as [Pyatt \(1997\)](#) and especially with suppletion accounts such as [Green \(2006, 2007\)](#) and [Hannahs \(2013a,b\)](#). In the case of [Pyatt \(1997\)](#), a diacritic feature $[\{L\}]$ will be present on the head [D](#) before it undergoes [VI](#), and this diacritic is what triggers phonological readjustment on an adjacent item such as the noun. In the suppletion accounts, similarly the responsible diacritic or subcategorisation frame has nothing to do with [VI](#), so that as long as the mutated item undergoes [VI](#) first, by the time the determiner undergoes [VI](#) a vowel-initial form *_afr* will already have been inserted, assuring the correct selection of the definite article. Again, this cannot work in a floating feature approach such as [Lieber’s \(1983\)](#) or my own, because the floating feature only gets inserted together with the mutation trigger. So how can we resolve this apparent [VI](#) paradox?

I argue that mutation in cases such as [\(191\)](#) is not in fact triggered by the determiner, but by a definite-agreement node, Agr_D , adjoined to a head lower in the nominal projection. There are a number of reasons to doubt that the definite determiner is the mutation trigger.

First, the fact that it has an enclitic variant which still triggers mutation is highly suspicious. Even if mutation is determined on morphosyntactic grounds under most theories, the fact that the trigger belongs to a different domain on the surface than in the underlying syntactic structure surely represents a hurdle, even if not an impossible one, to the learner.

Second, while the definite article appears to trigger LSM on nouns, it appears to trigger full SM on adjectives, as shown in (192).

- (192) *y* l*om*/**llom* *aelwyd*
 the.F poor.F hearth.F
 ‘the poor hearth’

If the trigger of mutation here were a diacritic feature or similar on the head *D*, we should surely expect that it triggers the same type of mutation regardless of the word class of what follows. As far as I can tell this is more or less fatal for Green (2006, 2007), though Pyatt (1997) could propose a readjustment rule where the mutation diacritic on *D* is replaced when it is followed by a prenominal adjective, and similarly Hannahs (2013a,b) could propose a separate subcategorisation frame only applicable to prenominal adjectives. We cannot assume that the adjective simply undergoes regular feminine gender mutation because we have seen in (187) that a prenominal adjective such as *llom* ‘poor’ cannot mutate when it is preceded by an indefinite determiner.

Third, numerals¹² are not normally affected by mutation when they follow the definite article, as shown in the examples in (193), adapted from Williams (1980, p. 8).

- (193) (a) *y tair*/*d*air gwraig* ‘the three wives’
 (b) *y pedair*/*b*edair gwlad* ‘the four countries’
 (c) *y pum*/*b*um heol* ‘the five roads’
 (d) *y deg*/*d*deg adnod* ‘the ten sections’
 (e) *y pymtheg*/*b*ymtheg merch* ‘the fifteen girls’

An interesting exception to this is the numeral ‘two’ (*dau*, *dwy*), which mutates following the definite determiner regardless of gender: *y ddwy ferch* ‘the two girls’, *y ddau ddyn* ‘the two men.’

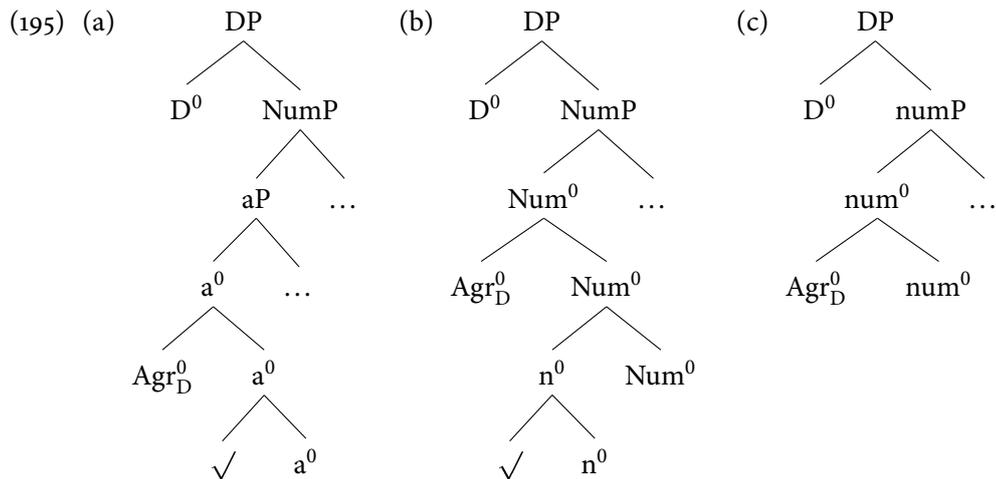
¹² Ordinals are subject to full and regular SM in this position. I assume that this is simply because they are recategorised and function much like a prenominal adjective.

Although the above fits the standard use described in e.g. Williams (1980), it appears to me as though many speakers can optionally mutate the numerals. In any case, it seems implausible to argue that for some reason numerals are immutable: not only are the forms *dau* and *dwy* mutable, but when used as ordinal numbers or pronouns (e.g. *y bedair* ‘the four.F’), the numerals undergo regular mutation. The effect also cannot be attributed to their position either: quantifiers such as *pob* ‘every’ in Welsh sit in **D** and trigger regular **SM** on any item adjacent to their right, including the numerals, as we would expect for a determiner that is an actual mutation trigger.

I conclude from the above that it is untenable to maintain that the actual trigger of mutation here is the feminine definite determiner. What I propose instead is that mutation following the definite determiner in Welsh is a form of definiteness-agreement marking. Similar to what Kramer (2009) proposes for Amharic definiteness-agreement, I propose that there is a morphological insertion rule which inserts an agreement head Agr_D . Agr_D is inserted on any head X^0 that is both c-commanded by **D** and linearly adjacent to **D**. The insertion rule for Agr_D is given in (194).

$$(194) [X^0] \rightarrow [\text{Agr}_D X^0] / [{}_{\text{DP}}\text{D} \text{ ___}]$$

The Agr_D -insertion rule in (194) means that **DP**s with an initial numeral, adjective and noun will have the structures in (195a–c), respectively (after head movement, irrelevant material omitted).



I follow [Kramer \(2009\)](#) in assuming that Agr_D copies all the features from D , including the ϕ -features, not just $[\pm\text{def}]$. Recall that adjectives following the feminine definite determiner receive SM , while nouns receive LSM , and numerals normally receive no mutation. All this can be captured with the four vocabulary entries in (196).

(196) VOCABULARY ENTRIES FOR Agr_D :

- (a) $[\text{Agr}_D, +\text{def}, +\text{fem}] \leftrightarrow / \underline{L} - / \underline{\quad} | \{?, H\}$
- (b) $[\text{Agr}_D, +\text{def}, +\text{fem}] \leftrightarrow / \underline{L} - / \underline{\quad} | H | / [\underline{\quad} [a]]$
- (c) $[\text{Agr}_D, +\text{def}, +\text{fem}] \leftrightarrow / \underline{H}, L - / \underline{\quad} | \{?\}$
- (d) $[\text{Agr}_D, +\text{def}, +\text{fem}] \leftrightarrow \emptyset / [\underline{\quad} [\text{num}]]$

An interesting property here is that (196b), the allomorph that causes voicing on fortis liquids, is conditioned by the presence of a . This derives the effect that adjectives show full SM , while for other items (196b) cannot be inserted giving rise to LSM . The general absence of mutation on numerals is due to (196d), which enforces zero exponence in these cases.

Recall however that numerals may be mutated optionally. There are two possibilities as to how this situation might come about. One rather interesting possibility is this: entries (196a–d) all have the same set of features to spell out, and (196a,c) are conditioned by the presence of one segment. Likewise, (196d) is conditioned by the presence of one terminal. If we assume that phonological and morphosyntactic conditioning are weighed the same for purposes of the Subset Principle, this gives speakers a free choice between insertion of (196a,c) and (196d). It is not currently clear whether this is feasible as a general theme in DM , and it may well be that morphosyntactic environments always trump phonological ones. If this is the case, we would need a further two vocabulary entries replicating (196a,c) and conditioned to the presence of a num head, as shown in (197).

(197) VOCABULARY ENTRIES FOR Agr_D on num :

- (a) $[\text{Agr}_D, +\text{def}, +\text{fem}] \leftrightarrow / \underline{L} - / \underline{\quad} | \{?, H\} / [\underline{\quad} [\text{num}]]$
- (c) $[\text{Agr}_D, +\text{def}, +\text{fem}] \leftrightarrow / \underline{H}, L - / \underline{\quad} | \{?\} / [\underline{\quad} [\text{num}]]$

Note that there is no need for a third entry targeting liquids in (197), because none of the Welsh numerals have an initial liquid. Presumably the vocabulary entries in (197) would be further conditioned by sociolinguistic factors.

Finally, recall that the numeral *dau/dwy* ‘two’ is mutated in this context, regardless of gender. This reflects a single additional vocabulary entry, shown in (198).

(198) VOCABULARY ENTRY FOR Agr_D ON [num, #2]:

$$[\text{Agr}_D, +\text{def}] \leftrightarrow / \underline{L} - / \text{ / } [\text{ ____ } [\text{num}, \#2]]$$

Vocabulary item (198) is also interesting in that it can be left completely unspecified for any phonological conditioning environment, further highlighting the point how the various allomorphs and conditions on these that arise in the account I have proposed can vary in every constituent part of their “regular” make-up.

Since Agr_D realises the definiteness-induced mutations, the definite determiner D itself can be realised simply in its three surface variants (enclitic *r*, pre-vocalic *yr*, or simple *y*), appropriate to the given environment. Vowel initiality on items such as *gafr* ‘goat’ will already have been derived during VI on more deeply embedded Num .

6.10 SUMMARY

In this chapter, I put forward a new floating element account of Welsh ICM . The principal innovation over previous floating feature accounts such as Lieber (1983) was the combination of floating melodic material with phonologically conditioned allomorphy. While positing several underlying allomorphs with various floating features to effect different mutations might at first seem counter-intuitive and uneconomical compared to analyses which posit a single triggering feature for each mutation, we saw that it is precisely this fractioning of the triggers into several suppletive forms which predicts many types of trigger-dependent variation. In most of these instances of variation, diacritic accounts normally have to posit an additional ad-hoc diacritic to account for variant behaviour, and possibly include additional allomorphs (for each word in the language) in target suppletion accounts. The triggers I have proposed principally consisted of these parts: a formative that is spelled out (e.g. [num, #2, -fem]), a phonological base form (e.g. /dai/ for the numeral *dau* ‘two’), floating features at the right edge of that base, e.g. a floating element [L], a phonological conditioning environment (such as preceding segments

containing the features $[?, H]$), and occasionally an additional morpho-syntactic conditioning environment (e.g. in adjacency to a head *a*). In the course of this chapter, and especially in deriving mutation in the DP in §6.9, we saw that every single one of these components might vary, giving rise to all the complex types of trigger-dependent variation that occur in Welsh. Neither target suppletion nor rule-based accounts offer a straight-forward explanation for why we should find this type of variation and how we might account for it efficiently, only the floating element account correctly places the locus of variation on the trigger, predicts these types of variation and encodes them in a natural way.

As opposed to target suppletion accounts, the model put forward here correctly predicts the productivity of the mutation system without recourse to some additional learning strategies involving WFSs or similar devices to populate the lexicon. Unlike Lieber's (1983) single-underlier account, the process of indiscriminate incorporation followed by resolution of illicit melodic structure by general phonological mechanisms (i.e., resolution of licensing constraints), avoids the paradoxical requirements for the underlying forms of mutation targets, yet manages to account for the disparate effects of different mutation patterns on the same type of segment. Unlike the other allomorphic accounts, Green (2006, 2007) and Hannahs (2013a,b), the model put forth here keeps in line with the general observation that suppletion is mostly a property of f-morpheme and rather marked on l-morphemes. In §6.9, we saw that even prenominal adjectives, often seen as good candidates for l-morphemes that trigger mutation, are best reanalysed in a way that makes their apparent mutation property the realisation of an f-morpheme, namely their categoriser. The only true cases of suppletion in l-morphemes I have posited above are those where fossilised mutations are involved. This is in stark contrast to the previous suppletion accounts, which essentially proposed that very few f-morphemes, but virtually every l-morpheme in Welsh is highly suppletive. Unlike almost all of the diacritic accounts, the Trigger Constraint actually derives from the model itself (floating elements cannot possibly skip over random morphosyntactic items in the phonology), rather than having to be externally stipulated in some way or other.

Finally, I have demonstrated here that even the more complex facts of Welsh mutation such as the intricacies of gender-dependent mutation

in the DP, can all be derived correctly by an account that, first of all, makes no use of any empirically unverifiable ad-hoc diacritics, and, more importantly perhaps, respects strict modularity. There is no need for modularity-violating devices such as phonological readjustment rules or module-transcending diacritics, so that we arrive at a theory that is more restrictive, makes better predictions, and is compatible with a simpler, modularity-respecting architecture.

Exceptional Non-Mutation

7.1 INTRODUCTION

We have seen in Section 4.9.2 that the principal type of target variation in the Welsh mutation system is the exceptional non-mutation of a target which we would expect to exhibit mutation based on its phonological characteristics. Compare for instance the behaviour of *gêm* /ge:m/ ‘game’ and *gên* /ge:n/ ‘jaw’. Both forms appear on the surface to be identical except for the place of articulation of the final nasal—a property that has no bearing on mutability in Welsh. Yet the former is entirely immutable and the latter takes part in the mutation process as expected, as illustrated in (199):

| | | | |
|-------|------------|------------|----------------|
| (199) | <i>gêm</i> | <i>gên</i> | |
| | [ge:m] | [ge:n] | ‘game/jaw’ |
| | [də ge:m] | [də e:n] | ‘thy game/jaw’ |
| | [və ge:m] | [və ɲe:n] | ‘my game/jaw’ |

There are two immediate questions that arise from this situation: Why are some items immutable? How is immutability implemented in the grammar of Welsh? The first of these two questions is mainly one for the historical linguist to answer. The answer to the latter question—which is the one I seek to answer here—does however give us some clues to the former, as we shall see.

7.2 PREVIOUS ACCOUNTS

Of the various theories of mutation that have been proposed only a subset explicitly addresses the problem of exceptional non-mutation. Ball and Müller (1992) discuss the data leading to what they call “lexical blocking”

“If a # or an ω is replaced by a ∫ and phonological processes are then said to occur in the vicinity of a banana, rather than of a # or an ω, the workings of the interface as we know it will remain unchanged. By contrast, a CV unit cannot be replaced by a ∫ for the trivial reason that it has a phonological identity which is independent from its eventual function of carrying morpho-syntactic information: an onset is an onset, not a banana; a nucleus is a nucleus, not a banana.”

—Scheer (2014a, p. 316)

an oversimplification. Historically, personal names in Welsh underwent regular mutation (as they still do in the q-Celtic languages), but today this is virtually confined to the Literary Welsh register. Exceptions in the colloquial language are found for some speakers with family names (Ball and Müller, 1992, p. 205 give *dros Domosiaid Y Bala* ‘the Thomas’s of Bala’ as an example) and names of historical figures such as characters from the Mabinogion or those featured very commonly in poetry.³ Though note that, as far as I can observe, this is invariably linked to the particular character; while *Llywelyn* might occasionally be mutated to *Lywelyn* when referring to Llywelyn the Great, it would not be mutated referring to any now-alive person by that name. I have also observed Welsh speakers purposely mutating the names of friends by way of jesting, though this is probably a paralinguistic phenomenon.

Rule (200) might of course hold in spite of such complications if we make some stipulation that historical or fictional characters may be treated as inanimate in these contexts, or that there is some feature that encodes “fictionality” or another trait that can distinguish them. However, as we have already seen in Section 4.9.2, personal names are really the only reasonably robust category for which this type of rule could even be considered; for all other commonly immutable categories (place names, g-initial items, borrowing, etc.) the rate of exceptions is much higher, and the immutable items are often in fact outnumbered by the mutable ones within the same category. Once we consider this, the manipulability of the proposed diacritic by the morphosyntax does not appear to be such a great advantage any more: even if there are useful generalisations to be made, there needs to be a way of specifying immutability item-by-item across the board to account for the mutable items within what might appear to be largely immutable categories. Furthermore, if we subscribe to this solution, we also have to answer the question why there appear to be no other rules such as (200) in the grammar of Welsh (or any other Celtic language). We would normally expect that these assignments should be quite common, as they reflect the type of diachronic generalisation we commonly find with other phenomena and are presumably more memory-

³ A possible reason for this might be that many bards writing in high register Literary Welsh will apply regular mutation to personal names. A reader who is familiar with a particular character primarily through such media might very well come to then adopt that practice for this particular character.

efficient than memorisation of the exceptions by marking each one of them with an individual diacritic \mathcal{M} in their lexical entry.

While Pyatt (1997) does not make explicit the process by which targets specified \mathcal{M} are prevented from mutation (she simply states that “[they] have been specified with some sort of diacritic, [...] specifying that they never mutate.”—Pyatt, 1997, p. 151), one possible solution that would work for all the diacritic accounts including Ball and Müller (1992), Kibre (1997), Pyatt (1997), Green (2006, 2007) and Hannahs (2013a,b), is to propose that \mathcal{M} triggers deletion of other mutation-inducing diacritics in its vicinity. This could, for instance, be achieved by a set of rules such as (201):

- (201) (a) $\{L\} \rightarrow \emptyset / [_ , \mathcal{M}]$
 (b) $\{S\} \rightarrow \emptyset / [_ , \mathcal{M}]$
 (c) $\{N\} \rightarrow \emptyset / [_ , \mathcal{M}]$

Following such a deletion rule in Pyatt’s (1997) model the default (non-trigger) diacritic $\{z\}$ would be inserted and no mutation triggered. For Green (2006, 2007) and Hannahs (2013a,b) the need to select corresponding allomorphs would be averted. In the other accounts the set of phonological rules sensitive to the diacritic would simply not be triggered. The point of this is not my proposing an implementation for a blocking diacritic here though. Rather, it is to show in quite simple terms that for most diacritic based accounts the common solutions to exceptional non-mutation converge on a singular addendum: the invention of yet another diacritic to undo the damage done by the other diacritics.

