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Phrase structure vs. dependency: The analysis of Welsh syntactic soft mutation[1]

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Most familiar syntactic frameworks recognize the category 'phrase', and are built around phrase structure relationships. However, the Word Grammar dependency model does not acknowledge the category 'phrase' as a primitive in the grammar; instead, all relationships are word-based, with phrases having no syntactic status. Here, I investigate the theoretical validity of the notion 'phrase' by examining the phenomenon in Welsh known as syntactic soft mutation, contrasting a phrase-based account with a dependency account. I conclude that an empirically adequate analysis of syntactic soft mutation must make reference to phrases as a category, thus ruling out the dependency account. A further theoretical question concerns the role played in the grammar by syntactically present but phonetically unrealized elements, including empty categories such as *wh*-traces and unrealized material in ellipsis. Syntactic soft mutation proves an interesting testing ground in these contexts, but the data again fail to support the dependency account. The conclusion is that a phrase-based account of the mutation is better motivated and empirically more accurate than the alternative dependency account.

1. Introduction

Most familiar syntactic frameworks recognize the category 'phrase', and are built around phrase structure relationships, although the theoretical assumptions each model makes may differ radically (compare, for instance, Principles & Parameters with Head-driven Phrase Structure Grammar). However, the dependency model known as Word Grammar (Hudson 1990, 2007) does not acknowledge the category 'phrase' as a primitive in the grammar; instead, all relationships are word-based, with phrases having no syntactic status. My first goal is to investigate the theoretical validity of the

[1] I acknowledge with gratitude my extensive debt to Richard Hudson, who has been of great help concerning the details and predictions of the dependency analysis. I would also like to thank Bob Borsley and David Willis, whose detailed, thoughtful and encouraging comments on various drafts have greatly improved this paper, as have three helpful reports from *JL* referees. I also gratefully acknowledge the British Academy conference grant which enabled the Fifth Celtic Linguistics Conference to be held at Gregynog in 2007, at which an earlier version of this paper was presented. Needless to say, none of the above is responsible in any way for what follows.

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notion 'phrase', with reference to the phenomenon in Welsh of syntactic soft mutation; I contrast a phrase-based account of the data with a dependency account. I conclude that an empirically adequate analysis of syntactic soft mutation must make reference to 'phrase' as a category, thus ruling out the dependency account.

A second major theoretical issue concerns the role played in the grammar by syntactically present but phonetically unrealized material, including empty categories such as *wh*-traces and unrealized words in contexts involving ellipsis. Both HPSG and Word Grammar inherently assume a more superficial structure than is proposed in Principles & Parameters models, and as a consequence, both have been more reluctant to postulate empty categories. In Word Grammar, unrealized elements were until recently not recognized at all; see, for instance, Hudson (2007: 172). HPSG has also been quite suspicious of empty categories, and some work has avoided them altogether. Recent developments in Word Grammar have resulted in changes in the earlier view of abstract elements, so that certain empty categories are now accepted. Of course, the research question concerns exactly which unrealized elements need to be recognized, and syntactic soft mutation provides an excellent testing ground for this issue. We will see that it is probably impossible to give a concise account of the environments for the mutation without postulating some syntactically present but unrealized material. Thus, a certain level of abstractness is unavoidable. However, different predictions concerning unrealized elements are made by the two grammatical models, and we will see that the dependency analysis encounters more problems in this regard than the phrase-based analysis.

A phrase-based account of syntactic soft mutation has been formulated quite successfully within HPSG (e.g. Borsley 1999), and my discussion of the phrase-based approach centres on this account. As yet, there is no full dependency analysis in the literature, but the bare bones of an account are sketched within Word Grammar by Hudson (2007), and I develop this in what follows.

Section 2 presents the main mutation data to be accounted for. In section 3, I first outline the phrase-based analysis, the XP trigger hypothesis. Empirically, this account has been very successful in predicting the occurrence of syntactic soft mutation in a wide variety of contexts, but it has sometimes been criticized, essentially for being unrelated to any other grammatical mechanism. I then introduce a new analysis, a Word Grammar account. Section 4 compares the predictions made by this new account with those made by the existing XP trigger account, examining a variety of data not previously discussed in the formal literature on mutation. One of the differences between the two accounts is that the Word Grammar analysis attempts to tie the mutation phenomena in with other, more familiar, linguistic phenomena. Specifically, syntactic soft mutation is analysed in terms of 'dependency distance', suggesting that the mutation signals the

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separation of a dependent from its parent. Since it is known that various syntactic effects do result from dependency distance, a successful dependency account might seem more motivated, and might therefore replace the phrase-based account. However, it would first have to be established that the dependency account is as successful empirically as the XP trigger hypothesis (to which it is in some superficial respects fairly similar). I conclude that this cannot be established. Moreover, an analysis which is phrase-based poses fewer theoretical problems, providing evidence for the psychological reality of the phrase itself.

2. Basic contexts for syntactic soft mutation

The term 'consonantal mutation' refers to sets of morphophonological alternations in the initial segments of words or morphemes which are conditioned by factors other than the purely phonological context. Conditioning factors include lexical triggers, morphosyntactic features, and the syntactic context. Consonantal mutation occurs extensively in all the Celtic languages, probably the family best known for this phenomenon, but is also found in various other families, including West Atlantic languages, such as Fula, and in Mande languages, such as Mende. I concentrate here exclusively on one member of the Celtic family, modern Welsh.