Although S.J. Hannahs (personal communication, August 21, 2008) seems to prefer a solution similar to the above, where immutable forms are lexically marked as exceptions (e.g. with an \mathcal{M} diacritic) and then treated as immutable by the grammar, the accounts in Green (2006, 2007) and Hannahs (2013a,b) are also compatible with a different solution. Because their proposals rely on targets which have a set of lexically listed mutation alternants, immutability can be accounted for by assuming that immutable forms either lack the mutation alternants or have identical “alternants” for every possible mutation condition.

Hannahs (2013a,b) does not discuss non-mutation in any detail and he indicates a preference to treat total immutability as a separate phenomenon from items that (fully or partially) do not take part in mutation

Green (2007) presents a similar but slightly different proposal, namely that in immutable forms all of the allomorphs are exactly identical (cf. Green, 2007, p. 134). Under this proposal the lexical entries for *gên* and *gêm* would presumably⁵ differ as shown in (204).

| | |
|------------------------|-----------------------|
| (204) (a) <i>gên</i> : | (b) <i>gêm</i> : |
| /ge:n/ _{RAD} | /ge:m/ _{RAD} |
| /e:n/ _{SM} | /ge:m/ _{SM} |
| /e:n/ _{LSM} | /ge:m/ _{LSM} |
| /e:n/ _{MM} | /ge:m/ _{MM} |
| /ɲe:n/ _{NM} | /ge:m/ _{NM} |
| /ge:n/ _{AM} | /ge:m/ _{AM} |

Note that the forms in (204) contain many duplicate entries for both forms, even the regularly mutable *gên*, since /g/-initial targets do not mutate in some of the contexts demanded by the Welsh mutation system and their mutation reflexes in the contexts of **SM**, **LSM** and **MM** are identical.

I have already discussed the issues this presents in terms of redundancy and the prediction that forms may randomly vary in completely arbitrary ways between even closely related patterns such as **SM** and **LSM**, and we see both points again here. In fact, this implementation is symptomatic of especially the latter point in its poor ability to make predictions: the only thing that cognitively differentiates a schema such as (204a) from (204b) under Green's (2006; 2007) proposal is that the former fits into the Bybeean **WFS** for items with an initial voiced plosive, while the latter doesn't. The account thus merely predicts that non-conforming schemata such as (204b) may entail a learning bias and so be rarer (and subject to diachronic regularisation). It fails completely to make any predictions as to what form deviating schemata may take. Any arbitrary departure from the schemata consistent with the **WFSs** is in principle created equal. What then makes the repeated entries “/ge:n/_{RAD}” and “/ge:n/_{AM}” in (204a) different from the hypothetical vocabulary item /ge:ɲ/ in (205a), which is only exceptional under **MM**, or the hypothetical vocabulary item /ge:l/

WFS for Irish lenition:
 $/C_{[-cont, -son, \{lab, dor\}]}X/_{radical}$
 \leftrightarrow
 $/C_{[+cont]}X/_{lenition}$
 (Green, 2007, p. 133)

⁵ Green (2006, 2007) does not actually ever provide a fully explicit listing of the complete alternants for any form, the listing given here thus represents my interpretation of his prosaic description of the state of affairs with such forms.

in (205b), for which all but the radical form entail initial nasalisation of the NM-type, rather than preserving identity with the form marked RAD?

| | |
|-------------------------------|------------------------|
| (205) (a) *g ^é ng: | (b) *g ^é l: |
| /ge:ŋ/ _{RAD} | /ge:l/ _{RAD} |
| /e:ŋ/ _{SM} | /ŋe:l/ _{SM} |
| /e:ŋ/ _{LSM} | /ŋe:l/ _{LSM} |
| /ge:nŋ/ _{MM} | /ŋe:l/ _{MM} |
| /ŋe:ŋ/ _{NM} | /ŋe:l/ _{NM} |
| /ge:ŋ/ _{AM} | /ŋe:l/ _{AM} |

Yet forms such as those in (205) are unattested. If some Welsh word is immutable then it is always immutable under all conditions, and the account proposed by Green (2006, 2007) fails to account for this restriction, incorrectly predicting that the completely unattested schemata in (205) should be equally possible. If one assumes that Hannahs' (2013a; 2013b) proposal doesn't allow such divergence from the generalised WFSs that the learner infers via pattern extraction, but only permits absence of associations as deviations from those patterns, then we predict that hypothetical schemata such as (205b) should be impossible. This is because fall-back is always to the radical and no form other than NM would be consistent with the extracted patterns if it had an initial nasal. Forms with a schema similar to (205a)—or, more generally, any subset of missing mutation alternants—could however not be ruled out, and the theory again fails to account for the generalisation, even if to a much lesser extent than Green (2006, 2007).

Of course both the accounts of Green (2006, 2007) and Hannahs (2013a,b) are compatible with both of the two proposals for immutability just discussed (as well as the diacritic approach discussed earlier). We could imagine a version of Green (2006, 2007) where the only permitted deviation is absence of some alternant, and we could imagine a version of Hannahs (2013a,b) where immutability is accounted for by association to other forms which are identical to the radical. Green (2006, 2007) explicitly argues for his version with essentially arbitrary listings, which he views as a strength of his account, so presumably would not be satisfied with this swap. Hannahs (2013a,b) on the other hand makes no overt arguments in either direction (and the author envisions a lexical

exception-marking solution), but I have argued that the omission variant would be most in line with the theory proposed there. Using the criteria of testability, accuracy and predictive power, it may seem preferable to situate Green's (2006; 2007) account in the more restrictive framework, with addition of the same restriction on the ways in which WFSs can be violated that I have proposed for Hannahs (2013a,b), and not vice-versa. However, the apparently more restrictive account with the absent alternants harbours an additional problem. If some lexical items have no associated forms marked for AM, SM, NM, &c., then what happens when a subcategorisation frame, e.g. $[[\dots]_{XP} [___<soft>]_{XP}]$, demands just such a missing alternant and no associated form is able to satisfy it? One might expect that this leads to ineffability and a crash of the derivation. In order to avoid this then, the proposal with omitted alternants would require us to change the way subcategorisation (and even syntactic government, in the case of Green 2006, 2007) work specifically for mutations. We have to stipulate that subcategorisation for mutation in these cases converges with a form marked <radical>/RAD iff no matching form is available otherwise.⁶

In summary, prior approaches to immutability have taken one of two routes. Diacritic-based accounts achieve non-mutation by positing yet another diacritic with the function of blocking either the mutation-triggering diacritic or the associated mutation rules. The accounts based on lexically stored target alternants either posit a set of identical alternants for each mutation pattern or the absence of the alternants altogether. Both approaches are inadequate. The diacritic approach suffers from all the problems associated in general with such diacritics, but the principal two issues are these:

- (i) Diacritics are inherently unable to make predictions. Because they are completely arbitrary and have no independent manifestation or fixed effects they can be ascribed any function whatever. We could easily imagine a diacritic only blocking say MM, or AM, or both LSM and NM but none of the others, or a diacritic that blocks

“If a theory doesn't make any testable predictions, what good is it?”

—Someone on the internet

⁶ An interesting way out perhaps would be to explore whether the subcategorised (diacritic) features can be arranged in such a way that an account in terms of the Subset Principle (Halle, 1997) familiar from DM becomes feasible, where the radical form would then function as the elsewhere item.

mutation only on velar-final words, or only on feminine singular adjectives, yet such systems appear to be non-existent.

- (ii) Diacritics don't explain non-mutation. They are but a stand-in for some unnamed principle which may explain their effect without specifying what that principle is. That is to say, diacritics of this type are merely a formal device to encode the observation that sometimes items don't mutate, and so cannot possibly in themselves be the explanation for why those items do not mutate—unlike say a theory where non-mutation follows from some other principle which exists independently of non-mutation.

The lexical listing approach simply makes the wrong predictions or is inherently unable to make the correct predictions regarding mutations. Under arbitrary listing of alternants we would expect that non-mutation is no different from any other kind of arbitrary suppletion and the variant targets could follow any number of unattested schemata—there is no way of deriving the fact that in this type of target variation all alternants are invariably identical to the radical. If these approaches are restricted to not allowing variant schemata but only non-listings this would require us to modify the (universal) mechanism underlying subcategorisation to encode a fact specific to Celtic mutations, most certainly an undesirable path to pursue.

7.3 THE EMPTY CV ALTERNATIVE

We have seen in the previous section that neither approaches relying on a blocking diacritic nor approaches relying on full lexical listing of mutation alternants are able to provide us with a satisfactory theory of immutability. In this section I want to advance an alternative view to both of these theories: immutability arises from the structural properties of an item's phonological representation.

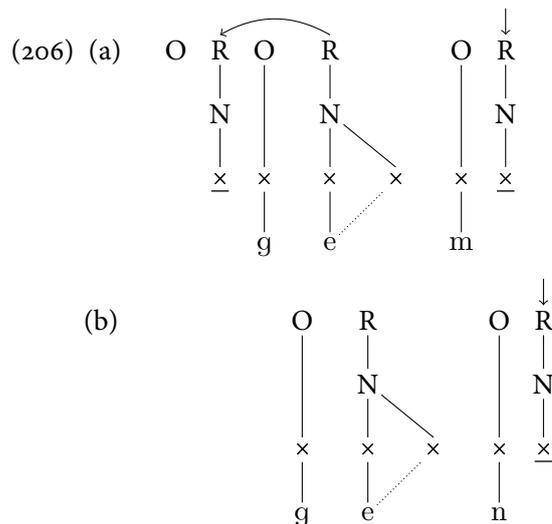
If the phonological effect of the mutations arises from the incorporation of a floating phonological feature within the phonological component of the grammar, as argued for by Lieber (1983) and as I have argued for in Ch. 6, then non-mutation can arise only in one of two ways: the floating feature fails to be incorporated into the onset of the adjacent word, or the

I discuss how this extends to the theories of Kibre (1997), Pyatt (1997), Green (2006, 2007) and Hannahs (2013a,b) in §7.8.

floating feature is not inserted to begin with. Clearly the first of these two options can only be down to the phonological structure of the adjacent target not supporting the incorporation of the floating feature. As for the second case, since under my proposal trigger allomorph selection is conditioned phonologically by the target, whether a floating feature is present in phonology also depends entirely on the phonological structure of the target. Floating feature analyses such as mine and Lieber's thus imply that immutability must be down to the structural properties of the target. The question then is, what is the property that might make specific target items unable to receive the floating feature?

7.3.1 Proposal

The hypothesis I want to put forward is that what makes immutable vocabulary items structurally incompatible with the floating feature is an initial empty OR sequence, in the manner proposed first by Lowenstamm (1999). Specifically, I propose that Welsh exhibits a contrastive use of such initial empty structure across different lexical items. That is to say, in Welsh some vocabulary items are endowed with an initial empty OR sequence in their underlying representation, while others are not. Immutability is the result of initial empty structure. A pair of immutable and mutable items such as *gêm* and *gên* have the underlying representations in (206a) and (206b), respectively.



The initial OR in (206a) prevents mutation from applying to *gêm*. In the account I have proposed this is simply a consequence of selection at Vocabulary Insertion. Recall that under my account mutation triggers have various allomorphs, only some of which contain floating material, and the insertion of which is dependent on the elemental make-up of the target's initial onset. For instance, the NM-triggering possessive *fy* has a vocabulary entry as in (207):

(207) VOCABULARY ENTRY FOR *fy* 'my':

- (i) [D, 1, -pl, gen] ↔ /vəL / / ___ |ʔ|
- (ii) [D, 1, -pl, gen] ↔ /vən / / ___ V
- (iii) [D, 1, -pl, gen] ↔ /və /

Because the first entry (207i) is contextually sensitive to an onset containing |ʔ| but the initial onset of an immutable item (206a) is entirely devoid of content, the conditions for inserting (207i) are not met. Likewise the conditions for inserting the pre-vocalic allomorph (207ii) are not met because the initial nucleus does not dominate an audible skeletal position.⁷ Consequently the elsewhere item (207iii) is inserted. Since the elsewhere item contains no floating material, we obtain the form [və ɣe:m], and not *[vən ɣe:m] or *[və ɣe:m].

In contrast, the leftmost onset in mutable *gên* (206b) contains the element |ʔ| and therefore selects vocabulary entry (207i), with a floating element |L|. When incorporated, the floating |L| results in the form [və ɣe:n], exhibiting regular mutation. As we can see from this, since in the Welsh system the floating material responsible for mutation is always contingent on phonological conditions in the target, it then follows that targets with initial empty onsets can never undergo mutation. Thus, the presence of an initial empty OR blocks mutation.

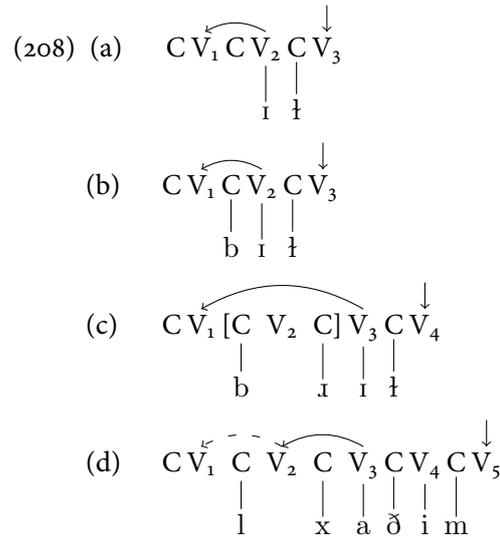
7.3.2 What else the initial CV does

Lowenstamm (1999), working in Strict CV Phonology (Lowenstamm, 1996; Scheer, 2004),⁸ proposes that the left edge of “major categories”

⁷ That is, I understand “V” in a contextual description to be shorthand for a pointless onset followed by a nucleus that is *not* p-licensed.

⁸ Strict CV Phonology is a version of GP which proposes that all prosodic structure is captured by strictly alternating non-branching CV slots, i.e. there are no prosodic

consists of an empty initial CV span. Depending on the initial segmental structure of a word, the nucleus in the initial empty CV may either be governable by a following nucleus or ungovernable. As shown in (208), it is in principle governable before empty onsets (English *ill*, 208a), singleton onsets (English *bill*, 208b) and true branching onsets (English *brill*, 208c), but not before bogus clusters (Hebrew /lkadim/ ‘capture.N.PL’, 208d).

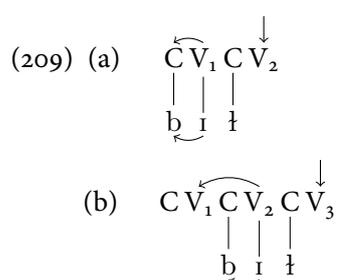


In (208a,b) V_2 properly governs V_1 in the usual way. The bracketed cluster [bɔɪ] in (208c) is accorded a special status in Strict CV, broadly comparable to a branching onset in traditional GP: the two Cs contract a relation termed Infrasegmental Government, by which the sonorant governs the obstruent across an empty nucleus. The empty nucleus that is sandwiched in the middle of this infrasegmental domain is stipulated to be categorically inert and thus both silent and transparent to Proper Government from V to V, which can reach across the infrasegmental domain (Scheer, 1996). Consequently in (208c) V_3 is able to properly govern V_1 , skipping V_2 which is sandwiched by the TR cluster. Conversely, in (208d), the RT cluster /lk/ (/k/ lenites to [x]) does not satisfy the requirements for Infrasegmental Government, so that V_3 will properly govern V_2 . V_2 in turn is then unable to properly govern V_1 by virtue of being governed itself, meaning that V_1 remains ungoverned.

constituents such as O, R, and N. Strict CV attempts to capture the effects classically ascribed to such constituents instead by positing additional and/or modified licensing relations between the C and V slots. The details of how this is done are not of major relevance here, so I will not discuss them further.

Thus, concludes Lowenstamm (1999), there are two possible systems of empty initial CV structures: those where its nucleus is always governed, such as in English which does not allow clusters of type (208d), and those where it is only governed some of the time and ungoverned at others, such as Hebrew, which allows all of the possible structures in (208). In order to neatly separate the two systems, Lowenstamm (1999, p. 164) proposes a Uniformity Convention, whereby in any given language, “if the initial CV is not licensed in all cases, then the site must remain unlicensed throughout the language.” Consequently, in a language like Hebrew the initial CV would be left ungoverned by principle across all of the possible structures.

One of the original aims of Lowenstamm’s (1999) proposal was to find a phonological, non-diacritic replacement for the word-initial boundary marker #. The CV unit, being a true phonological object with an identity of its own, as opposed to the #, can then be drawn on to explain various phenomena related to the left edge of the word and traditionally associated with the environment ‘#’. Lowenstamm (1999) specifically addresses the fact that domain-initial consonants are typically phonologically strong, something that is unexpected under the assumptions of Strict CV, which proposes that government weakens a position while licensing strengthens it (cf. Ségéral and Scheer, 2001, 2008). Without an initial CV, the initial consonant is both targeted by the following nucleus’ (V_1) government and licensing as shown in (209a) and so is expected to be weak; conversely with the initial CV as in (209b) the consonant is subject to licensing from V_2 , while V_2 ’s government targets V_1 instead, thus leaving the consonant in a strong position.



There is no immediate explanation for such facts if we assume their natural environment is a diacritic #, but with an initial CV in its stead they follow directly as a consequence of the CV’s regular phonological properties.