Welsh displays three basic series of mutations, known as soft mutation, nasal mutation and aspirate mutation, of which soft mutation (SM) is by far the most extensive, both in terms of the number of contexts in which it is triggered, and in terms of its frequency in the spoken and written language. The majority of contexts for all three series of mutations can be described very straightforwardly: typically, the trigger is a lexical item such as a preposition or a numeral, often a small functional element. For instance, the third person masculine singular possessive proclitic *ei* triggers SM: given the basic form *telyn* 'harp', 'his harp' is *ei delyn*. The homophonous third person feminine singular proclitic *ei*, on the other hand, triggers aspirate mutation: 'her harp' is then *ei thelyn*. The mutation itself always appears on the initial segment of the constituent which is the target for mutation. Note that not all consonsants are mutable; if the initial segment happens not to be one of the mutable consonants, then the target constituent bears no signs of the mutation at all.

In certain contexts, there are morphosyntactic restrictions on either the trigger or the target for mutation. For instance, the definite article *y* triggers SM, but only targets feminine singular nouns: since *telyn* 'harp' is feminine, we find *y delyn* 'the harp', but in the plural, *y telynau* 'the harps', with no mutation. A masculine noun also undergoes no mutation in this context, thus *terfyn* 'end' and *y terfyn* 'the end'.

In most instances, the structural description of the mutation context is relatively simply stated, and there are typically no particular theoretical

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implications arising from statements of the environments for the mutations. However, one context for Welsh SM is decidedly different, and has been the topic of much debate in the generative literature over the past twenty-five years or so. What is unusual is that the mutation in this context appears to be purely syntactically triggered. The central research question has been to describe and predict under what exact conditions the mutation occurs. Some of the core instances of this syntactic SM are illustrated in (1)–(7):[2]

(1) Prynodd y ddynes delyn. (*telyn*)
buy.PAST.3S the woman harp
'The woman bought a harp.'

(2) Gwnaeth y ddynes [werthu telyn]. (*gwerthu*)
do.PAST.3S the woman sell.INF harp
'The woman sold a harp.'

(3) Dechreuodd y ddynes [ganu 'r delyn]. (*canu*)
begin.PAST.3S the woman sing.INF the harp
'The woman began to play the harp.'

(4) Dymunodd Aled [i Mair ganu 'r delyn]. (*canu*)
want.PAST.3S Aled to Mair sing.INF the harp
'Aled wanted Mair to play the harp.'

(5) Dw i [lawn mor grac â chi]. (*llawn*)
be.PRES.IS I full as angry as you
'I'm just as angry as you.'

(6) Mae ar y llwyfan [delyn hen iawn]. (*telyn*)
be.PRES.3S on the stage harp old very
'There is on the stage a very old harp.'

(7) Rhoddodd Elen y delyn [ddwy droedfedd yn nes at y ffidil]. (*dwy*)
put.PAST.3S Elen the harp two foot PRED nearer to the fiddle
'Elen put the harp two feet nearer the fiddle.'

These examples show that Welsh is a verb-initial language, with either a finite lexical verb or a finite auxiliary in initial position in the basic word order, immediately followed by the subject. In (1), the object of a VSO clause bears SM. In (2), the initial finite element is an auxiliary, with the lexical verb *gwerthu* 'sell' in its non-finite form lower down in the clause, within a verb phrase. The SM is on the initial element of that verb phrase: *gwerthu* > *werthu*. In (3), we have what in some frameworks (e.g. Principles &

[2] In what follows, only instances of mutation germane to the discussion are noted; the word bearing the relevant mutation is underlined, and its radical form is given in parentheses following the example. Words cited in the text are given in their radical form, even when discussing a form which is mutated in a numbered example, unless it is the mutation itself which is under discussion.

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Parameters) would be treated as a biclausal example. *Dechreuodd* 'began' is a raising verb, and its complement, the predicate *canu'r delyn* 'play the harp', bears the mutation, which as usual shows up on its initial segment: *canu* > *ganu*. The SM is within a non-finite embedded clause in (4), not on the initial segment of the clause, but on the initial segment of the predicate, *canu'r delyn*. In (5) we have a copular clause, with the (bracketed) adjectival predicate *llawn mor grac â chi* 'just as angry as you' undergoing the mutation. Though all the examples so far display the unmarked word order, the word order in (6) is somewhat marked: the subject, *telyn hen iawn* 'a very old harp', does not immediately follow the initial verb, but instead follows a PP, *ar y llwyfan* 'on the stage'. In this position, the subject bears SM, which as usual shows up on its initial segment: *telyn* > *delyn*. And in (7) we have a three-argument verb *rhoi* 'put', with SM on the initial segment of the (bracketed) third argument, *dwy droedfedd yn nes at y ffidil* 'two feet nearer the fiddle': *dwy* > *ddwy*. Other environments for syntactic SM will be illustrated as the discussion progesses.

It will be seen straight away that a variety of constituents can undergo SM. The mutation appears on the object in (1), on a verb phrase in (2) and (4), on a clause (or, depending on the theoretical assumptions made, a verb phrase) in (3), on an AP predicate in (5), on the subject in (6), and on a preposition phrase complement in (7) (which has the head preposition *nes* 'nearer'). Syntactic SM is thus not limited to nominal phrase targets only, but can appear on constituents headed by a range of lexical categories.

Other things being equal, the most successful account would formulate a single generalization covering all instances of syntactic SM, and various attempts with such a goal in mind appear in the generative literature from around 1981 onwards. I will assume in what follows that the burden of proof lies with any analysis which requires more than one single generalization, and will evaluate available analyses accordingly.

3. Outline of the two analyses

3.1 *The phrase-based account: the XP trigger hypothesis*

The XP trigger hypothesis has its roots in an informal suggestion made by T. J. Rhys Jones (Rhys Jones 1977: 328, 338), and was developed within generative grammar by Harlow (1981, 1989), Borsley & Tallerman (1996), Tallerman (1990, 2006), Borsley (1997, 1999) and Borsley, Tallerman & Willis (2007). The principal idea in this literature is that initial consonants undergo SM when immediately preceded by a phrase, XP. Before turning to the formalization of what Borsley & Tallerman (1996) term the XP trigger hypothesis (XPTH), we can get an informal idea of its basic predictions by examining the data in (1) to (7). In all these examples, a phrasal category immediately precedes the element undergoing the mutation. So in (1), (2)

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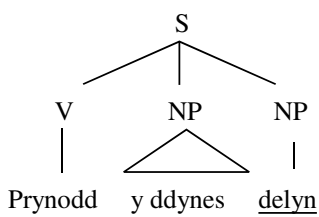
and (3), the triggering XP is in each case *y ddynes* 'the woman', the subject of the root clause (in (1), the only clause). In (4) the trigger is also a subject, but this time the subject of the non-finite embedded clause, *Mair*. In (5), the trigger is again the subject, *i* 'I', and the mutation appears on the first segment of the following AP predicate. However, in (6), it is the subject itself, *telyn hen iawn* 'a very old harp', which undergoes SM, and the triggering XP is the preceding PP, *ar y llwyfan* 'on the stage'. And in (7), the constituent which undergoes the mutation is itself a PP, *dwy droedfedd yn nes at y ffidil* 'two feet nearer the fiddle', with the object, *y delyn* 'the harp', as the immediately preceding XP trigger. Structural assumptions for some basic examples are discussed below.

Obviously, the exact predictions made by the XP trigger hypothesis depend on its formulation, and on what kind of structures are proposed. The version of the XPTH which I will adopt here is shown in (8), adapted from Borsley (1999: 286):

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

In Borsley's HPSG analysis, syntactic structures are essentially flat, so that in a simple VSO clause such as (1), the head verb, subject and object are all sisters:[3]

(9)



Given such a structure, the XPTH predicts that the object, a complement, bears SM, since it is immediately preceded by a c-commanding phrase (the subject). The basic data in (1) to (5), for instance, all have the subject XP as the mutation trigger, and can thus be accounted for in a similar fashion; see Borsley (1999) for full illustration. Examples such as (6) and (7) have different XPs as the mutation trigger, but are all accounted for straightforwardly under (8), given the assumptions of a flat structure analogous to that in (9).

[3] Given that the major constituents of the clause are all sisters, Borsley (1999: 286) can restrict the relationship between trigger and target more narrowly than in (8): under his formulation, the target must be 'immediately preceded by a phrasal sister'. Since 'sister' presupposes 'c-command', and since the distinction between sisterhood and c-command is not critical in what follows, I adopt the formulation in (8). I assume that X c-commands Y iff the first branching node dominating X also dominates Y.

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Note that (8) predicts that only complements – and not constituents which are merely part of a complement, nor adjuncts – will undergo syntactic SM.[4] This restriction gives rise to an important change in the predictions made by an earlier formulation of the XPTH by Borsley & Tallerman (1996), which proposed that the target was a CONSTITUENT (not necessarily a complement) immediately preceded by XP. As Borsley's restriction is also relevant to the evaluation of the Word Grammar analysis (section 4.4.1), it is worth briefly outlining the main evidence that the target is the entire complement. One critical piece of data is shown in (10):

(10) Prynodd y ddynes delyn newydd, corn/*gorn a
buy.PAST.3S the woman harp new horn horn(+SM) and
ffidil. (*telyn*)
fiddle
'The woman bought a new harp, a horn and a fiddle.'

Here, as in (1), SM appears on the direct object, *telyn newydd, corn a ffidil* 'a new harp, a horn and a fiddle', and is triggered by the subject XP; as usual, the mutation appears on the initial segment, so *telyn* > *delyn*. Note, however, that whatever the analysis of co-ordination, it would be reasonable to expect it to involve a structure in which each conjunct c-commands the next conjunct. Since each conjunct is itself a full XP, the question then is why the first conjunct *telyn newydd* 'a new harp' does not trigger mutation of the second conjunct *corn* 'horn', and so on.[5] Yet if *corn* in (10) is mutated to **gorn*, the result is ungrammatical. Crucially, when the target for SM is a series of conjoined phrases, the mutation only appears on the first conjunct, and not on any subsequent conjuncts. Borsley's solution (1999: 286) is that the whole complement itself – in this case, the object of the clause, *telyn newydd, corn a*

[4] SM triggered under (8) is restricted to complements, excluding adjuncts, because 'the presence or absence of mutation on adjuncts is generally dialectally or idiolectally determined, irrespective of syntactic context' (Borsley et al. 2007: 247); see also Borsley & Tallerman (1996) and Borsley (1999). Basically, adjuncts may occur either with or without mutation, as in (i):

(i) A' i yno ddydd Mawrth/ dydd Mawrth.
go.FUT.1S I there Tuesday(+SM) Tuesday
'I'll go there on Tuesday.'