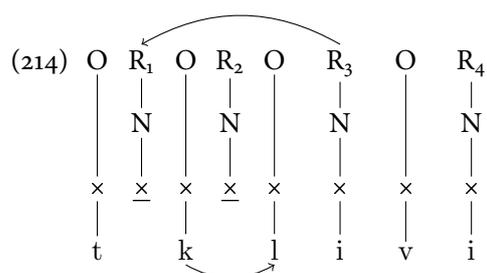
Lowenstamm (1999) also draws on the initial empty CV to explain asymmetries between cliticisation behaviour in the two types of systems (with a governed and an ungoverned initial CV), and it has also since been employed to explain the contrast between RT and TR type languages and the effects of phase boundaries (for an overview see e.g. Kijak, 2008).

7.3.3 *Procedural v. underlying initial CVs*

One important further issue to note with regard to the initial empty CV is that Scheer (2014a) argues that the initial empty CV is never lexical. Rather, he suggests, it is always inserted by morphological processes. In contrast, Lowenstamm (1996) does not make any arguments for or against the initial CV being stored lexically or inserted morphologically. I depart from this view in assuming that initial empty CV's—at least of the governed type—may form part of the underlying (i.e. lexical) representation of vocabulary items: after all, as long as the initial site can be phonologically licensed within a single domain, it is a licit representation and so can in principle be stored lexically. Note that this does not deny the possibility of a morphological initial empty CV. It rather is a rejection of the claim that every initial empty CV sequence is always an object originating purely from morphological circumstance (e.g. a spellout of whatever node demarcates words or utterances in the morphosyntax). While I won't have much to say about the morphological type of the initial empty CV as used in Scheer (2014a), it seems apt to briefly point out that the initial empty structures potentially originating in these two different ways (one from an item's underlying representation, one arising from morphology) are not in conflict. As Lowenstamm (1999) proposes in the case of serial cliticisation, stranded initial empty structure will ultimately “simply wither away” (Lowenstamm, 1999, p. 163). Such withering away of the additional, morphological, empty structure would also result from Kaye and Gussmann (1993) and Kaye's (1995) proposal of a truncation process applicable under juncture, where replicated empty structure is truncated to a single instance of empty structure. Kaye and Gussmann (1993) term the process Reduction. Reduction is defined in (210):

do not appear to adhere to the same restriction as French in regard to whether they do or don't allow proper government across branching onsets. As we have already seen above, this is assumed to be the general case in Strict CV, where government can pass across infrasegmental domains (Strict CV's equivalent of a branching onset). If proper government across a branching onset is possible, then it might be unnecessary to stipulate a parameter specifically to license the initial OR, at least in languages that do not behave like French.

On the basis of [Kaye and Gussmann's \(1993\)](#) analysis of Polish word-initial clusters, [Cyrán \(2010, pp. 146f\)](#) concludes that Polish behaves differently to French in that it does allow proper government across branching onsets, possibly suggesting that the French restriction may be parametric. This follows from Polish triconsonantal initial clusters such as [tkl] in *tkliwy* /tɔkɫivi/ 'loving', where the empty nucleus between the first consonant and the branching onset remains silent, meaning that it must be governable by the following filled nucleus /i/. Faced with the problems of such clusters, [Kaye and Gussmann \(1993\)](#) originally did not abandon the proposal that proper government is blocked in this situation. Rather they proposed an additional notion of *interonset licensing*, very similar in formulation to infrasegmental government in Strict CV. The interonset relation can be contracted between any two onsets that could form a licit branching onset, and the nucleus sandwiched between them is then suppressed and can be governed over, while normal branching onsets are still impermeable to proper government. This is illustrated for Polish *tkliwy* below (cf. [Cyrán, 2010, p. 146](#)):



In (214), [k] interonset governs [l], and R₂ is p-licensed by virtue of being sandwiched in this interonset relation, thus remaining silent. Since interonset government does not inhibit proper government, R₃ can now properly govern R₁, which thus remains silent also.

It is rather undesirable to have both branching onsets (with their internal government relations) and interonset licensing in our theory simultaneously. Not only does it bloat the theory unnecessarily, it also predicts that we find three types of languages: ones where TR clusters are always impermeable to proper government, ones where TR clusters are always permeable, and ones where they are sometimes permeable (i.e. some TR sequences may be genuine branching onsets, while others may be the result of interonset government). The first case is manifest in French, the second in Polish, the third is unattested. Note that [Kaye and Gussmann \(1993\)](#) actually continue to use genuine branching onsets for the #TR sequences in #TRXV and #TRV initial strings, illustrating the point that those mixed systems are precisely what they predict. Yet, no system, including Polish, ever contrasts #TRØX with #[TØR]ØX or #XØTR with #XØ[TØR] sequences where one shows a different pattern of vowel-zero alternation between the X and the TR sequence than the other. In fact, since for [Kaye and Gussmann \(1993\)](#) interonset government can only be contracted between TR sequences and the p-licensing of the sandwiched nucleus is obligatory in that case, there is no possible empirical data that could ever support a differentiation between the two based on surface forms. As [Cyrn \(2010\)](#) points out, interonset government as proposed by [Kaye and Gussmann \(1993\)](#) is effectively identical to saying that Polish allows proper government over branching onsets. Parametrically permitting government across branching onsets is thus the simpler and empirically better solution, and I will adopt that view here. A tentative¹² formulation is given in (215):

(215) ONSET PERMEABILITY PARAMETER:

On Proper government can pass across intervening branching onsets.

[*Off*] Proper government is blocked by intervening branching onsets.

I assume that Onset Permeability in Welsh, like in Polish, is set to *On*.

¹² The parameter may be derived from a different property (i.e. a different parameter), which results in the blocking/non-blocking dichotomy. If we take [Charette \(1990\)](#) as a starting point, one candidate may be the level at which government-licensing is applied: if it applies at licensor projection then branching nuclei block proper government, if it applies at an earlier projection it does not. I will not explore this possibility here.

Although Welsh shows some vowel-zero alternations, the data does not allow as clear a diagnosis of the case as do French and Polish. Antepenultimate deletion (Hannahs, 2013b, pp. 115ff) gives rise to vowel-zero alternation across initial branching nuclei in some trisyllables, cf. e.g. *edrych* [ɛdriχ] ‘to look’ and *drycha* [driχa] ‘look.IMP’. However, the deletion form is often in free variation with the non-deletion form (i.e. deletion is optional, at best), the process is highly irregular and idiosyncratic (only some of the possible target forms undergo it), and it also applies to entire syllables including onsets, e.g. *Nadolig* [nadɔliɡ] ~ *Dolig* [dɔliɡ] ‘Christmas’. This all suggests that the antepenultimate deletion has a diachronic origin and is synchronically situated in the lexicon: some trisyllabic forms have two exponents in the vocabulary list, one with and one without the initial syllable, which both have the same conditioning factors attached, as shown in (216–217):

(216) VOCABULARY ENTRY FOR *edrych* ‘look’:

- (i) $\sqrt{\text{look}} \leftrightarrow /ɛdriχ/$
- (ii) $\sqrt{\text{look}} \leftrightarrow /ɛdriχ/ / [__ \text{ OR}]$
- (iii) $\sqrt{\text{look}} \leftrightarrow /driχ/ / [__ \text{ OR}]$

(217) VOCABULARY ENTRY FOR *Nadolig* ‘Christmas’:

- (i) $\sqrt{\text{xmas}} \leftrightarrow /nadɔliɡ/$
- (ii) $\sqrt{\text{xmas}} \leftrightarrow /dɔliɡ/$

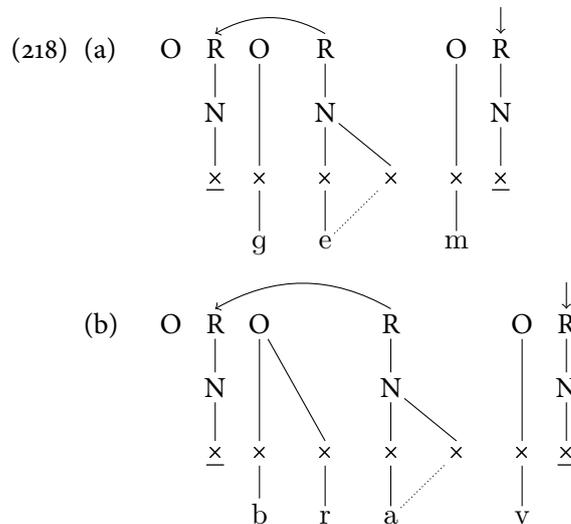
At vocabulary insertion, when $\sqrt{\text{look}}$ is spelled out with a monosyllabic suffix the subset principle cannot disambiguate between (216ii) and (216iii) so that both candidates can be inserted, while in all other cases (e.g. no suffix, a longer suffix) the subset principle selects (216i), the form with the initial vowel. Similarly, when $\sqrt{\text{xmas}}$ is spelled out the absence of a conditioning factor for both available forms leads to a situation where both candidates are equally acceptable following the subset principle, so that here too both (217i) and (217ii) are available for insertion.¹³

Welsh also shows vowel-zero alternation in word-final position. This is the case where stems end in a rising sonority cluster. However, all the attested Welsh words with final rising sonority clusters end with either the

¹³ There may of course be subtle sociolinguistic factors at play here, leading to a preference for one or the other form in a given social context. I ignore this issue here.

shape TØR# or sTØR#, and never XØTR# (cf. Hannahs, 2013b, pp. 88f). This means that stem-final epenthesis in Welsh cannot provide evidence one way or the other, either. If a word of this shape were to be found however, it would provide us with a clear empirical test case for the Welsh situation.

There appears to be no conclusive data to indicate that Welsh either does or does not permit government across branching onsets, then. However, it seems reasonable to assume that *On* would be the default setting for the parameter, given that languages such as French will always exhibit evidence of the fact they do not permit government across branching onsets in the form of audible empty nuclei preceding branching onsets. That is, a word such as French *secret* where the initial nucleus cannot remain silent (while the learner has evidence that the position is melodically empty) gives the learner negative evidence and allows them to set the parameter to *Off* in response. In the absence of negative evidence, the setting remains *On*. Thus I want to adopt here the proposal that branching onsets are by default transparent to proper government, so that both forms such as *gêm* and *braf* have, by hypothesis, properly governed initial rhymal positions in their initial empty OR sites, as shown in (218).



If we have underlying forms such as (218) in Welsh, then the initial empty OR has the ability to isolate any target item from any floating melodic material which would normally be inserted and incorporated into its initial onset position. This state of affairs is the main strength of the initial empty OR analysis of immutability, as it makes the crucial

prediction that every item whatever that begins with an initial empty OR sequence will be entirely immutable. This is in contrast to the accounts discussed in §7.2, which fail to explain the absence of mutation-type specific and target specific exceptions (recall hypothetical **gêng*). The empirical situation in Welsh is this: if an item is not susceptible to *one* type of mutation, it is not susceptible to *any* type of mutation. Of the available analyses, only the OR analysis predicts this correctly.

Moreover, because the initial empty OR is a true phonological object, with all the regular properties of an onset-rhyme pair, we might rightly expect that its presence should have other phonological consequences apart from the mundane task of lexically marking out the exceptions to mutation. Let us now turn to two cases where we see such effects spanning different phonological phenomena: Welsh word-minimality and initial sC clusters.

7.4 IMMUTABILITY AND WORD-MINIMALITY

7.4.1 *The standard view and the problem*

Capturing word-minimality requirements in Welsh has not been straightforward hitherto. According to Hannahs (2013b), Welsh words should be preferably bisyllabic, but failing that they may be bimoraic instead. As is common cross-linguistically, function words appear not to be subject to this condition and these may be monomoraic. (219) shows examples of all three types of words, bisyllabic (219a), bimoraic (219b), and monomoraic (219c.)

| | | | |
|-----------|-------------|---------|----------|
| (219) (a) | <i>ateb</i> | [atɛb] | ‘answer’ |
| | <i>gwrw</i> | [gʊrʊ] | ‘beer’ |
| | <i>afon</i> | [a:vɔn] | ‘river’ |
| (b) | <i>tŷ</i> | [tʲi:] | ‘house’ |
| | <i>pob</i> | [pɔ:b] | ‘every’ |
| | <i>twp</i> | [tʊp] | ‘stupid’ |

| | | | |
|-----|-----------|------|--------------|
| (c) | <i>y</i> | [ə] | ‘D.DEF’ |
| | <i>fy</i> | [və] | ‘D.POSS.1SG’ |
| | <i>dy</i> | [də] | ‘D.POSS.2SG’ |

That the words in (219a) are both bisyllabic and bimoraic is uncontroversial. The items in (219b) are, in traditional terms, monosyllabic but bimoraic. The function words in (219c) are both monosyllabic and monomoraic, but typically cliticise to either the following or the preceding word. One common account is this: function words do not constitute proper phonological words of themselves and therefore are not subject to the usual word minimality restrictions that apply to (219a-b).

However, recall from the discussion of quantity in §3.8 that only a subset of the Welsh consonants contribute to syllable weight, and the others do not. This is what gives rise to the difference in vowel length in a pair such as *pob* [po:b] ‘every’ and *twp* [tʊp] ‘stupid’: Under [Hannahs’ \(2013b\)](#) analysis, /p, t, k, m, ŋ, ʃ/ are moraic, /b, d, g, f, θ, χ, v, ð/ are non-moraic and /l, n, r/ are contrastively moraic or non-moraic (cf. Table 10 in §3.8, where I have analysed this behaviour in terms of geminability rather than moraicity). As [Morris-Jones \(1931, p. 69\)](#) points out, in addition to subminimal function words which readily cliticise (such as the determiners), North Welsh especially¹⁴ provides another set of challenging function words which invariably end up being subminimal yet do not readily cliticise. Among these we find *rhag* [r^hag] ‘against’, *heb* [hɛb] ‘without’, *nid* [nɪd], *nad* [nad] ‘not’, *ac* [ag] ‘and’, *nac* [nag] ‘nor’. Even when emphasised and fully stressed, these items do not show a long vowel as we would expect them to, given both the requirement for stressed syllables to be heavy and the requirement for the minimal word to be at least bimoraic. Not being clitics and receiving primary stress, they must constitute a prosodic domain when emphasised. *Ac* [ag]/[ˈag] ‘and’ contrasts in behaviour with *ag* [ag]/[ˈa:g] ‘with’. The latter surfaces with a long vowel when fully stressed, lending further weight to the expectation that these items should show metrical lengthening and escape their apparent subminimality.

¹⁴ In “Standard” South Welsh these items are typically assumed to have a long vowel when emphasised/fully stressed, but the empirical situation is not entirely clear, especially considering a broader range of dialects.

Hannahs' (2013b) analysis of the Welsh situation described above follows the proposal of Prince (1980), McCarthy and Prince (1986, 1990, 1993) that word minimality derives from the prosodic requirement to have a foot present, and thus essentially equates to the foot, which has to be minimally bisyllabic or bimoraic. This requirement is thus typically derived from a foot binarity constraint, which McCarthy and Prince (1993, p. 46) formulate as follows:

(220) FOOT BINARITY (FTBIN):

Feet must be binary under syllabic or moraic analysis.

The binarity constraint in (220) is adopted by Hannahs (2013b, p. 109) split into two constraints, FTBIN- σ and FTBIN- μ :

(221) FOOT BINARITY (SYLLABIC) (FTBIN- σ):

Feet must be binary under syllabic analysis.

(222) FOOT BINARITY (MORAIC) (FTBIN- μ):

Feet must be binary under moraic analysis.

To encode the preference for bisyllabicity over bimoraicity in Welsh, FTBIN- σ dominates FTBIN- μ . Both foot binarity constraints are largely undominated except some constraints relating to the conditioning of /h/ by foot-structure (see Hannahs, 2013a, pp. 102ff), something I will not go into further here. Clearly the words in (219a) do not violate either of those constraints. For those in (219b), Hannahs' proposal of contrastive moraicity derives the right variants in both cases, assuming that underlyingly the vowels in both cases are short. This is shown in Tableaux (223a-b):

(223) (a) Tableau for *twp* /tʊp/ 'stupid'

| /tʊ _μ p _μ / | FTBIN- σ | FTBIN- μ | MAXIO | DEPIO |
|-----------------------------------|-----------------|--------------|-------|-------|
| ☞ tʊ _μ p _μ | * | | | |
| tʊ: _μ p _μ | * | | | *! |

(b) Tableau for *pob* /pɔb/ 'every'

| /pɔ _μ b/ | FTBIN- σ | FTBIN- μ | MAXIO | DEPIO |
|----------------------|-----------------|--------------|-------|-------|
| pɔ _μ b | * | *! | | |
| ☞ pɔ: _μ b | * | | | * |

We see in (223b) that the lack of moraicity of /b/ leads to a fatal violation of FTBIN- μ for the fully faithful candidate. In (223a) neither candidate violates the FTBIN- μ constraint and the fully faithful candidate wins on account of its general faithfulness.

Since the items in (219c) are function words and thus do not constitute independent phonological words, as the usual argument goes, they are not subjected to the grammar in isolation but rather together with some other phonological word and hence emerge fully faithfully, their minimality requirements being fulfilled by whatever other item they are computed with.

All this relies on Prince's (1980, et alibi) proposal that word-minimality effects arise from phonological wordhood requirements. Phonological words are minimally constituted of a foot, and a foot is minimally constituted of two syllables or two moras. How we are to deal with a subminimal non-clitic function word that receives stress due to emphasis or the like, such as *heb* ['hɛb] 'without', is not clear; presumably their phonological wordhood must still be denied.

One problem from the GP point of view is that neither Standard GP nor Strict CV recognise the prosodic hierarchy as distinct from the cyclic projection of nuclei. Standard GP, following Kaye (1995), only recognises a simple distinction between analytic and non-analytic domains, as well as the cyclic projection of rhymes. The claim would thus have to be that function words simply never have their own domain, i.e. they are always parasitic on some stem and never occur in configurations other than [CF], [FC], or [[C]F],¹⁵ where C is a content word and F is a function word. This restriction clearly does not include everything that cross-linguistically has been put in the category of function words. We would expect exclamations, yes/no responses, personal pronouns &c. to be fully able to constitute independent domains, and how items such as *heb* are to receive stress if they *never* constitute domains is not clear, either.