Adjuncts appearing clause-initially (i.e. not following any possible trigger) exhibit just the same variation. The wisest conclusion seems to be that any mutation on adjuncts is not triggered at all, thus restricting the triggering context in (8) to complements. This is not problematic in theoretical terms, since there are various other contexts for mutations in modern Welsh which do not involve a trigger. Note that the variation in mutation in examples like (i) prevents SM from being a reliable criterion for distinguishing complements from adjuncts.

[5] The final conjunct in the series is immediately preceded by *a* 'and', itself a lexical trigger for aspirate mutation. There is no conflict between two potential triggers, since the closest trigger always takes precedence, and thus blocks a mutation which might otherwise have been triggered by, say, an earlier lexical item.

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ffidil – is the only target for SM. Hence, the mutation appears just on its initial segment. Since each individual conjunct is not itself a complement, but only part of the complement, the formulation of the XPTH in (8) correctly predicts that only the first conjunct bears SM.

One of the questions raised by this restriction, though, concerns the definition of 'complement'. First, given such data as (6), 'complement' must also include the subject of a clause, since subjects in the appropriate context are targets for syntactic SM. In most theoretical frameworks, subjects are not considered to be complements, although they are of course arguments. However, some versions of the HPSG model propose that a post-verbal subject is a member of the COMPS list, i.e. the set of complements of a head; see Borsley (1989, 1999) and Sag, Wasow & Bender (2003). As we will see in section 3.2, a rather similar assumption is made within Word Grammar (e.g. Hudson 2007), where subjects are also VALENTS, and as such are included in the set of possible mutation targets under the assumptions made by this account too. Second, predicates must also be treated as complements/valents, since in the appropriate context they too are targets for syntactic SM. For instance in (4), which contains an embedded *i*-clause, the predicate *canu'r delyn* 'play the harp' bears the mutation. The adjectival predicate in (5) is similarly a target for SM, hence must also be a complement. Although these decisions may appear controversial in some frameworks, such a treatment allows a single generalization to be made across a wide range of mutation data. I will assume from now on that restricting mutation targets to complements/valents in the above sense is correct, that such a restriction must apply to any version of the XPTH, and must equally apply to the dependency account of syntactic SM.

In empirical terms, the phrase-based account has proved highly successful as a hypothesis predicting the occurrence of Welsh syntactic SM. Nonetheless, as a mechanism it has been criticized recently by Ian Roberts for failing to relate to other grammatical phenomena, or at least to phenomena postulated within a P&P framework, such as Case theory or checking theory (Roberts 2005: 76). It is far from self-evident that the XPTH must therefore be wrong, particularly as Roberts' own P&P account of syntactic SM, in terms of Case-licensing, has serious empirical flaws (Tallerman 2006, Borsley et al. 2007: chapter 7). However, we can now compare the XPTH with a completely novel account of syntactic SM, which does include a proposal about the function of the mutation, and also about how this function relates to other observed grammatical phenomena. In section 3.2, then, I compare the XPTH with a new surface-based analysis, a dependency account.

3.2 *Dependency distance: a Word Grammar account*

The best-known syntactic models, including both P&P/Minimalism and HPSG, are based on phrase structure. Word Grammar (e.g. Hudson 1990,

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2007, Creider & Hudson 2006), on the other hand, is based on dependency structure between individual words, and has no phrasal nodes. Hudson (2007: 124–129) suggests that the results of experiments on language processing show that phrase structure lacks psychological reality; instead, 'the only relevant units seem to be words' (Hudson 2007: 125). Specifically, there is a substantial body of work on what is known as 'dependency distance', which refers to 'the number of words that separate a word from its parent … the greater the distance, the harder the processing' (Hudson 2007: 124). Evidence from psycholinguistics and language typology indicates that difficulty in processing increases with dependency distance. Furthermore, grammatical structures cross-linguistically are generally organized in such a way as to minimize dependency distance; see, for instance, Hawkins (1990, 1994, 2001, 2004).

Dependency distance relates to syntactic SM in the following way: the basic proposal is that the mutation has a function, namely to mark the separation of a dependent from its head. In a brief sketch of this idea, Hudson (2007: 126) notes that Welsh 'seems to have explicit markers of dependency distance. SM … applies to verb dependents under complex conditions … which may reduce to being separated from the verb'.[6] In fact, as we will see, cases where dependents are separated from verbal heads constitute only one instance of the overall phenomenon of syntactic SM. Stated more broadly, the proposal is that the mutation signals the separation of a dependent from any head. Interestingly, this idea reflects, and indeed extends, an environment noted in traditional Welsh grammars, known as a *sangiad*, which refers to cases where the normal word order is disrupted by some intervening phrase, and SM immediately follows (e.g. Morgan 1952: chapter 19).

If the proposal for a function for syntactic SM could be maintained – and providing the account of the mutation is empirically accurate – this would be a highly interesting result, and the analysis might even replace the XPTH account, which proposes no function for the mutation. However, we first need to establish that the Word Grammar account proves successful in accurately predicting the occurrence of syntactic SM in as many contexts as the XPTH – and as we will see, this turns out not to be the case. Moreover, if a phrase-based account such as the XPTH is actually more successful in predicting the environments for the mutation, then we will have some evidence for the psychological reality of phrase structure. In fact, it appears that an account which does not recognize the existence of the phrase requires a significantly more complex analysis than an account which is phrase-based.

[6] A formal account in terms of dependency distance has not been presented in the previous literature. Following an e-mail exchange between the author and Dick Hudson, the basic idea first appeared in Hudson (2007: 126–128). The specifics of the proposal outlined here were developed from this.

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The proposal can be initially formulated as in (11), which I refer to from now on as the dependency distance (DD) account:

(11) *The dependency distance account of syntactic SM* (*preliminary version*)
X bears soft mutation if:
(a) X is a VALENT of a preceding overt head H, and
(b) X is SEPARATED from H by Z.

As noted above, the term 'valent' in Word Grammar covers both subjects and complements; see Hudson (2007: 165). As we saw in section 3.1, 'complement' is used in this way in Borsley's (1999) HPSG account. Other types of dependents, such as optional locative expressions, are not valents (Word Grammar does not recognize the category 'adjunct'; see Hudson 2007: 162–164). Word Grammar thus distinguishes between valents and non-valent dependencies: only the former are predicted to be targets for syntactic SM. However, the 'complement' of HPSG and 'valent' of Word Grammar are not exact equivalents – in fact, there are critical differences. In any grammatical model which is based on phrase structure (like HPSG), a complement is an entire phrase selected by some head. Word Grammar, on the other hand, as its name suggests, relates words to each other. So an individual word can be the valent of a head, but a phrase cannot, because only individual words contract relationships in the system. Each element in a phrase is either a parent or a dependent, and each parent in turn is a dependent of some other word within a larger phrase, and so on up to the sentence root (Hudson 2007: 118). A phrase is just a word, its dependents, its dependents' dependents, and so on, and there are no nodes corresponding to phrases. We will see in section 4.4.1 that this crucial difference proves problematic for the DD account of co-ordination.

Before I turn to an outline of the predictions made by the DD account, note first that under (11a), the relevant head from which the target valent is separated must precede that valent, and must also be overt. The data in (12) and in (13) show why this restriction is necessary.

(12) **Telyn**/***delyn** brynodd y ddynes.
harp (+SM) buy.PAST.3S the woman
'It was a harp that the woman bought.'

(13) Pa offeryn brynodd y ddynes? **Telyn**/***delyn**.
what instrument buy.PAST.3S the woman harp (+SM)
'What instrument did the woman buy? A harp.'

In (12) we see that a fronted object (where the head verb does not precede the valent) does not bear the mutation, thus the need for PRECEDING in (11).[7]

[7] Examples such as (12) exhibit the 'fronting' of constituents for focus. This does not necessarily imply movement to the initial position; another possibility is that the displaced phrase is base-generated in that position. Examples like (i), where the displaced phrase

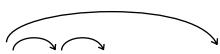
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And (13) shows that sentence fragment objects (*telyn*) do not bear the mutation; this accounts for the need for the relevant head to be OVERT in (11). As we will see in section 4.4.2, however, the requirement for the valent to be separated from an overt head in order for SM to occur is problematic in light of data involving ellipsis. Hudson (2007: 180) proposes that sentence fragments of this kind are 'syntactically complete', but with phonetically unrealized material. Note that in contrast, the XPTH analysis must regard sentence fragments as bare arguments; in other words, these do not involve the postulation of invisible structure. There is thus no covert material to trigger SM on the object in (13).

I next outline how the DD account handles both straightforward and also less obvious instances of mutation. Very often, it is the subject which separates the relevant head from its mutated valent. In (14) (=(1)), the object *telyn* is separated from the verb of which it is a valent by the subject, so the object bears the mutation. Example (14b) shows the dependency relations in the standard Word Grammar notation. (Note that the determiner at the start of the subject noun phrase is a dependent of the verb, with the noun itself a dependent of the determiner. I return to this point below.)

(14) (a) Prynodd y ddynes delyn. (*telyn*)
buy.PAST.3S the woman harp
'The woman bought a harp.'

(b)



The mutation in both (2) and (3) appears on the non-finite verb, and this can be handled in an identical fashion, provided that we make the reasonable assumption that this mutated verb is in each case a valent of the initial finite auxiliary or verb. Again, the valent is separated from its head by the intervening subject.

differs in person from the agreement proclitic in the displacement site, suggest that this may be the case:

(i) **Fi** mae Gwyn wedi **'i** ddewis.
me be.PRES.3S Gwyn PERF 3MS choose.INF
'It's me that Gwyn has chosen.'

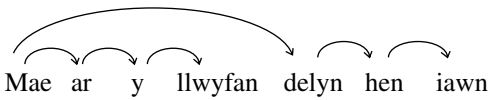
Here, the fronted constituent is a first person singular pronoun, but the agreement proclitic is third person masculine singular. I am grateful to Bob Borsley for this observation.