Independent of the GP outlook and the issue of function words, we also find some adjectives in Welsh which have, for at least some speakers, undergone some sort of fissional reanalysis. In these cases the mutated form has been reanalysed as the underlying form of a different terminal, while the old form continues to exist independently. There are at least

¹⁵ Kaye (1995) reasons that domains of the type [A[B]] do not exist for independent reasons.

two cases of relevance here that I'm aware of: *byth* 'still/ever/never' and *pob* 'every'. *byth* has split into two items for some speakers, one item referring only to stative 'ever(ness)/never(ness)/eternity' (mainly as a noun) which always surfaces as [bɪθ] (presumably < /bɪθ/) and is both subminimal (according to the above criteria) and immutable, and one item referring to 'still' and quantificational 'ever/always' (chiefly as an adverb or adjective) that surfaces as [bi:θ] and is fully mutable). Is it the nominal version of *byth* that is somehow a function word, while the modifier version is a content word? Similarly, *pob* 'every' has fossilised in some idiomatised expressions such as *bob hyn a hyn* 'ever so often/now and again'. What is notable here is that, not only is it the SM form that has fossilised, but for many speakers this fossilised *bob* is subminimal (according to the above criteria) and immutable, surfacing as [bɔb] rather than the expected [bo:b], while the regular modifier use of *pob* continues to entail vowel lengthening, whether mutated or not. Does the idiom involve a "functional use" of *bob* while the mutable case constitutes a "content word situation"? Why should *byth* as a noun and *bob* in idiomatic use be unable to constitute their own phonological domains? Cases such as these make it difficult to even draw a language-specific arbitrary line between function and content words, if indeed that should be the origin of the differentiation.

Garrett (1999) challenges both the status of the function/content word distinction and the claim that word minimality effects arise from a foot binary requirement from a cross-linguistic point of view. He shows that the function word explanation is unhelpful cross-linguistically due to the absence of clear cut boundaries and the very existence of words in an ambiguous spectrum of the two oppositions, as should be apparent from the above. He then goes on to challenge the proposal that the minimal word equates to the minimal foot, showing that in many languages minimal feet are not sufficient for minimal words, and that the proposal is unable to predict word minima from the languages' foot structure. For instance, Lushootseed and Javanese both allow monosyllabic, short CV to constitute a foot for main stress assignment, but the minimal word is still CVX (Garrett, 1999, §2.6). Garrett's conclusion that word minimality requirements do not match foot minimality requirements are further corroborated by the typological work of Gordon (2006, 2016) and Down-

ing (2005, 2006). Gordon (2016, p. 269) concludes similarly that there is an “overall lack of cross-linguistic support for the moraic uniformity hypothesis”.

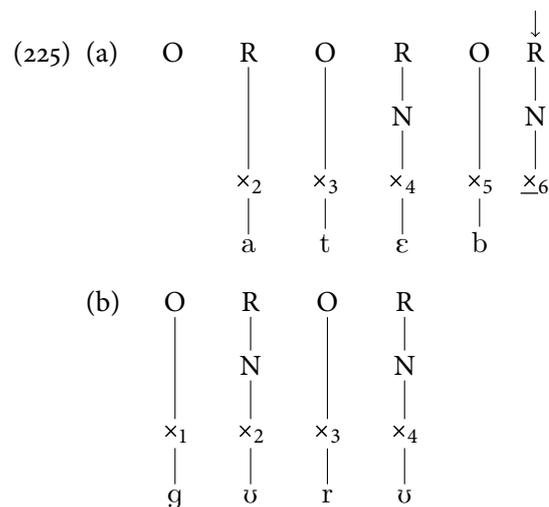
7.4.2 A new word minimality condition

As an alternative to the syllabic foot-based approach with a fallback to the moraic foot and an exception for a hard to define category of function words, I want to propose a single condition for Welsh: a Welsh word (or more generally, any independent phonological domain in Welsh), must have at least two skeletal positions (×’s) that are dominated by a rhymal categoriser (R).

(224) WORD MINIMALITY CONDITION (WELSH):

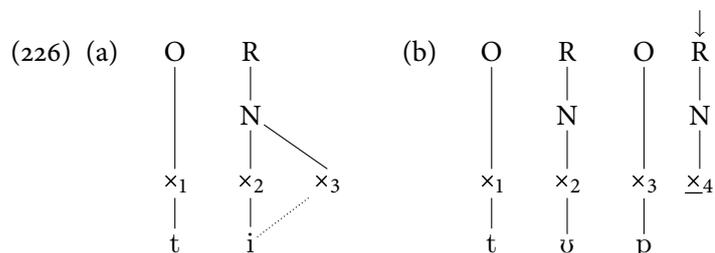
A word must consist of at least two skeletal positions dominated by a rhyme.

It is easy to see that the bisyllabic items in (219a) satisfy this condition. They have two vowels, meaning they must have at least two skeletal positions dominated by separate rhymes. This is shown for *ateb* (which actually has a third, final empty nucleus) and *gwrw* in (225a) and (225b) respectively.

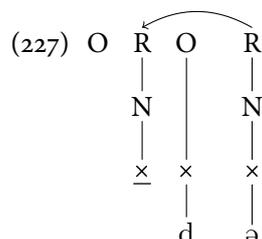


The bimoraic items in (219b) satisfy the requirement either through a branching nucleus, i.e. two skeletal positions dominated by the same rhyme, or they feature a final empty nucleus, and thus also must have

at least two skeletal positions dominated by separate rhymes, much like the items in (219a). The two possibilities are illustrated for *tŷ* and *twp* in (226):

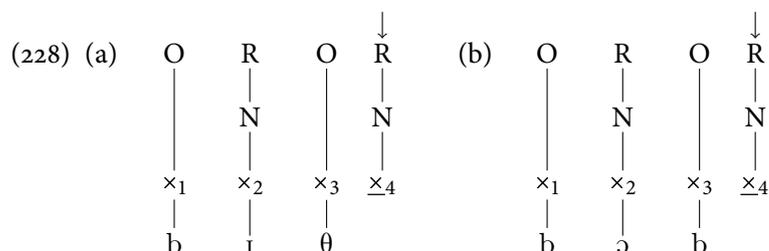


What is interesting about the minimality condition in (224) is that it can also be successfully applied to the apparently subminimal function words in (219c). If the minimality condition in Welsh applies equally to such superficially monomoraic items, this means that they must necessarily carry empty structure to satisfy the minimality requirements. On the assumption that such empty structure (i.e. empty OR pairs) cannot be supported word-finally, superficially monomoraic items must thus have an initial empty OR sequence, as shown for the second singular possessive *dy* in (227):



This means that, if we abandon the exception for function words for Welsh and treat them just as we do the content words, then we predict that such superficially subminimal words are always immutable.

What however of the apparently subminimal variants of *byth* and *bob* discussed earlier? Under the definition given in (224), these items are not subminimal at all, as shown in (228):

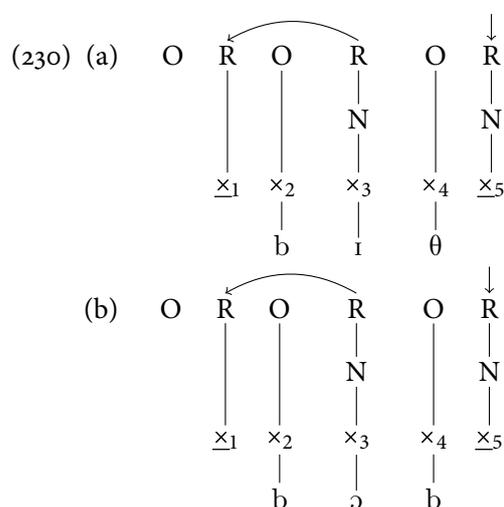


Both the structures in (228) clearly contain two skeletal slots, \times_2 and \times_4 , which are in turn dominated by a rhyme R. We thus fail to make the right prediction here: subminimal *byth* and subminimal *bob* are both in fact immutable. The problem here is that what currently makes the definition in (224) accept words as well-formed that are subminimal under Hannahs's proposal is that we assume that final empty nuclei are metrified. This also means that the condition proposed treats regular *pob* and *twp* in the same way, and there should be no need to have a long vowel in *pob* since it has a final empty nucleus that should satisfy word minimality. Let us thus restate the word minimality requirement with a qualification that parametrically licensed positions such as the final empty nucleus do not count:

(229) WORD MINIMALITY CONDITION (WELSH) (REVISED):

A word must consist of at least two skeletal positions dominated by a non-parametrically licensed rhyme.

Following (229) both the structures for *bob* and *byth* in (228) and those for the bimoraic *twp* in (226) are ill-formed. Given the condition in (229) we now predict that all these items carry initial empty structure and therefore be immutable. This is indeed the case for subminimal *bob* and *byth* which have the structures in (230):

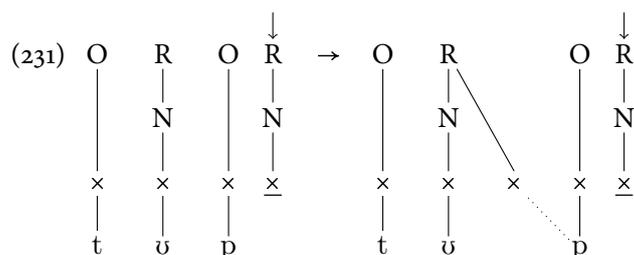


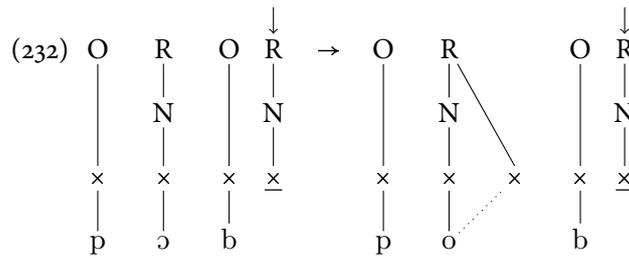
governed, rather than parametrically licensed, so it counts together with \times_3 and satisfies the minimality requirement. *Twp* and regular *pob* escape this fate due to metrical lengthening, which I turn to now.

7.4.3 *Escape by metrical lengthening*

I have proposed in §3.8 that Welsh has a regular process of metrical lengthening similar to languages like Italian. A rhyme with main stress must dominate two skeletal positions (that is, it must branch either at the **N** or at the **R** projection). Where the underlying form does not already satisfy this condition (e.g. by virtue of a diphthong or a word-internal rhymal adjunct), a new adjunct position is created for the rhyme. The new position must be melodically filled, which can be achieved either by spreading of the nucleus or the following onset. I argued that there is a preference for spreading the following onset, and only if the onset is not geminable will the nucleus spread, creating a Johnsen vowel.

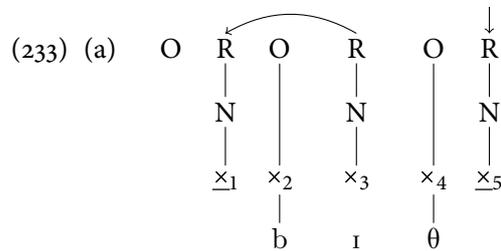
Let us briefly look at the pair *twp* and *pob* again. Hannahs (2013b) accounted for their differing length by an interaction of the underlying (non)-moraicity of the final consonants and the two constraints FTBIN- σ and FTBIN- μ (cf. example 223). Under this analysis, the same facts derive from an interaction between the metrical weight requirement and the geminability of the final consonant. The rhyme must branch and the new position be melodically filled. Thus, given that /b/ cannot geminate, the vowel in *pob* has to lengthen, while the final, geminable, consonant in *twp* has to geminate. This is shown in (231) and (232):

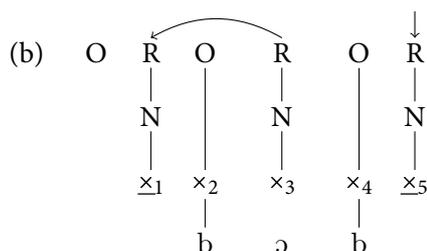




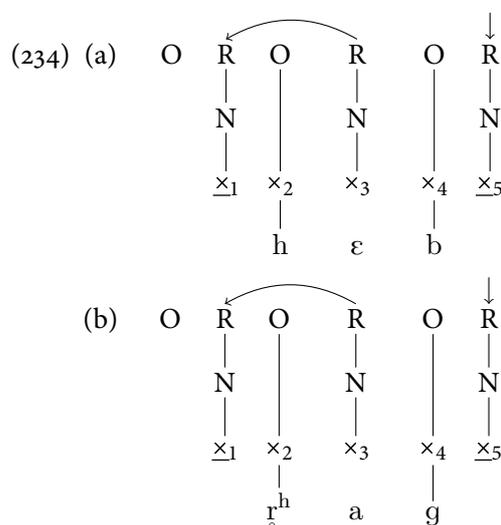
Clearly the geminate version of *twp* and the Johnsen vowel version of *pob* both satisfy the word minimality requirement on the surface due to metrical lengthening (recall that the word-final geminate in (232) remains virtual only because it is word-final).

Returning now to the problems arising from the superficially subminimal items discussed above, there is a good reason why schwa-final open syllables as in *dy* [də] could not ever satisfy minimality by undergoing metrical lengthening: schwa in Welsh cannot be long, so the skeletal position created by metrical lengthening would fail to be filled in any case. As such, metrical lengthening in such a case fails to apply. We could however well imagine that the apparently subminimal versions of *byth* and *bob* discussed earlier can undergo metrical lengthening. Given that [θ] and [b] are both non-geminable, we would expect that both *byth* and *bob* should receive a long vowel. There must be something about their structure that prevents them from undergoing metrical lengthening. Given the inability of schwa to lengthen and the consequential failure of metrical lengthening to apply, I will tentatively stipulate that their melody remains unattached in the underlying representations, and they thus behave like schwa with regards to metrical lengthening, i.e. no new skeletal point is created. This means that, like *dy*, they must also begin with an empty initial OR sequence in order to satisfy word-minimality, making them inherently immutable. Thus the final structure for *byth* and *bob* must be as follows:





The same also applies to the other problematic function words discussed by [Morris-Jones \(1931\)](#), such as *heb*, *nid*, *rhag*, &c.. Such items are similarly inherently immutable on account of their need to satisfy the word-minimality requirement in (229), which can only be achieved through initial empty structure. For clarity of exposition, (234) shows the representations for North Welsh subminimal prepositions *heb* ‘without’ and *rhag* ‘against’:



In this section we have seen that the proposal that immutability arises from empty initial structure on the target in the form of an empty properly governed OR sequence shows interesting interactions with the facts surrounding Welsh word minima and metrical lengthening. It makes the empirically correct prediction that words which appear subminimal on the surface under the established criteria must be inherently immutable, regardless of whether they may be function or content words.

7.5 IMMUTABILITY AND THE MAGIC OF sC(C)

7.5.1 *The Italian evidence for magic licensing*

It is a well-known fact that in many language sC(C) sequences are not well-behaved with regard to general phonotactic constraints. For instance, Welsh allows word-initial fricative-liquid ([fl, pr]), stop-liquid ([tl, pr]) and sibilant-liquid ([sl, sr]) sequences. It does not allow fricative-stop (*[ft, fp]) or fricative-stop-liquid sequences (*[ftl, fpr]). Yet, it allows sibilant-stop ([st, sp, sk]) and sibilant-stop-liquid ([stl, spr, skl]). This is a well-attested asymmetry in many languages, including the entire Celtic family.

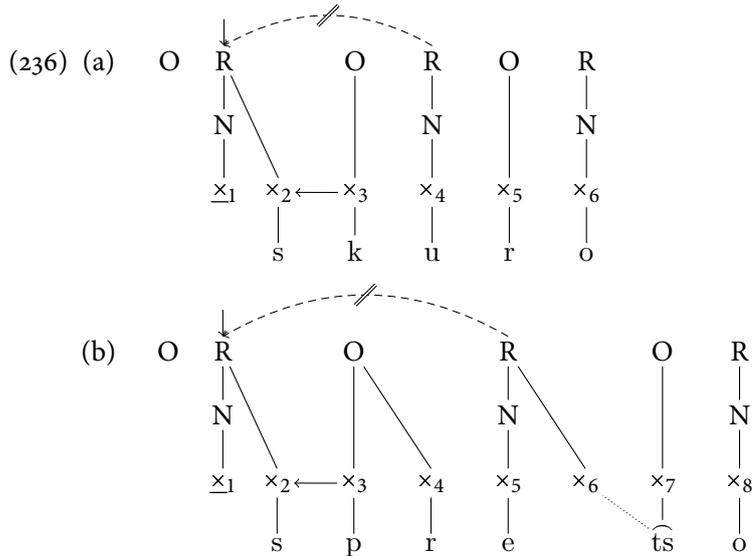
The exceptional behaviour of sC(C) clusters has received a myriad of different analyses (see e.g. [Vaux and Wolfe, 2009](#) for an overview). In GP, the established view following [Kaye et al. \(1990\)](#) and [Kaye \(1996\)](#) is that the initial sibilant in such sequences is not extrasyllabic or some sort of prosodic appendix, but a rhymal adjunct (a coda). This is true whether it is found word-internally following a filled nucleus, or word-initially following an empty nucleus. [Kaye et al. \(1990, pp. 204f\)](#) give the following data, illustrating the selectional properties of the Italian masculine singular definite article, to show that initial sC(C) sequences in Italian indeed behave as though they were vowel initial:

- | | | | | | | |
|-------|-----|--------------------|-------------|-----|-------------------|----------------|
| (235) | (a) | <i>il costo</i> | ‘the price’ | (b) | <i>il piombo</i> | ‘the lead’ |
| | | <i>il lato</i> | ‘the side’ | | <i>il treno</i> | ‘the train’ |
| | (c) | <i>il solco</i> | ‘the wake’ | (d) | <i>l’arco</i> | ‘the arch’ |
| | | <i>il sale</i> | ‘the salt’ | | <i>l’elenco</i> | ‘the list’ |
| | (e) | <i>lo straccio</i> | ‘the cloth’ | (f) | <i>lo scuro</i> | ‘the darkness’ |
| | | <i>lo sprezzo</i> | ‘the scorn’ | | <i>lo slancio</i> | ‘the elan’ |

From (235a-c) we see that *il* is selected before singleton consonants and branching TR onsets. Notably, this includes singleton [s] (235c). In (235d) we see that before vowel-initial words, the definite article takes the form *l(o)* (the vowel syncopates following cliticisation). From (235e-f) we see that sC(C) sequences are associated with the same selectional properties as the vowel initial items, i.e. they select the pre-vocalic variant *lo*, rather than the usual pre-consonantal *il*. [Kaye et al. \(1990\)](#) propose that the

selection of the definite article depends simply on whether the target item begins with an empty or a filled onset: empty onsets select *lo*, filled onsets *il*. Consequently, the [s] in the sC(C) sequences must live in the rhymal adjunct position of an initial empty onset-nucleus sequence, rather than in an onset.