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By contrast, the subject itself normally immediately follows the verb, so it typically undergoes no mutation. However, when the subject is separated from the verb, then it does indeed mutate:

(15) (a) Mae ar y llwyfan delyn hen iawn. (*telyn*)
be.PRES.3S on the stage harp old very
'There is on the stage a very old harp.' (=(6))

(b)

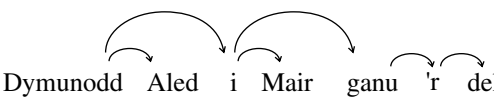


Under the generalization in (11), any verbal dependents are predicted to bear syntactic SM when they are separated from their head. This accounts for the mutation of the third argument of three-argument verbs, such as the locative complement in (7): these are always separated from the head verb by both the subject and the object, so again are predicted to bear the mutation.[8]

In (4), repeated here as (16), the mutation appears on the non-finite verb (the start of the predicate) in an embedded clause:

(16) (a) Dymunodd Aled i Mair ganu 'r delyn. (*canu*)
want.PAST.3S Aled to Mair sing.INF the harp
'Aled wanted Mair to play the harp.'

(b)



This is one of the cases mentioned at the start of this section which show that the relevant head in (11) does not have to be a verb, and the target for mutation is not necessarily the dependent of a verb. Here, the Word Grammar analysis would (reasonably) consider the clause-initial functional element *i* 'to' as the head, of which the non-finite verb *canu* 'sing' is a valent. Since *canu* is separated from this head by *Mair*, it is correctly predicted to bear SM.

Before moving on to some more complex data, I complete the review of basic examples by considering the objects of non-finite verbs. These normally do not bear SM, as seen in (2), where we find *telyn* and not **delyn*. In (17) we have another example with a periphrastic verb, where the initial element is a finite auxiliary and a non-finite lexical verb occurs later on in the clause:

(17) Roedd y ddynes wedi prynu telyn.
be.IMPF.3S the woman PERF buy.INF harp
'The woman had bought a harp.'

[8] The example in (7), where the mutated element is a numeral, raises an important issue for the DD account concerning the nature of the target for mutation. I return to this point later in the section.

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The lack of mutation on the object is predicted under the DD account, since *telyn* 'harp' is adjacent to the non-finite verbal head *prynu* 'buy', of which it is a valent. But if some phrase intervenes between the verb and the object in such examples, then the object does mutate:

(18) Roedd y ddynes wedi prynu [ar eBay] delyn hen
be.IMPF.3S the woman PERF buy.INF on eBay harp old
iawn. (*telyn*)
very
'The woman had bought on eBay a very old harp.'

Again, this is predicted by the DD account (and indeed by the XPTH), since the valent is now separated from its preceding head. These contrasts between the lack of mutation in examples like (17) and the occurrence of mutation in (18) have led proponents of the XPTH to note that unlike case-marking, to which it has sometimes been compared (Roberts 2005), syntactic SM in Welsh is a very superficial phenomenon; see, for instance, Borsley et al. (2007: chapter 7).

We have now seen how a representative sample of data would be handled under the DD account. However, a conspicuous problem arises at this point. In (14), the target for mutation is the object of the verb. As a noun, it is an uncontroversial candidate for dependent of the preceding verb. But what happens in examples parallel to (14) if the element which bears the mutation is not a noun, but some pre-modifier of the noun, as in (19): could this initial element still be a valent of the separated verb? More broadly, how does the DD account work when some element other than a noun or a verb (or some other item which is clearly eligible to be a valent of a preceding head) is initial in the phrase? Can such initial elements in general be regarded as valents of a preceding head from which they are separated?

(19) (a) Prynodd y ddynes dri thocyn. (*tri*)
buy.PAST.3S the woman three ticket
'The woman bought three tickets.'
(b) Prynodd y ddynes lawer o delynau. (*llawer*)
buy.PAST.3S the woman many of harps
'The woman bought many harps.'
(c) Prynodd y ddynes wir delyn Lydewig. (*gwir*)
buy.PAST.3S the woman true harp Breton
'The woman bought a genuine Breton harp.'

In (19a), a numeral precedes the noun, and it is the numeral which bears syntactic SM, rather than the noun, which we might have expected to be a valent of the preceding verb. In Word Grammar, however, it is standard to regard a noun as a dependent of a preceding numeral (Hudson 1990: 303), which suggests that the head in *tri thocyn* 'three tickets' is actually the numeral. Welsh mutation provides some additional evidence for this proposal.

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In Word Grammar, influence is a sign of dependency, so if word X influences the form of word Y, then Y is likely to be a dependent of X. Relationships between mutation trigger and target are a good example. For instance, many prepositions (heads) trigger some mutation on the following noun (dependent). We also find such a relationship in (19a). Most of the lower numerals are triggers for some mutation on the following noun; *tri*, for instance, triggers aspirate mutation in formal Welsh, giving *thocyn* (< *tocyn*) in (19a). Note also that cardinal numerals can appear without a head noun, as in (20):[9]

(20) Mae **tri** wedi marw yn y storm.
be.PRES.3S three PERF die.INF in the storm
'Three (people) have died in the storm.'

It seems reasonable to conclude that the numeral is indeed the head in *tri thocyn*, and thus that the numeral is a valent of the preceding verb, and the following noun is in turn a valent of the numeral. Given this conclusion, the fact that the numeral bears SM is predicted by the DD account.