Following the proposal in [Kaye \(1996\)](#), the initial sC(C) sequences in *scuro* and *sprezzo* must be represented as follows:



As can be seen from the representations in (236), the head of the onset \times_3 transconstituent governs the rhymal adjunct \times_2 . This means that the initial rhyme dominating \times_1 and \times_2 cannot be governed by the following rhyme (quite irrespective of whether Onset Permeability were set to *On* or *Off*). Nonetheless the nucleus appears to have license to remain silent. [Kaye \(1996\)](#) terms this “magic licensing”, as a reminder that we do not as yet have a good explanatory principle for why/how this nucleus is actually licensed to remain silent.

7.5.2 Magic licensing and mutation in Celtic

If Celtic languages have magic licensing structures such as those in (236), and my proposal that initial empty onset-rhyme sequences are responsible for immutability, then initial magic licensing configurations should block mutation. The prediction is essentially analogous to the Italian case

discussed by [Kaye et al. \(1990\)](#): the magic licensing structures behave selectionally as though they were vowel initial.¹⁶

Of course, in Welsh [s] is not subject to mutation in any case, so that we cannot test the prediction here. However, in Irish [s] and its palatalised variant [ʃ] are subject to Lenition (loosely comparable to SM in Welsh). Under Lenition, [s] changes to [h] and [ʃ] to [hʲ]. As we will see presently, sC(C) sequences in Irish indeed show peculiar behaviour with regard to their mutability.

In Irish, the definite article *an* triggers Lenition on feminine singular nominative nouns. This is shown for a number of different environments in (237) below (data adapted from [Cyran, 1995](#), pp. 188f):

Pattern of Irish Lenition:

| Rad | Len | Rad | Len |
|-----|-----|----------------|----------------|
| p | f | p ^j | f ^j |
| t | h | t ^j | h |
| k | x | c | ç |
| b | w/v | b ^j | v ^j |
| d | ɣ | d ^j | j |
| g | ɣ | ɟ | j |
| m | w/v | m ^j | v ^j |
| s | h | ʃ | h ^j |
| f | ∅ | f ^j | ∅ |

- (237) (a) *cistin* → *an chistin* ‘(the.SG.F.NOM) kitchen’
bean → *an bhean* ‘(the.SG.F.NOM) woman’
- (b) *cruacht* → *an chruacht* ‘(the.SG.F.NOM) hardness’
pléasc → *an phléasc* ‘(the.SG.F.NOM) bang’
- (c) *seilg* → *an tseilg* ‘(the.SG.F.NOM) hunt’
súil → *an tsúil* ‘(the.SG.F.NOM) eye’
- (d) *sláinte* → *an tsláinte* ‘(the.SG.F.NOM) health’
srón → *an tsrón* ‘(the.SG.F.NOM) nose’
snáthaid → *an tsnáthaid* ‘(the.SG.F.NOM) needle’
- (e) *scoil* → *an scoil* ‘(the.SG.F.NOM) school’
spéir → *an spéir* ‘(the.SG.F.NOM) sky’
steig → *an steig* ‘(the.SG.F.NOM) slice’
smaois → *an smaois* ‘(the.SG.F.NOM) snout’
screab → *an screab* ‘(the.SG.F.NOM) crust’
splais → *an splais* ‘(the.SG.F.NOM) splash’
- (f) *óiche* → *an óiche* ‘(the.SG.F.NOM) night’
obair → *an obair* ‘(the.SG.F.NOM) work’
abairt → *an abairt* ‘(the.SG.F.NOM) sentence’

¹⁶ This is, in Welsh at least, of course not quite true: sC(C) items and immutable items do not undergo PVA, unlike truly vowel initial items. PVA triggers appear to be sensitive to a filled nucleus at the left edge, rather than an empty onset at the left edge as is the case in Italian.

We can observe from the data above that initial consonants (so long they belong to the set /p, t, k, b, d, g, m, f/ or the palatalised equivalent) undergo Lenition, whether they occur as singletons (237a) or in an initial TR sequence (237b). We see from (237c) that items beginning with a singleton [s] or [ʃ] are subject to t-prothesis¹⁷ in this environment. (237d) shows that this is also the case for items beginning in the sequences [sl, sr, sn] (and their palatalised equivalents). In contrast to this, we see from (237e) that initial sT and sTR sequences are neither subject to Lenition nor t-prothesis; they behave exactly like the vowel-initial items in (237f). We clearly see from (237) then that sT(R) sequences in Irish behave in a similar way to sC(C) initials in Italian, i.e. they pattern with the vowel-initial stems. Interestingly however, sL- and sn-initial forms behave differently from both T(R)-initial stems, sT(R)-initial stems and V-initial stems.

We can see that sL- and sn-initial stems do indeed pattern with T(R) however when we look at what happens after other mutation triggers, such as the possessives *mo* ‘my’, *do* ‘your’ and *a* ‘his’. Consider the same set of data as in (237) but this time featuring the first singular possessive, *mo*:

- (238) (a) *cistin* → *mo chistin* ‘(my) kitchen’
 bean → *mo bhean* ‘(my) woman’
 (b) *cruacht* → *mo chruacht* ‘(my) hardness’
 pléasc → *mo phléasc* ‘(my) bang’
 (c) *seilg* → *mo sheilg* ‘(my) hunt’
 súil → *mo shúil* ‘(my) eye’
 (d) *sláinte* → *mo shláinte* ‘(my) health’
 srón → *mo shrón* ‘(my) nose’
 snáthaid → *mo shnáthaid* ‘(my) needle’

(cont’d overleaf)

¹⁷ T-prothesis following the definite article *an* is found on *feminine* singular nominative nouns starting in *s* or *sn*, *sl*, *sr* and on vowel-initial singular *masculine* nominative nouns. There is no t-prothesis or Lenition following *an* on any consonant-initial singular *masculine* nominative nouns, including *s*, *sn*, *sl*, and *sr*.

sm/ but not /sn/ sequences. These alternations are not attested in sT(R) sequences.

What are we to make of the differential behaviour of [n] and [m] in this environment ([ŋ] does not occur in this environment in Irish)? We have already seen something similar in Welsh, where the metrical lengthening facts reveal one [n] to pattern with the sonorants (I proposed earlier that this version of [n] does not contain the element [ʔ]) while the other patterns with the fortis stops, as do Welsh [m, ŋ]. The Irish case seems to be somewhat analogous, with the [n] in these cases patterning with the sonorants and [m] with the stops. It is not inconceivable that they are, like in Welsh, representationally different, although we would ideally be able to show that [n] and [m] show other behavioural or distributional differences in Irish to give credence to such a hypothesis.

Although /s/ does not mutate in Welsh, the behaviour of initial sC(C) sequences in Irish supports the hypothesis that magic licensing configurations give rise to mutation blocking effects. This is exactly what we expect if mutation is inhibited by initial empty structure on the left edge of a target.

7.6 AN IRISH QUALIFICATION

One of the main claims put forward in this chapter is that the initial empty OR analysis correctly predicts that such items are totally immutable, while the other accounts that have been put forward fail to explain the non-selectivity of immutability. While it is true that in Welsh whenever an item is immutable this immutability extends to the entirety of the mutation system, the same cannot be said of Irish. Pyatt (1997, p. 151) points out that in Irish some words, such as *Dé* /dʲe:/ ‘day’ and the past indicative forms of *abair* ‘to say’ such as *dúirt* /dʲu:rʲtʲ/, appear to resist lenition but are susceptible to eclipsis (see Table 26 for the Irish mutation patterns). This is shown in the examples in (241), adapted from Pyatt (1997, p. 151):

| SEGMENT | p | t | k | b | d | g | m | n | ŋ | s | ʃ | f | x | v | ɣ | r | w | j |
|---------|---|---|---|---|---|---|---|---|---|----------|----------|----------|---|----------|---|----------|---|----------|
| PLACE | U | A | – | U | A | – | U | A | | <u>A</u> | <u>I</u> | <u>U</u> | – | <u>U</u> | – | <u>A</u> | U | <u>I</u> |
| MANNER | ʔ | ʔ | ʔ | ʔ | ʔ | ʔ | ʔ | ʔ | ʔ | | | | | | | | | |
| LX | H | H | H | | | | L | L | L | H | H | H | H | | | | | |

Table 27: Representation of the Irish Consonants, adapted from [Cyran \(2010\)](#).

from undergoing lenition, in addition to the total mutation blocking effect of initial empty structure.

A full account of how Irish lenition-resistance is achieved is beyond the scope of this work, as it would require an in-depth analysis of the Irish consonant and mutation system similar to that presented here for Welsh. Nonetheless, there are some interesting observations we can make with regard to the Irish data.

To start, let us assume that the Irish consonants are represented in the way proposed by [Cyran \(2010\)](#), shown in Table 27.¹⁸ If we now compare the corresponding consonants in each of the mutation patterns in Table 26, we see that lenition consistently results in a structurally less complex segment, while eclipsis occasionally results in increased structural complexity.¹⁹ This is shown systematically in Table 28. By contrast, none of the Welsh mutation patterns results in a consistent loss of melodic material. It thus stands to reason that the mechanism preventing only lenition in Irish has something to do with the fact that lenition is purely reductive in function while eclipsis is not.

[Pyatt \(1997, p. 152\)](#) actually proposes that this is linked to coronal-based exceptions to Irish lenition: lenition fails to apply where coronal-initial targets are preceded by a coronal-final trigger. This would result in the loss of |A| in addition to either |ʔ| or |H| following a trigger itself

¹⁸ [Cyran \(2010\)](#) only gives a fully explicit listing for the stop consonants and the (oral) fricatives. The other consonants shown have been inferred from his in-text discussion. I have not been able to ascertain how he would represent /l/ and he explicitly states that the situation with regard to /h/ is unclear; I will assume that /h/ is some form of an empty onset and leave open the question of how this is to be distinguished from /ɣ/ in [Cyran's](#) system.

¹⁹ If voicing at least under mutation is similar to Welsh, then eclipsis consistently results in a structurally more complex output due to added |L| in the mutation-voiced segments, though I do not want to claim here that this is how Irish voicing under eclipsis is effected.

| LENITION | DIFFERENCE | ECLIPSIS | DIFFERENCE |
|----------|------------|----------|------------|
| k > x | -ʔ | k > g | -H |
| p > f | | t > d | |
| g > ɣ | | p > b | |
| b > v | | f > v | |
| m > v | | | |
| t > h | -ʔ, -A | g > ŋ | +L |
| d > ɣ | | d > n | |
| | | b > m | |
| s > h | -H, -A | | |
| f > ∅ | -H, -U | | |

Table 28: Melodic difference between radicals and mutated forms in Irish.

containing those elements. If the word-based exceptions to lenition as with *dúirt* and *Dé* are indeed due to the effect on complexity (both of these notably involving the loss of two elements) then it seems plausible that the conditioning factor behind the two may indeed be linked. Future research on mutation exceptionality might thus look into whether a phonological conditioning factor can be discovered which is sensitive to this split in outcomes.

7.7 DIACHRONIC SOURCES FOR EMPTY STRUCTURE

We have seen above that the proposed empty initial OR often aligns well with other phenomena that also find a possible explanation in empty structure. In most of these cases, we have little in the way of arguments for why speakers may choose to posit initial empty structure to solve the problem presented by acquisition of the relevant phenomena; it simply appears that the system of Welsh works in such a way that speakers are principally able to freely assign such empty structure to particular vocabulary items, and that Welsh speakers during acquisition make deliberate use of this to implement immutability as well as to solve issues around word-minimality. There are however a number of items for which we may

be able to adduce a diachronic argument for the origin of empty structure, which I will briefly discuss here.

7.7.1 *Erosion of the definite article*

There are a number of immutable adverbial phrases which were historically obligatorily preceded by a definite article. For instance, King (2016, p. 14) states that *tu allan* ‘outside’ and “certain other adverbs” which were originally preceded by the definite article *y* do not undergo mutation. Morgan (1952, pp. 263-266) describes a few such cases, including *tu allan* ‘outside’, *tu draw* ‘beyond’, *tu hwnt* ‘yonder’, *pryd hynny* ‘just then.’²⁰ Many more such forms with a historically obligatory definite article, especially with “*tu ...*”, can be found in Thomas (1967), but this being a dictionary the precise situation with regard to mutability is often not clear. All these adverbial phrases were originally preceded by the definite article, i.e. *y tu allan*, *y pryd hynny*, etc. but this article was, for the most part, lost (it is still occasionally used and treated as optional by most grammars and dictionaries, cf. e.g. the entry for *tu allan* in Thomas, 1967). Notably, while the adverbial forms are immutable, the respective nominal forms are perfectly regular in mutation:

(242) *Mae* *’r dyn tu allan*
 be._{3SG.PRS.AFF} the man outside
 ‘The man is outside’

(243) *Mae* *’r dyn ar du allan*
 be._{3SG.PRS.AFF} the man on outside
 ‘The man is on the outside’

In (242), *tu allan* is used adverbially and does not undergo mutation, while (243) shows *tu allan* being used nominally and undergoing SM, much like any regular noun.

We can see a similar diachronic development in many place names which have historically had an obligatory definite article as part of their name, but where the definite article either has been or is in the process of being lost, for instance *Bala* < *Y Bala*, *Borth* < *Y Borth*, *Drenwydd* < *Y*

²⁰ It appears that, in the written language only, *pryd hynny* is occasionally mutated to *bryd hynny*, cf. Morgan (1952, p. 263) and also Thomas (1967).

Drenewydd, *Gaerwen* < *Y Gaerwen*. The “reduced” forms *Bala*, *Borth*, *Drenewydd*, and *Gaerwen* are all entirely immutable. However, the situation is, diachronically speaking, more complicated than for forms such as *tu allan*. This is because place names are inherently feminine in Welsh, and feminine nouns undergo SM after the definite article. As such, *Drenewydd* is already mutated (from *tre(f)-newydd* ‘town-new’), as is *Gaerwen* (from *caer-(g)wen* ‘castle-white’), and there is an additional pressure at work not to double-mutate words. This pressure may well exist synchronically in cases such as *Drenewydd* and *Gaerwen* where the names are transparent in terms of their derivation. *Borth*, which derives from *porth* ‘harbour’, is probably to be included among these, as though *porth* has been frequently displaced by other words to designate ports and harbours, it is still common in unmutated form in many other place names and has by no means completely fallen out of use, meaning that the presence of a mutation is probably readily apparent to the Welsh speaker.

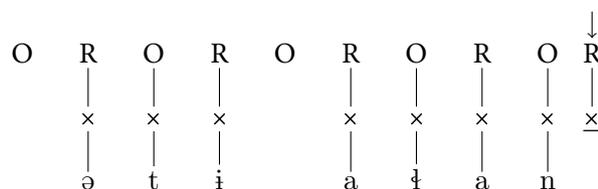
Bala however is an interesting case, as there is no attested form *pala*, which is the radical we would expect given that it should have derived diachronically via SM. The earliest source cited in Thomas (1967), the charter of the Abbey of Ystrad Marchell, goes back to 1191 and already appears in the form *Bala*, and without a definite article (though the source text is in Latin). While Thomas (1967) includes *bala* as a regular entry with the meaning of the ‘efflux of a river from a lake’, it appears to me that this is entirely tied to place names, and most of the historic sources cited already make clear such reference. For instance, Davies (1632), writes “Bala. Est oppidum ejus nominis, & significat Caput fluminis e lacu fluentis [...]”²¹ Given the absence of a form *pala* (both synchronically and diachronically) and the fact that *bala* does not appear to be in use apart from its appearance in place names, it is more difficult to argue that the double mutation pressure is equally applicable; the expectation is that *bala* is no more transparent to the current speaker of Welsh than the *-cester* in *Leicester*, *Bicester*, *Worcester*, &c.

Be that as it may, according to the theory of immutability that I have put forward, all these immutable forms will have an initial empty OR sequence. In the above examples we see that immutability may diachronically arise from actual phonological material which historically intervened

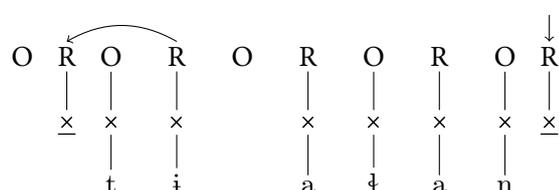
²¹ Translation (mine): “Bala. It is the name of the town, and it signifies the source of a river flowing from a lake [...]”

and shielded the immutable forms from mutation. As the phonological material in question was lost, an initial empty OR corresponding to the structural presence of the diachronic precursor remained, which continues to “shield” the form from mutation.

(244) STAGE 1:



STAGE 2:



This diachronic development is illustrated in (244) (vowel and consonant length have been omitted for simplicity). At Stage 1, *tu allan* is still preceded by the definite article *y*, which when lost at Stage 2 leaves behind the initial OR structure, but the rhyme now receives proper government from the former initial rhyme of *tu* and remains silent, resulting in a structure analogous to that I have proposed for other immutable forms. It is easy to see from this how an initial empty OR may arise diachronically from the erosion of the phonological material of the definite article, leaving in its wake an immutable form.

It is not unusual for empty initial structure to arise in this way diachronically. Similar developments are known to have taken place in the case of French *h-aspiré* and a subset of the cases of Italian *raddoppiamento fonosintattico*.

In Italian, some words trigger gemination of the initial consonant of an item that follows them, for instance *città* /tʃit.ta/ ‘city’ + *santa* /san.ta/ ‘holy’ → [tʃit.tas.san.ta] ‘holy city’. There are a variety of factors that condition raddoppiamento synchronically and diachronically, including syntactic category, structural configuration and stress (see Loporcaro, 1997 for a detailed study of all these factors and how they led to the major dialectal variants that are attested). While many of the present day triggers

diverging in not assuming the stress-related Stage 3 facts. For [Passino \(2012\)](#) items with a structure similar to what is here Stage 2 trigger a fortition-inducing configuration under concatenation, which results in gemination of the fortified initial consonant of the right-hand item.

In French, the diachronic developments surrounding [h] have resulted in phonetically vowel-initial vocabulary items that behave as though they were still consonant-initial. To illustrate this, consider the behaviour of the definite article before consonant- and vowel-initial items in [\(248\)](#).

- (248) (a) *le garçon* [lə ɡaʁsɔ̃] ‘the boy’
 l’ami [l‿ami] ‘the friend’
 (b) *les amis* [lez‿ami] ‘the friends’
 les garçons [le ɡaʁsɔ̃] ‘the boys’

As we can see in [\(248a\)](#), the final schwa in the masculine singular definite article is elided before vowel-initial items, but not before consonant-initial ones, a phenomenon known in French as *élision*. *Élision* in French generally applies also to other f-morphemes that end in an unstressed vowel, for instance the feminine singular definite article *la* (*l’ami* ‘the friend.F’) and the pronouns *je* and *ce* (*j’ai pensé* ‘I’ve thought’, *c’est normal* ‘it’s normal’). In [\(248b\)](#) we see what is known as *liaison*. Under *liaison* a word-final consonant is either parsed as the onset of the following item, if it is vowel-initial, or deleted when the following item is consonant-initial. Similar to *élision*, *liaison* is not limited to the definite article but found throughout the language, e.g. with the adjective *petit* ‘little’ in *petit grimpeur* [pɛti ɡʁɛ̃pœʁ] ‘little climber’ vs *petit enfant* [pɛtit‿ɑ̃fɑ̃] ‘little child’.

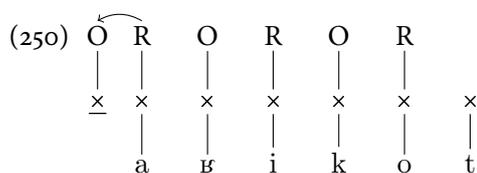
There are however a number of items which do not appear on the surface to fit this pattern. Words with orthographic initial ⟨h⟩ do not have any overtly pronounced consonant at the start, rather the ⟨h⟩ does not correspond to a phonetically present entity. For instance, *haricot* ‘bean’ is pronounced [aʁiko], and *heure* ‘hour’ is pronounced [œʁ]; both forms have an orthographic initial ⟨h⟩ but a vowel-initial surface form. As shown in [\(249\)](#), *heure* patterns with vowel-initial forms such as *ami*, but *haricot* patterns with consonant-initial forms such as *garçon*.

- (249) (a) *le haricot* [lə aʁiko] ‘the bean’
 l’heure [lœʁ] ‘the hour’
 (b) *les haricots* [le aʁiko] ‘the beans’
 les heures [lezœʁ] ‘the hours’

The entirely transparent ⟨h⟩ in items such as *heure* is known as *h-muet*, while the élision/liaison-blocking ⟨h⟩ in items such as *haricot* is known as *h-aspiré*. The present dichotomy between *h-muet* and *h-aspiré* is intimately tied to the diachronic developments surrounding [h] in French. Roughly speaking, Classical Latin /h/ was already lost in Vulgar Latin by the time Old French developed leading to the persistent loss of [h] in vocabulary items such as Modern French *homme* (< Classical Latin *homo*). The vast majority of *h-muet* items fall in this category. ⟨h⟩ was often omitted in writing also but later reintroduced more consistently but phonologically these items appear to have been consistently treated as vowel-initial historically. In contrast, the *h-aspiré* of items such as *haricot* is typically due to later developments, especially influence and borrowing from surrounding Germanic languages such as Frankish in Early Middle French, where these items were borrowed with intact initial phonetic surface [h] and patterned regularly with other consonant-initial items. /h/ was then lost once again in Late Middle French but the *h-aspiré* items of Middle French retained their patterning with consonant-initial items (see Southworth, 1970 for a more detailed summary of the diachronic developments surrounding *h-muet* and *h-aspiré*).

Synchronically, Schane (1975) points out that the exceptional behaviour of *h-aspiré* is difficult to account for in terms of either exception marking in linear rules and/or the introduction of diacritics. This is because the environments of élision and liaison are disjunct and so would require multiplication of rules for each to account for a single pattern of exceptions, meaning we would ultimately fail to generalise their exceptionality across the two processes. Schane (1975) concludes that the most satisfying solution is indeed to posit an abstract initial consonant. Clements and Keyser (1983) follow this line of reasoning and propose that the initial syllable of *h-aspiré* items contains an empty initial C-slot. Based on Vergnaud (1982), Charette (1991) proposed that the initial onset of *h-aspiré* items dominates a skeletal slot but no melodic material, similar to a silent nucleus, while

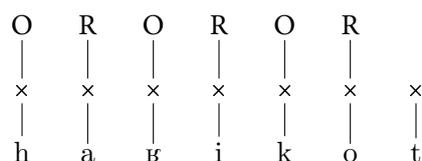
the onset of regular vowel-initial items does not dominate a skeletal slot, as shown in (250) for *haricot* ‘bean’.



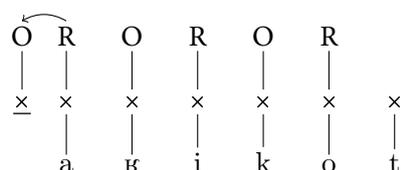
Charette (1991) shows that her analysis of h-aspiré also explains that we do not find vowel-zero alternation before h-aspiré in items such as *dehors* [døʁs] ‘outside’, since in order for the “h” to remain silent it must be properly governed by the following vowel, meaning that vowel is unable to properly govern the preceding empty nucleus which must surface as schwa.

Under this analysis, the development of h-aspiré then simply involved the loss of the melodic material from the initial onset of [h]-initial items, as shown for *haricot* in (251).

(251) STAGE 1:



STAGE 2:



At Stage 2, when the melodic content of the initial skeletal point is lost, the onset must be properly governed by the following rhyme in order to remain silent. Liaison applies where a final floating consonant is followed by a pointless onset, meaning it fails to apply in an h-aspiré item because just as is the case with consonant-initial items in French, the initial onset is not pointless. Similarly, élision applies in French before items where the first skeletal slot is nuclear, as is typically the case with vowel-initial items. Again, élision fails to apply because the initial skeletal point belongs to an onset, not a nucleus. Thus, the diachronic loss of the

melodic material in the word-initial site of h-aspiré items in French has left behind a melodically empty word-initial position that essentially isolates the word's left edge and leads it to behave as though it was consonant-initial at its left juncture.

Both the cases of raddoppiamento and h-aspiré discussed above show interesting parallels to the Welsh case. Not only do we see here highly similar diachronic origins of empty structure, but we also see that the types of outcomes they lead to give rise to effects located at junctures and allomorph selection, as is also the case with mutation. Indeed, the effects of h-aspiré are very much alike those of the mutation-blocking initial empty OR.

7.7.2 *Loanword integration*

As discussed in Chapter 4, the majority of English loanwords are immutable, and their immutability correlates well with two factors: their level of integration and the identity of their initial consonant. Ad-hoc loans are always immutable, as are most recent loanwords even as they become more established. As loans become more established and more deeply integrated, the likelihood that they are treated as mutable increases, with the exception of /g/-initial items, which generally remain immutable. For convenience, let us refer to ad-hoc and other recent loans as Stage 1, and to established and well integrated loans as Stage 2 loans. Note that I do not intend to imply with this terminology that status as a Stage 1 and Stage 2 item necessarily involves successive and gradual transition, as is standardly assumed (cf. e.g. Romaine, 1989; Myers-Scotton, 2002). It may well be the case that assignment in either category may be abrupt and non-successive, as suggested by Poplack and Dion (2012). This does not bear crucially on what I attempt to illustrate; the point is simply that Stage 1 loans are treated as code-switched items with their own linguistic frame, while Stage 2 items are essentially imported into the native vocabulary. Now how can we explain the fact that Stage 1 loans appear to be inherently immutable but then become mutable at Stage 2, with the exception of /g/-initials?

IF THE INITIAL OR analysis is correct, it stands to reason that all loans at Stage 1 for some reason have an initial OR, which has been “lost” in the majority of items as at Stage 2. I hypothesise that the initial OR at Stage 1 finds its origins in the properties of ad-hoc code-switching (and doubly so): Scheer (2009) proposes that initial empty ORs (CVs in his framework) function as the spellout of word boundaries as well as some phase boundaries, namely those featuring a phonology-relevant feature marking the Phase Impenetrability Condition (PIC).

Following Scheer’s (2009) diagnostic criteria for word-level initial ORs, Welsh cannot have an inherent word-level initial OR because (i) phonological processes, namely mutation, apply across word-boundaries, and (ii) there are some word-initial vowel-zero alternations. For instance [sb̥ʊrjɛl] ~ [əsb̥ʊrjɛl] and the examples in §7.3, but more importantly examples of postvocalic encliticisation, as for instance with the definite article: *yn yr ardd* ‘in the garden’ but *o’r ardd* ‘of the garden’). Both of these are absolute criteria ruling out a word-level initial OR. On the other hand, English fulfils criteria for the definite presence of the word-level initial OR: (i) the initial consonant of English words is “strong no matter what” (it is not influenced by the preceding word) and (ii) the initial vowel of words cannot alternate with zero “no matter what”. Thus, it stands to reason that where code-switching occurs and the Stage 1 loan is treated as an English vocabulary item, it is inserted with the same initial empty OR it would have if it were inserted in an English matrix clause and thus behaves differently with regard to mutation than would a Welsh word inserted in the same context.

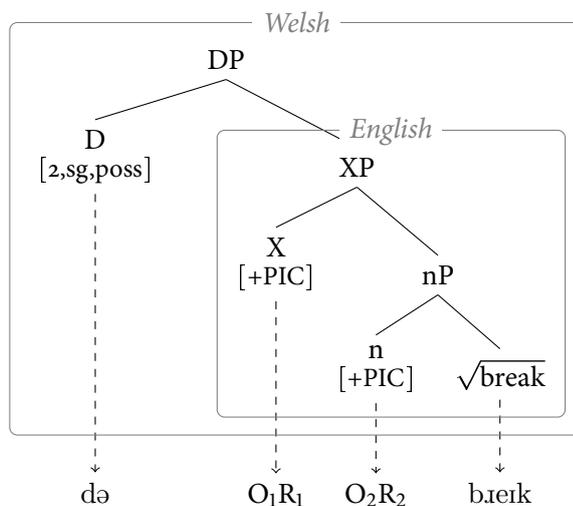
It has further been proposed that code-switching aligns with the distribution of otherwise impenetrable syntactic phases (López et al., 2017). If this is correct, then it would seem reasonable to assume that code-switched phrases in general carry a PIC-feature that is spelled out as an empty OR sequence, in line with Scheer (2009). As already discussed previously, the two co-incidental initial ORs will be subject to the Reduction process in (??), but it is clear that we are invariably left with a sequence of an empty initial OR sequence in code-switches to English (and perhaps other languages, such as code-switching to Spanish in Patagonian Welsh, cf. Carter et al., 2010), leaving Stage 1 loans inherently immutable.

By way of illustration, let us consider the derivation of the phrase *dy break* ‘your break’, involving the Stage 1 loan *break*. First, let us assume that we have the vocabulary entries in (252a) and (252b) for English and Welsh, respectively:

- (252) (a) VOCABULARY LIST (English):
 $\sqrt{\text{break}} \leftrightarrow /b.\text{ɪ}e\text{ɪ}k/$
 [+PIC] \leftrightarrow OR
- (b) VOCABULARY LIST (Welsh):
 [D, 2, -pl, gen] $\leftrightarrow /d\text{ə}/ \lfloor \underline{L} \rfloor / _ | ? , H |$
 [D, 2, -pl, gen] $\leftrightarrow /d\text{ə}/ \lfloor \underline{L} \rfloor / _ | H |$
 [D, 2, -pl, gen] $\leftrightarrow /d\text{ə}/ \lfloor \underline{H}, L \rfloor / _ | ? |$
 [D, 2, -pl, gen] $\leftrightarrow /d\text{ə}/$

In (252a) the PIC feature has as its correspondent an empty OR sequence, and the root $\sqrt{\text{break}}$ simply spells out as the string $/b.\text{ɪ}e\text{ɪ}k/$. The Welsh vocabulary entries in (252b) are repeated from (156) and implement a spellout of the string $/d\text{ə}/$ plus the necessary floating material to effect SM.

Example (253) shows a possible morphosyntactic structure for the phrase *dy break*, with the associated spellout for each node below. Here I’ve assumed that XP simply refers to some phase boundary corresponding to the code-switched node, while little nP categorises the root $\sqrt{\text{break}}$ as a noun. I’ve assumed for simplicity that both X and n have a PIC feature that is spelled out as an empty initial OR, though it is quite conceivable that n has a separate vocabulary entry and no PIC feature; all details that are not very relevant to our point.

(253) MORPHOSYNTAX OF *dy break*:

As shown in (253), the nP spells out as two phonological objects, “O₂R₂” and “b.ɛɪk”, which are subject to `concat()` and then $\varphi()$ to create the object “O₂R₂ b.ɛɪk”. Next, the node X is spelled out as the phonological object “O₁R₁” and concatenated with the previous string, at which point the Reduction process applies and (after applying $\varphi()$) leaves us with the phonological object “O₁R₂ b.ɛɪk” in place of XP. Now the head D is spelled out, and given that the just spelled-out adjacent node begins with an empty onset, the elsewhere form is selected and D is spelled out as the phonological object “də”. Again `concat()` and then $\varphi()$ apply to yield the final object “dəO₁R₂ b.ɛɪk”.²³ This shows quite clearly how the immutability of Stage 1 loans can be explained as a direct consequence of an English code-switch being spelled out with their corresponding English initial empty ORs when embedded inside a Welsh matrix clause.²⁴

AT STAGE 2, loans are integrated into the vocabulary list of the matrix language (i.e. Welsh). When speakers integrate the new vocabulary item they have to make a choice between including the initial empty OR from the source language or dropping it; this is a true choice available to the

²³ I have not indicated phonological domains for purposes of simplicity.

²⁴ Note that, even if single item nonce loans are not in fact integrated syntactically as a fully fledged phase comparable to multi-word code-switches, as Poplack and Dion (2012) suggest may be the case, it stands to reason that they retain at least their categorisation and thus the OR delimiting the word boundary, leading to an extensionally equivalent output.

speaker since the native word stock contains both vocabulary items with and vocabulary items without an initial empty OR sequence. Given that the majority of native vocabulary items in Welsh do not have an initial OR however, there is a bias toward uniformity, leading to a preference for removal of the extra structure when words are lexically integrated. Other biases may however counteract and override this predisposition, which I propose is the case with /g/-initial items.

WELSH /G/-INITIALS in general appear to be disproportionately likely to remain immutable, and it seems quite clear that Welsh speakers have a bias against deletion of initial consonants over and beyond a general non-alternation bias (which would also target other potential undergoers of mutation not involving deletion). This presumably arises from a combination of factors.

Probably one of the most important factors is the hearer's ability to match the observed string to an appropriate lexical entry. In most models of lexical access the left edge of a word plays an important role in facilitating lexical access by progressively narrowing down the lexical search space as the string continues to be perceived (e.g. Forster, 1979; Marslen-Wilson and Tyler, 1975, 1980; McClelland and Elman, 1986; Gow and Gordon, 1995; Gaskell and Marslen-Wilson, 1997). Gow et al. (1996) argue that the perceptual demands of lexical access are reflected directly in phonological asymmetries involving the left edge, giving as an example the commonality of regressive assimilation across word-boundaries (/bæt kerv/ → [bæk kerv]) in comparison to the scarcity of analogous progressive assimilation (/bæt kerv/ → *[bæt terv]). Mutation in general thus presents a challenge to the Welsh hearer from this view as the alternation in the left edge of the word makes lexical recognition more difficult. It is not currently known how hearers of ICM languages mitigate these issues. One possibility is that they do indeed have stored somewhere the mutated reflexes at least of high frequency words and remap them to the same entity as the radical form, but even if this were the case with established word-stock, it would not help the hearer in the situation where they are integrating new word stock into their lexicon as these forms would not yet exist. We would thus expect that any mutated form incurs some form of temporal penalty in recognition and from this arises a bias against

mutation of novel forms and borrowings. While the effect of mutation on lexical access has not been studied thus far, it has been well established experimentally that substantial deviation (deletion or segment substitution) in word-initial onsets does impede lexical access and prevents priming of related targets (Marslen-Wilson and Zwitserlood, 1989). However, it has also been shown that, while some penalty may still be incurred, where the initial onset of a word varies only in one or two melodic features this does not prevent priming of related targets (Connine et al., 1993). This suggests that whole segment deletion is much worse for lexical access than other effects of mutation, which tend not to alter the melodic make-up of a target by more than two primes, i.e. the hearer should succeed in mapping non-/g/-initial targets to a lexical entry even as they are newly integrated into the system. However, we would expect that there is a significant chance that they will fail to identify the correct lexical entry where the wholesale deletion of an initial /g/ is involved.