In (19b) it is the quantifier *llawer* which bears the SM. Quantifiers are unlike numerals in that they do not typically trigger any mutation on the following element. However, they do subcategorize for what follows them, and in this sense are typical heads. Most quantifiers select a preposition phrase headed by *o* 'of' and containing a plural noun, as in (19b), but some select a bare nominal dependent. For instance, we find *peth* ('some, a bit'), as in *peth caws* 'some cheese', or *sawl* 'several, how many', as in *sawl llyfr* 'several books' – note also that *sawl* selects a singular noun, hence *llyfr* 'book' and not *llyfrau* 'books'. Given such selectional restrictions, it seems uncontroversial to suggest that the quantifier is the head of the string *llawer o delynau* 'many harps', and thus *llawer* qualifies as a valent of the preceding verb. Note also that, like numerals, most quantifiers can be used alone, as the head of the phrase. It is standard within Word Grammar to adopt what is known elsewhere as the DP analysis of noun phrases, so that in a determiner–noun pair, the determiner is regarded as the head; quantifiers can then also be regarded as heads.

In (19c), the element bearing the mutation is an adjective. Normally in Word Grammar, the noun is regarded as the parent of a preceding attributive

[9] As noted, the lower numerals often trigger some mutation on the following word. However, some numerals agree in gender with the following noun: *dau*/*dwy* 'two (masc./fem.)', *tri*/*tair* 'three (masc./fem.)' and *pedwar*/*pedair* 'four (masc./fem.)'. In such instances, the noun influences the form of the numeral, apparently casting doubt on the usefulness of 'direction of influence' as a diagnostic for head status. In fact, though, AGREEMENT merely needs a dependency link, with the direction of determination going in either direction – from head to dependent or from dependent to head. Compare the parallel situation where a verb agrees (say) in person and number with its subject: the verb is uncontroversially the head, and the subject its dependent, yet the dependent influences the form of the head via agreement. This suggests that, modulo agreement, direction of influence is a good test for head status, with the word undergoing the change in form being the dependent.

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adjective (Hudson 1990: 303). But in (19c), the adjective itself would have to be a valent of the initial verb for the DD account to work. There are two indications that the adjective here could be considered the head, and the following noun its dependent. First, note that adjectives are generally post-nominal in Welsh, but a small set of adjectives appear in pre-nominal position – the same position as quantifiers, numerals and determiners, all elements which are regarded as heads. Second, the direction of influence strongly suggests that a pre-nominal adjective is the head on which the noun depends, since an adjective in this position triggers SM onto the following noun: thus, in (19c), we have *gwir delyn* (< *telyn*). Note that mutation occurs in this context whatever the number and gender of the following noun. On the other hand, in the case of post-modifying adjectives, the direction of influence is the opposite: a noun (if feminine singular) triggers SM on the following adjective (e.g. *telyn ddu* (< *du*) 'harp black + SM' = 'a black harp'). Given the direction of influence in each case, we might conclude that pre-nominal adjectives are heads, and that post-nominal adjectives are dependents, with respect to the modified noun. As a consequence, in (19c) the mutated adjective is a valent of the preceding verb, from which it is separated, and the mutation is therefore predicted.

However, unlike cardinal numerals and quantifiers, singular adjectives cannot generally be used alone (or with a determiner) to head a phrase. Plural adjectives can be used with a determiner and no noun, but there is evidence that these should actually be considered nouns, rather than adjectives; see Borsley et al. (2007: section 5.4.5), from which these examples are taken:

(21) (a) *y glas
the blue
('the blue one')

(b) yr un glas
the one blue
'the blue one'

(c) y Gleision
the blue.P
'the Blues'

Moreover, as Bob Borsley has pointed out to me, if the adjective itself is regarded as a valent of the verb in examples like (19c), the prediction would seem to be that whenever a nominal dependent can occur, an adjectival dependent could also occur – clearly, an incorrect prediction.[10] A possible solution to this problem is to regard the set of pre-head adjectives as in some

[10] For example, (i) is impossible in the intended meaning:

(i) *Dewisodd y ddynes ddu.
choose.PAST.3S the woman black
('The woman chose black.')

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sense nominal, just as plural adjectives used as heads (as in (21c)) are nominal. Note also that Roberts (2005: 91) treats pre-head adjectives as special cases, suggesting that they are adjoined to N. Assuming that such an account can be maintained, the adjective in (19c) can continue to be regarded as the valent of the initial verb. In fact, this is also consistent with the view taken by Welsh traditional grammar, which regards A + N as a compound. Without stretching credulity too far, then, we could treat A + N as a single word, labelled N.

In sum, it seems that a reasonable DD account can be provided for the data in (19) without requiring stipulations. If we consider further data, however, it is clear that the DD account must be amended. In (5), repeated here as (22), we have an adjectival predicate (bracketed) with a pre-modifier, *llawn* 'full'. As this is initial in the phrase it must be the target for SM. Clearly, though, this pre-modifier is not a dependent of the preceding copula, which the DD account in (11) would require to be the case, but a dependent of the adjectival predicate which it modifies.

(22) Dw i [lawn mor grac â chi]. (*llawn*)
be.PRES.1S I full as angry as you
'I'm just as angry as you.'