In terms of the phonology, another factor conditioning the resistance of newly integrated /g/-initials may arise from analytic bias. It has been widely recognised that word-initial position is in certain ways phonologically privileged, for instance by allowing more contrast, allowing more complex structure, and favouring strengthening over weakening of segments. This is reflected most clearly in Beckman's (1998) theory of positional faithfulness. Following Beckman (1998) virtually all work in OT has recognised a specific set of initial faithfulness constraints to encode this phonological bias. While all mutations invariably involve some degree of initial unfaithfulness, initial segment deletion clearly represents one of the extrema of unfaithfulness: not only does it involve the eradication of all melodic information from the initial position but it also involves the deletion of the associated skeletal slot, making the onset unfaithful even structurally. This leads to a situation similar to that in lexical access. A small degree of initial unfaithfulness at the level of one or two differing melodic components may be more tolerable and overruled by other considerations compared to the maximal unfaithfulness that comes with whole segment deletion (in OT terms, the former will incur fewer violations than the latter). This may lead to a reversal of a preference for regularisation (removal of the initial OR) to faithfulness (retaining of the

initial OR) in order to avoid introducing an instance of such significant initial unfaithfulness into the system.

Hayes and White (2015) argue that typologically and analytically dis-preferred saltatory alternation arose in Campadanian Sardinian due to a similar bias against whole segment deletion. In saltatory alternations a class *A* alternates with a class *C* without affecting an intermediate class *B*, i.e. $A \rightarrow C$ but $*B \rightarrow C$. For instance, in Campadanian voiceless plosives are voiced and spirantised, but voiced plosives do not spirantise, as shown in (254a) and (254b), respectively (examples from Bolognesi, 1998, pp. 30f & 36–39, as cited in Hayes and White, 2015, p. 268):

| | | | | |
|-----------|------------|----------|-----------------|----------------|
| (254) (a) | piʃ:i | ‘fish’ | bel:u βiʃ:i | ‘nice fish’ |
| | trintaduzu | ‘32’ | s:u ðrintaduzu | ‘the 32’ |
| | kuat:ru | ‘4’ | dɛ yuat:ru | ‘of 4 ...’ |
| (b) | bĩu | ‘wine’ | s:u bĩu | ‘the wine’ |
| | dominiyu | ‘Sunday’ | don:ja dominiyu | ‘every Sunday’ |
| | gɔma | ‘rubber’ | dɛ gɔma | ‘of rubber’ |

Hayes and White (2015, pp. 273ff) argue that the system arose historically from a regular intervocalic lenition trajectory of the form $T \rightarrow D \rightarrow V \rightarrow \emptyset$ (e.g. $p \rightarrow b \rightarrow \beta \rightarrow \emptyset$). At one stage this led to a system where underlying voiceless plosives (*p*) surfaced as voiced fricatives (β) and underlying voiced plosives (*b*) underwent deletion. Thus at this stage we had forms such as [bɛl:u βiʃ:i] ‘nice fish’ (< /piʃ:i/ ‘fish’) and [s:u ỹu] ‘the wine’ (< /bĩu/ ‘wine’). They argue that the extensive neutralisation arising from this whole segment deletion in the specially sensitive word-initial site put Campadanian Sardinian in a “crisis stage” and learners then rejected the word initial deletion in favour of faithfulness (thus [s:u bĩu]) while retaining the leniting pattern for the non-deleting alternation involving underlying voiceless plosives. Interestingly there are some forms that still show fossilised alternants with a zero onset, e.g. [bak:a] ‘cow’ can surface variously as [s:a bak:a] ‘the cow’ with an overt onset or [s:a ak:a] with an elided onset (Hayes and White, 2015, p. 274). In some ways this reflects quite well the situation in Welsh, where the speaker/learner refuses to posit novel underlying forms that lead to deletion of the initial segment (i.e. (once) novel /g/-initial forms such as borrowed *gêm* /ge:m/ ‘game’), but preserves historical forms that show this very alternation (such as

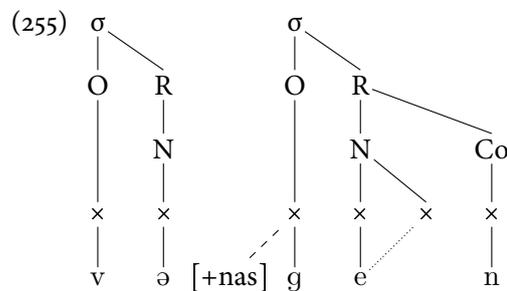
the fully mutable *gên* /ge:n/ ‘jaw’), all the while leaving the remaining system of word-initial alternations that does not lead to such word-initial deletion intact.

7.8 COMPATIBILITY WITH OTHER ACCOUNTS

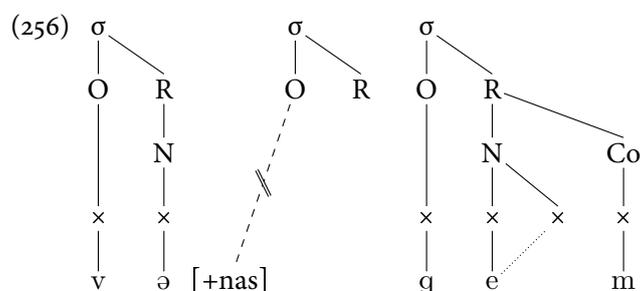
While floating feature accounts are the natural home of the initial empty OR analysis of immutability, it is not restricted to the floating element account I have proposed. In Section 7.8.1 I show that my account makes the same predictions for Lieber’s (1983) autosegmental account. Conversely, in Section 7.8.2 I show that an empty structure analysis is intractable for the rule based accounts of Ball and Müller (1992), Kibre (1997) and Pyatt (1997). In Section 7.8.3, I then turn to the target-allomorphy based accounts of Green (2006, 2007) and Hannahs (2013a,b) and show that, while it is difficult to implement the account straightforwardly, some gains can be made with the right assumptions and we can at least predict the immutability of Irish sT-sequences in Green’s framework.

7.8.1 Floating feature accounts

Let us first consider the autosegmental analysis in Lieber (1983), where a mutation trigger such as *fy* /və/ would not show any allomorphy but rather always be inserted with a floating feature [+nasal]. For Lieber (1983) the factor determining which consonants mutate and which don’t is whether the floating feature is able to dock onto the skeletal position of the onset without producing an illicit autosegmental structure. Thus, a regular item such as *gên* faces incorporation of a floating feature [+nasal] into the skeletal slot hosting the initial consonant, resulting in that position surfacing as [ɲ], as shown in (255).



The situation changes when an initial empty OR is present, as for example with the immutable target *gêm*. As shown in (256), the floating [+nasal] feature at the right edge of *fy* is unable to dock on the onset of an initial empty OR because it must be dominated by a skeletal slot ×. Attaching it directly to the empty O would create an illicit structure.²⁵



The initial OR analysis thus makes the same predictions regarding immutability for Lieber's (1983) account: any item with an initial empty OR will be inherently unable to incorporate floating material and thus show total immutability.

7.8.2 Rule-based accounts

Whether the theory of immutability put forward here has any standing in rule-based phonological accounts such as Ball and Müller (1992), Kibre (1997) and Pyatt (1997) rests crucially on whether empty syllabic structure can be meaningfully represented in linear phonology. Traditionally, linear phonology has not allowed any form of substantially empty vowels or consonants, and presumably a segment consisting solely of, say, [+syll] would later simply be filled in with the unmarked values for all the underspecified features required for phonetic interpretation. We could try and claim that Welsh nonetheless has such a super-underspecified segment consisting solely of [+syll], which prevents the application of the mutation rules (since these are conditioned by [-syll]), but that this segment is deleted by a rule that applies just before feature-filling rules would target it. The problem with this is that we would have to posit a rule such as (257), which makes explicit reference to the zero-valuedness (or absence) of

²⁵ The same would of course apply also in a GP account, were floating material to be inserted regardless of the target's phonological structure.

some feature complex which is never underspecified for the other vowels in the language.

$$(257) \left[\begin{array}{c} +\text{syll} \\ 0 \text{ high} \\ 0 \text{ low} \end{array} \right] \rightarrow \emptyset$$

However, positing a feature-changing rule that can make explicit reference to zero-values, such as (257), is highly problematic in that it would undermine the assumption that phonological computation operates on binary-valued features by covert reference to a ternary system (cf. Stanley, 1967, esp. §3.1). Feature-changing rules have, for this reason, traditionally been understood to be unable to make reference to zero. They may assign a $\{+, -\}$ value to a previously zero-valued feature through some rule, but they will neither specifically target zero nor feature zero in their contextual specification. Feature filling rules (also known as redundancy rules), which apply after feature changing rules, are arguably²⁶ able to refer to zero, because they specifically target as-of-then underspecified features while not affecting those features which have already received some specification. A deletion rule such as (257) cannot be part of the set of feature filling rules however, because it affects at least one already specified feature, [+syll].²⁷

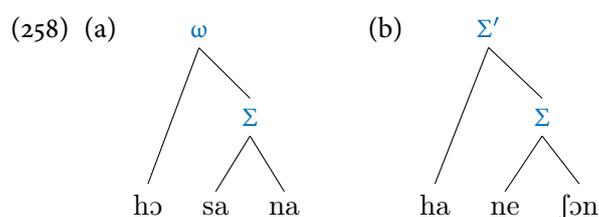
The alternative of co-opting some unattested feature combination, say [+syll, +high, +low], is no plausible alternative either. Given the absence of any phonological potency of the individual features involved, the

- ²⁶ Based on the assumption that feature-value pairs are pairs of the form $\langle V, F \rangle$, Bale et al. (2014) propose that the dichotomy between feature-changing and feature-filling rules can be captured by a consistency condition: all rules can assign some value $\{+, -\}$ to output- V , but this value cannot be incompatible with input- V . Underspecified features have no content in V ($V = \emptyset$), so any value can be assigned by any rule, while for those which have some valuation $V = \alpha$, assigning a value $-\alpha$ would violate consistency. Feature-changing rules then differ from feature-filling rules in that they first remove the valuation V from F , leaving the feature-changing rule free to assign any value whatever. Feature-filling rules do not have the subtractive component and therefore cannot overwrite existing values. In this system then no explicit reference to a zero-value is necessary to effect the different behaviour of the two types of rules. Rule (257) would then be inexpressible in this system.
- ²⁷ Stanley (1967, p. 410) distinguishes two types of improper use of 0: (i) to keep underlying feature matrices distinct from those with a $\{+, -\}$ value, and (ii) phonological rules whose application is dependent on some specific feature being valued 0. The use in (257) notably constitutes the improper use of 0 not just under one of these criteria, but under both simultaneously.

speaker would have no reason to posit them in the first place.²⁸ We would end up with what Kiparsky (1968/1982a) calls the “purely diacritic use of phonological features”, and in Scheer’s (2014a) words, we might as well replace [+syll, +high, +low] by \curvearrowright and say that the mutation rules simply do not apply to bananas, the predictions would be the same. In effect, what this shows is that an account of immutability based on structure is not feasible in linear phonology, and therefore accounts such as Ball and Müller (1992), Kibre (1997) and Pyatt (1997) ultimately have to rely on diacritic exception marking.

7.8.3 Target-allomorphy accounts

The situation is less clear with regard to accounts based on allomorphy of the mutation target. Both Green (2006, 2007) and Hannahs (2013a,b) operate within Optimality Theory, which itself has little to nothing to say about the representational options available within their respective accounts. Hannahs (2013b) clearly assumes that phonological constituents at syllable- and foot-level have some status in the theory, and although this structure is largely derived rather than stored there is at least some structural information that must be encoded underlyingly: in some trisyllabic forms such as /hɔ'sa.na/ *hosanau* ‘socks’ the first syllable can undergo optional deletion, while in others such as /ha'ne.ʃɔn/ it cannot undergo deletion. Hannahs (2013b) proposes that in the former, the initial syllable is attached directly to the prosodic word ω while the latter parses the initial syllable into a superfoot constituent Σ' , as shown in (258a) and (258b), respectively:



Since this distinction is unpredictable from the melody of these words alone, something has to be stored lexically that gives rise to one or the

²⁸ In fact, the combination [+syll, +high, +low] would possibly make the incorrect prediction that preceding South Welsh [s] palatalises before immutable items.

other structure (perhaps an exceptional form such as 258a is stored including the prosodic structure while the regular structure in 258b is not). Still, it is at best doubtful whether this extends to the admittance of empty structure in Hannahs' framework. As for Green (2006, 2007), there is nothing in his account that would lead me to think that underlyingly encoded prosodic structure may figure at all.

That being said, if we assume that forms can be stored with initial empty ORs in Hannahs' and Green's theories, then accounting for their immutability is relatively straightforward in that the proposed WFSs, which target forms with initial /p, t, k, b, d, g, m, n, ʎ, r^h/, won't apply to forms with empty onsets. If the theories don't allow underlyingly encoded empty structure however, then that precludes any effects attributable to an initial empty OR. Thus no straightforward analysis of the facts presented here in terms of structural properties would be possible in their framework.

The sC(C)-cluster effects in Irish are possibly an exception to this, since the initial empty structure can easily be derived by a set of high ranked constraints relating to general principles of syllable structure (namely a high ranking constraint ruling out branching s-Obstruent clusters combined with a set of constraints enforcing otherwise structurally well-formed syllables). As shown in Appendix A, under such an analysis, we can derive the immutability of Irish #sT-initial items under the account of Green (2006, 2007), because for him target-selection takes place in the phonology, but this in turn involves some perhaps undesirable implications for his account (as discussed in Appendix A). Such an analysis of #sT remains without consequences for Hannahs (2013a,b) because selection of the target alternant is pre-phonological and any account of immutability based on the phonological analysis of sC(C) sequences thus remains intractable under those assumptions.

7.9 SUMMARY

At the outset of this chapter I posed the question of how immutability is implemented in the grammar of Welsh. The conventional answer to this was something typical of a diacritic-based account: we must avail ourselves of another diacritic (or several, even) to mark out the exceptions. As we have seen, such an approach is neither as straightforward and simple

to implement as it might seem, nor is it very insightful—in fact, it offers us no insights into the phenomenon of immutability at all.

What I have proposed is that this exceptionality is actually encoded in the phonological structure of the immutable items themselves, in the form of an empty initial OR sequence which “shields” the target from mutation. Given that this initial OR is a real phonological object, it followed that it should interact with other phonological phenomena that relate in some way to the structural properties of the word-initial site. We have seen that this is indeed the case, by looking at conditions where words should for independent reasons receive a (at least partially) empty initial OR sequence, namely word-minimality and the structure of word-initial sT-clusters. We saw that these purely phonological factors in fact led to immutability of the affected words and thereby not only discovered interesting facts about immutability but also about the way word-minimality in Welsh works, the way metrical lengthening is effected, the structural split between s-Obstruent and s-Sonorant clusters in Irish. We also saw that there are diachronic developments that we can reasonably deduce would lead to the occurrence of initial empty structure, and again this aligned well with the facts of mutation and gave us a first insight into how mutation on some items may arise diachronically.

Compared to the diacritic approach with its inherent inability to make any predictions, the above demonstrates the great success of the strictly modular, non-diacritic approach. The phonological vacuity of diacritics simply hid the connections between immutability and phonological structure. This is reflected by the fact that previous accounts have usually not had more to say about immutability than fits in a single paragraph, if that. The initial OR theory of immutability put forward here shows that we have no need to fall back on modularity offending devices such as diacritics to explain this type of exceptionality, that immutability interacts with other phonological properties of the language in perhaps unexpected ways, and most crucially, it gives us for the first time an account that makes falsifiable predictions about immutability.

Conclusion

The main aim of this thesis was to develop a strictly modular account of Welsh Initial Consonant Mutation.

In Chapter 2 I justified the strictly modular approach on both conceptual and methodological grounds, situating it within a minimalist architecture of the grammar, in line with Distributed Morphology and Government Phonology. Crucially, I rejected there the idea of a phonological readjustment component as part of spellout, both because such a component is too unrestrictive and because it is incompatible with strict modularity.

In Chapter 3 I provided a detailed analysis of the Welsh consonantal system and made a number of novel representational proposals. I proposed that Welsh has a three-way laryngeal contrast and that the segmental representation of certain segments varies according to phonological position. I showed how this has bearing not only on mutation but also on the metrical system of Welsh.

In Chapter 4 I undertook a comprehensive and largely theory-neutral survey of the various mutation patterns, their variants, and their triggering environments. A crucial insight here was that the system shows a high degree of trigger-dependent variation. Apart from the three main mutation patterns **SM**, **AM**, **NM**, we also have to take into account the variant patterns **LSM** and **MM**, as well as the interaction between **AM** and **PVA**. Even within these patterns there was evidence for further, trigger-dependent idiosyncratic variation. Conversely, the only significant way in which mutation targets vary lies in whether they take part in the mutation system or not.

In Chapter 5 I reviewed previous accounts of the morphophonological implementation of Welsh **ICM**, making particular reference to (i) their empirical adequacy in relation to the findings of Chapter 4, and (ii) their

“Das Wahrscheinliche [...] und das Unwahrscheinliche [...] unterscheiden sich nicht dem Wesen nach, sondern nur der Häufigkeit nach, wobei das Häufigere von vornherein als glaubwürdiger erscheint. Es ist aber, wenn einmal das Unwahrscheinliche eintritt, nichts Höheres dabei, keinerlei Wunder oder Derartiges, wie es der Laie so gern haben möchte. Indem wir vom Wahrscheinlichen sprechen, ist ja das Unwahrscheinliche immer schon inbegriffen, und zwar als Grenzfall des Möglichen, und wenn es einmal eintritt, das Unwahrscheinliche, so besteht für unsereinen keinerlei Grund zur Verwunderung, zur Erschütterung, zur Mystifikation.”

—Max Frisch²

² From *Homo Faber*.

(in-)compatibility with the strict modularity hypothesis. The most recent and comprehensive accounts take two distinct approaches. One proposes that mutation triggers are marked by a diacritic feature indicating the type of mutation to be triggered. Mutation itself is then implemented by a set of rules that apply either in the lexical cycle or in the phonological readjustment component. The other takes a target suppletion approach, where every lexical item that undergoes mutation is stored in the lexicon with a full set of suppletive forms inserted in each of the mutation environments. I argued that neither of these approaches is compatible with strict modularity. They either employ module-transcending diacritics or have to rely on a mechanism that is able to manipulate phonological forms outside phonology proper. In addition, I argued that previous accounts are empirically unsatisfactory on at least two counts. First, they misplace the locus of variation on mutation targets, when we have seen in Chapter 4 that the locus of variation sits squarely on the mutation triggers. This makes the wrong predictions about a crucial aspect of the phenomenon. Second, both approaches rely on the use of ad-hoc diacritic features, which I argued against in Chs. 5 and 7, on the grounds that they are (i) empirically unjustified, (ii) inherently unable to make any predictions, and (iii) inherently unable to explain why it is that certain factors condition mutation and others do not.

In Chapter 6 I proposed a new, strictly modular account of Welsh Initial Consonant Mutation. The principal idea is that floating melodic material at the right edge of a mutation trigger is incorporated into the onset of an item to its right, thereby causing the phonological alternation in the target item. This idea has previously been successfully applied to mutation in many other languages, including Irish and Fula. While there has been an earlier attempt at such an analysis of the Welsh system, it turned out that this would require paradoxical underlying forms for mutation targets. My proposal departs from previous floating feature accounts in two significant ways. First, instead of assuming that triggers have only a single underlier with a fixed bundle of floating features, I proposed that triggers of mutation can have up to four distinct allomorphs, each of which can insert different floating material. The selection of the appropriate form is accounted for mainly through phonologically conditioned allomorphy, an independently well-motivated component of Vocabulary Insertion.

Second, while previous approaches typically assume that the incorporation of floating material may be blocked, for instance by the presence of an incompatible prior feature specification, I have proposed that incorporation happens regardless of melodic well-formedness. Rather, it is left up to the regular phonology to deal with the representations resulting from incorporation.

Not only does trigger suppletion overcome the paradoxes encountered by previous floating feature approaches, but the various allomorphs allow for an insightful analysis of trigger-dependent variation. For instance, *LSM* results from the absence of one of the allomorphs present in *SM* triggers. *MM* triggers carry an allomorph typically associated with *AM*, instead of the *SM* allomorph that otherwise targets voiceless plosives. We also saw that allomorphs can vary in other dimensions, such as the phonological or morphosyntactic conditioning environment of the vocabulary item. This analysis correctly predicts that certain forms, in particular functional items and lower numerals, should be suppletive. The trigger suppletion approach is consistent with the well-established observation that suppletion is very common in f-morphemes but very rare in l-morphemes. This is in stark contrast to target suppletion approaches, which wrongly imply that *ICM* languages should show suppletion on virtually every single l-morpheme in the language but on relatively few f-morphemes.

An analysis of the Welsh complementisers and the copula showed that what had previously been thought of as a series of lexically specified mutation triggers can be reanalysed as cases of polarity-fission. Not only does this allow for a radically simpler and more economical set of vocabulary entries for the relevant items, but it also accounts for the fact that in some speakers the mutations are triggered even when the complementisers are not overtly realised. Similarly, an analysis of mutation in the *DP* showed that the floating element approach accounted for the data with equal efficiency and economy to diacritic approaches. I proposed that mutation following the definite determiner is a type of definiteness-agreement, as found for instance in Amharic. Such an analysis avoids the insertion paradox whereby the determiner's form appears to be dependent on a post-mutation form which is itself conditioned by the determiner and efficiently accounts for the fact that the mutation induced varies according to the word-class of the target. The analyses of the complementisers and

mutation in the DP showed that floating element account allows us to tie mutation to the triggering environments in a much more intricate and insightful way than diacritics do. In many cases, what appears to involve a large number of lexical triggers can be analysed as the exponence of a single terminal.

In Chapter 7, I proposed the first comprehensive account of items that exceptionally resist mutation. I proposed that immutable items begin with an empty initial CV. The initial CV is a lexical property of specific vocabulary items, rather than being present on all lexical items on account of a parametric setting. The initial CV proposal makes several interesting and perhaps unexpected predictions. Among other things, it successfully accounts for the immutability of monomoraic function words in Welsh and of sC(C)-initial words in Irish.

There are several areas in which the work presented here requires further research. The proposals made for the representation of the Welsh consonants would benefit from further work in areas outside the metrical system and mutation which might corroborate or suggest alternatives to the proposed analyses, especially regarding the laryngeal contrast and segments contrastively specified for occlusion. Further work on the featural and structural properties of the complementisers, especially in regard to the periphrastic/synthetic contrast and relative clauses, could further simplify the analysis presented. The analysis of the DP did not deal with complex numerals (which often involve movement), with nominal adjuncts, or with compounds. A full analysis of the DP and its accompanying mutations must eventually take these factors into account.

An area which has garnered much attention from syntacticians but which deserves particular attention from a morphophonological standpoint is direct object mutation. While I suggested possible modifications to the case-linked approach in §4.8.2, it is not clear how the more widely accepted XP Trigger Hypothesis could be implemented morphophonologically. Although the problem exists also in other approaches to mutation, the strictly modular approach pinpoints the issue very succinctly. If every mutation is the exponence of some morphosyntactic entity, what entity can be realised in the environment described by the XP Trigger Hypothesis?

Overall, this thesis shows that Welsh ICM can be successfully analysed in a model compatible with the strict modularity hypothesis. Morphosyntax only does morphosyntax, without any reference to or manipulation of phonological material. Phonology only does phonology, without any reference to morphosyntactic material. The high amount of interlinking can be reduced entirely to strictly local conditions at Vocabulary Insertion. There is no need for novel devices or mechanisms which are not already part of the common analytic repertoires of spellout and phonology. What makes Welsh mutation special is that it makes more extensive use of phonologically conditioned allomorphy and floating melody than many other morphophonological processes do. The strictly modular and non-diacritic approach proved fruitful, as it forced analyses based on actual morphosyntactic and phonological entities, which entails that these entities will have all the effects their presence would have independently of mutation.

APPENDIX

high ranked constraints relating to general principles of syllable structure, a claim I will substantiate here. Let us assume the set of constraints in (261–265):

(261) *S-OBSTRUENT CLUSTERS (*_[σsT]):

Assign one violation mark for each sequence of [s] followed by an obstruent at the left edge of a syllable.

(262) NUCLEUS (N):

Assign one violation mark for each syllable that does not contain a nucleus.

(263) *GAP:

Assign one violation mark for each (structural) gap in the segmental string.

(264) *NUCLEAR CONSONANTS (*N_[-syll]):

Assign one violation mark for each nucleus dominating a segment that is specified [-syll].

(265) DEPENDENCY (DEP):

Assign one violation mark for any segment in the output that is not present in the input.

The constraint *_[σsT] here essentially enforces the differential Irish sonority sequencing facts of sC clusters, and might be subsumed by a more general instantiation of *SONSEQ*. N militates against syllables without a nucleus. *GAP is an output-oriented contiguity constraint (cf. *O-CONTIG* in McCarthy and Prince, 1995) and penalises structures that break the linear adjacency of the input segments, e.g. by inserting an empty constituent in the middle of a string rather than at an edge, while *DEP-S* penalises the presence of any segment in the output that is not present in the input, which I take to include objects such as melodically empty onsets and nuclei. Finally *N_[-syll] penalises the parsing of [-syll] consonants as nuclei.

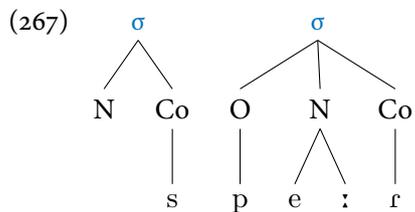
As shown in Tableau (266), assuming that *DEP* is outranked by all these constraints and by *MAX-C* (I will not make any ranking arguments

other than for DEP), the least marked output is the candidate with a structure resembling the magic licensing construction in GP:

(266) Tableau for Irish *spéir* /spe:ɾ/ ‘sky’

| /spe:ɾ/ | MAX-C | *[σsT] | *N _[-syll] | *GAP | N | DEP |
|--|-------|--------|-----------------------|------|----|-----|
| [pe:ɾ] | *! | | | | | |
| [spe:ɾ] | | *! | | | | |
| [s ^O][pe:ɾ] | | | | | *! | |
| [s ^{Co}][pe:ɾ] | | | | | *! | |
| [s ^N][pe:ɾ] | | | *! | | | |
| [s ^N Co][pe:ɾ] | | | *! | | | * |
| [s ^O N][pe:ɾ] | | | | *! | | * |
| [O s ^{Co}][pe:ɾ] | | | | | *! | * |
|  [N s ^{Co}][pe:ɾ] | | | | | | * |
| [O N s ^{Co}][pe:ɾ] | | | | | | **! |

As we can see, the structure of the winning candidate is not one with an initial empty onset, as this would introduce structure that is not strictly necessary to improve markedness, but rather we end up with a structure that starts with an empty nucleus, as shown in (267):

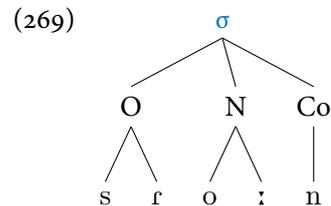


Compare this to the input *srón* /sro:n/ ‘nose’ in Tableau (268):

(268) Tableau for Irish *srón* /sʀo:n/ ‘nose’

| /sʀo:n/ | MAX-C | *[_σ sT | *N _[-syll] | *GAP | N | DEP |
|------------------------------|-------|--------------------|-----------------------|------|----|-----|
| [ʀo:n] | *! | | | | | |
| ☞ [sʀo:n] | | | | | | |
| [s ^O][ʀo:n] | | | | | *! | |
| [s ^{Co}][ʀo:n] | | | | | *! | |
| [s ^N][ʀo:n] | | | *! | | | |
| [s ^N Co][ʀo:n] | | | *! | | | * |
| [s ^O N][ʀo:n] | | | | *! | | * |
| [O s ^{Co}][ʀo:n] | | | | | *! | * |
| [N s ^{Co}][ʀo:n] | | | | | | *! |
| [O N s ^{Co}][ʀo:n] | | | | | | *!* |

As seen here, because *[_σsT is not violated by the s-liquid sequence in /sʀo:n/, the outcome for such an input form does not permit the introduction of any additional empty structure. The winning candidate in (268) thus has the structure in (269), with a regular branching onset.

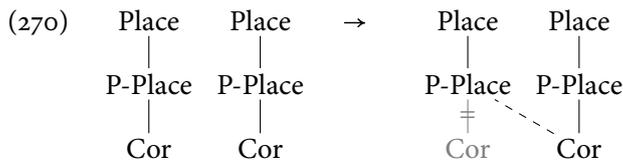


Comparing the two structures in (267) and (268) yielded by the OT grammar to the GP structures in (259) and (260), we see that while #sT under the GP analysis begins with an empty onset and #sT under the OT analysis begins with an empty nucleus, it is true that under both accounts Irish #sT-initial items begin with empty structure.

Of course, in a floating element/feature account, this initial empty nucleus should suffice to prevent incorporation of a floating feature, but neither Hannahs' (2013a; 2013b) nor Green's (2006; 2007) accounts are of this nature. Rather, they are both based on allomorph selection. This takes place at the point of insertion for Hannahs (2013a,b), thus ruling out any effect phonological computation could have in "overruling" the

selection that has taken place at vocabulary insertion. This makes the structure of Irish sT clusters irrelevant to Hannahs' account and we are left unable to predict that these words are inherently immutable.

Green (2006, 2007) however assumes that allomorph selection takes place during phonological computation, where the highly ranked constraint MUTAGREE ensures that the insertion candidate matches the selectional diacritic of a (syntactically) governing element. This means that, in principle, a mutation can be suppressed for phonological reasons if MUTAGREE is outranked by some markedness or faithfulness constraint(s). Green (2007, pp. 121ff) argues that this is the case in Irish coronal-coronal sequences. In Irish, where a coronal final trigger is followed by a coronal-initial mutable target, the target resists mutation despite being mutable in other (phonological) environments. Following Ní Choisáin (1991), Green (2007) analyses this as an instance of coronal fusion: adjacent coronals in compounds, prefixed forms and clitic domains undergo fusion and share a single primary place node (P-Place) (cf. Ní Choisáin, 1991, p. 108), as shown in (270):



Green (2007, p. 124) implements this in OT in the form of the markedness constraint in (271), which enforces coronal homorganicity within the prosodic word domain:

(271) CORONAL HOMORGANICITY (CORHOM):

In $\omega(\dots C_i C_j \dots)$, if C_i is coronal, then C_j is coronal.

CORHOM is outranked by FAITH(Place), so that lexically specified non-homorganic sequences, e.g. in *olc* [olk] ‘bad’, are never altered to satisfy CORHOM. However, because in the case of mutable forms two or more alternative underliers are entertained (meaning that FAITH(Place) does not figure), one which agrees in coronality and one which doesn't, CORHOM can arbitrate between morphemes. This is illustrated in Tableau (272), taken from Green (2007, p. 125):

(272) Tableau for Irish *sean duine* /ʃan dʲnə/ ‘old person’

| /ʃan/+LEN+ $\left\{ \begin{array}{l} dʲnə_{\text{RAD}} \\ \gamma dʲnə_{\text{LEN}} \end{array} \right\}$ | FAITH(Pl) | CORHOM | MUTAGREE |
|--|-----------|--------|----------|
| $\omega(\omega(\text{ʃan})_{\omega}(\text{dʲnə}))$ | | | * |
| $\omega(\omega(\text{ʃan})_{\omega}(\gamma dʲnə))$ | | *! | |

In (272) we can see that CORHOM overrules selection of the expected LEN-marked allomorph. Now let us assume that Green’s (2007) WFSs have applied to an immutable sT form such as *spéir* /spe:r/ ‘sky’. We expect this to have three lexical allomorphs, as in (273):

(273) *spéir*:/spe:r/ _{RAD}/hpe:r/ _{LEN}/spe:r/ _{ECL}

While none of the constraints in (261–265) would effectively overwrite MUTAGREE given that they should behave similarly to FAITH in the scenario where we are dealing with multiple competing underlying forms, it is clear that hT is not a good output form in Irish. What I will suggest is that, since Irish does not allow any word-initial obstruent obstruent clusters, we can replace the *[sT constraint by the more general *[_σOB-SOBS constraint in (274):

(274) *OBSTRUENT-OBSTRUENT CLUSTERS (*[_σOBSOBS):

Assign one violation mark for each sequence of an obstruent followed by an obstruent at the left edge of a syllable.

*[_σOBSOBS will force the underlying form /hpe:r/ into the same syllabic structure, where /h/ occupies a coda position. As in many other languages, Irish /h/ is banned from coda position. Let us capture this with a constraint *CODA-h:

(275) *CODA-h:

Assign one violation mark for each /h/ in coda position.

*CODA-h is never violated in Irish and we can therefore assume that it is undominated. We then expect that the form /hpe:r/ will lose out to /spe:r/ if the entire set enforcing the nucleus-coda structure for initial sT outranks MUTAGREE due to undominated *CODA-h. This is illustrated in Tableau (276):

(276) Tableau for Irish *spéir* /spe:r/ ‘sky’

| $\left\{ \begin{array}{l} \text{spe:r}_{\text{RAD}} \\ \text{hpe:r}_{\text{LEN}} \end{array} \right\}$ | *CODA-h | MAX-C | *[_σ OBSOBS | ... | *OC ₀ | DEP-S | MUTAGREE |
|--|---------|-------|------------------------|-----|------------------|-------|----------|
| ☞ [N s ^{Co}][pe:r] | | | | | | * | * |
| [N h ^{Co}][pe:r] | *! | | | | | * | |

For clarity, the final ranking of constraints assumed in (276) is as follows:

- *CODA-h
- >> MAX-C, *[_σOBSOBS, *N_{[-syll], *GAP, N}
- >> DEP
- >> MUTAGREE.

Ultimately, what this shows is that MUTAGREE can be overruled by a phonological ban on initial hT clusters, leading to the preferential selection of a form with an sT cluster. Thus, it is possible to derive the inherent immutability of Irish #sT-initial items in an OT analysis following Green’s (2006; 2007) account, but under Hannahs’ (2013a; 2013b) account even forcing this kind of initial empty structure would not lead us to make such a prediction. And while this may work under Green’s account, and indeed look phonologically interesting given that what exactly may constitute the “s”-portion of an sT cluster can differ cross-linguistically, it leaves us with the odd conclusion that a Greenian learner of Irish will posit underlying lexical forms with a phonological shape that will never surface, and which they have no evidence should be possible from their input during acquisition; they end up storing a literally useless artefact of the WFSs they need to deal with the remainder of Irish mutations. This is a curious prediction, but not one which is testable with methods currently available.

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