And in (23) (see also (7)), the preposition *i ffwrdd* 'away' is itself a valent of the preceding verb, but its pre-modifier *dwy droedfedd* 'two feet' is not; yet the mutation appears at the start of the phrase as usual: *dwy* > *ddwy*:

(23) Rhoddodd Elen y delyn [ddwy droedfedd i ffrwdd]. (*dwy*)
put.PAST.3S Elen the harp two foot away
'Elen put the harp two feet away.'

Such instances, where some pre-modifier of the actual valent occurs at the start of the phrase, are in fact common, but they cannot be accounted for by the DD account under the formulation in (11). The account evidently needs to be revised, but this revision involves a significant complication to the grammar. It introduces a new relationship, which we can call FIRST, to link the head word in a phrase (which is the actual valent) to the first word of its phrase.[11, 12] Welsh is a strongly head-initial language, so in many contexts the head of a phrase and the FIRST of the phrase are the same; therefore FIRST(X) = X. This is the case in all the instances of syntactic SM in (14) to (19). But if X has a pre-modifier of some kind, as in (22) and (23), then this

[11] I am indebted to Richard Hudson for suggesting the concept of FIRST.

[12] Although the concept of 'phrase' is not a primitive in Word Grammar, note that 'even a W[ord] G[rammar] dependency structure can be interpreted in terms of phrases' (Hudson 2007: 118).

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pre-dependent is the FIRST: FIRST(X) = pre-dependent(X). The DD account in (11) must then be revised as in (24):

(24) *The dependency distance account of syntactic SM* (*revised and final version*)
X bears soft mutation if:
(a) X is a FIRST of a valent of a preceding overt head H, and
(b) X is SEPARATED from H by Z.

This can be indicated schematically as in (25):

(25) H Z [X ....]
[+SM]

Note that only the FIRST is the target for SM in (24), so we avoid a situation in which both a pre-dependent and the actual valent itself are predicted to bear SM. Under (24), the words *llawn* in (22) and *dwy* in (23) and in (7) are now predicted to bear the SM as FIRSTS. As already proposed with respect to examples like (19a), given a Numeral + Noun sequence, the numeral is the head – and therefore it is the numeral which is a pre-dependent of the preposition *i ffwrdd* 'away' in (23). However, the notion of FIRST is actually recursive, and will also apply to a pre-dependent of a pre-dependent of X.

The revised DD account in (24) can now handle the data shown so far.[13] It also presents a possible alternative solution to the issues posed by pre-modifying adjectives, as in (19c): if the idea above that such adjectives are the head in an Adj–Noun string is not accepted, then the data will in any case be accounted for under (24). From now on I adopt (24) as the DD account, though for clarity I generally continue to refer to a separated 'valent', rather than a 'first'.

Note, though, that the complications which led to the revision of the DD account do not arise at all under the XPTH. In all the contexts examined so far, the SM is predicted simply because the target constituent is in a post-XP

[13] In examples like (i), the lower clause is separated (by the intervening subject) from the matrix head verb, of which it is a valent. A referee for *JL* notes correctly that (24) predicts that the FIRSTS of such clausal complements should undergo SM, yet they do not:

(i) Gwn i [pwy/ *bwy ddaeth i 'r parti].
know.FUT.1S I who who(+SM) come.PAST.3S to the party
'I know who came to the party.'

Clausal complements are also quite problematic for the XPTH, and indeed for all other approaches to syntactic SM. The traditional rule is that their initial segments should not mutate (Morgan 1952: 441, Thomas 1996: 406), though Morgan notes that hypercorrections (i.e. with mutation at the start of the embedded clause) do occur; Tallerman (2006: 1770) records some recent examples, which are, in fact, very easy to find. Within the phrase-based approach it is sometimes proposed that a CP clause boundary blocks SM (e.g. Borsley & Tallerman 1996: 230). It is not at all clear how such blocking could be achieved in the dependency account, since such phrase boundaries do not exist; (i) is therefore particularly problematic for the Word Grammar account.

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position; which particular element occurs at the start of the mutated constituent is irrelevant to the account. It also seems that in a substantive sense, the notion of 'phrase' – which, as noted above, is not a recognized concept in the Word Grammar machinery – comes in by the back door in (24). What the DD account attempts to say is this: the target for SM is whatever comes at the start of the phrase following some separating sequence of words. The formulation using the concept of FIRST is a way of saying this without referring to phrases. But the XPTH is more straightforward, and does not have to invoke any special concepts such as FIRST in order to deal with the full range of data. The phrase-based account is in fact simpler, and an analysis utilizing the notion 'phrase' seems to make exactly the correct predictions about syntactic SM.[14] Section 4.2 below presents further problems arising from the lack of the notion 'phrase'.

More problematically, although (24) is now empirically accurate, the DD account itself appears far less motivated. As noted in section 3.2, Hudson's original idea was that syntactic SM serves to signal the separation of a dependent from its head. Now we have to say that the mutation may signal the separation of a dependent of that dependent from its head – or even a dependent of a dependent of the actual valent of the separated head – a relationship which is intuitively far less satisfying. It seems, then, that the extension to the rule, though vital to capture the data, results in the loss of much of the functional motivation which made the DD account seem appealing in the first place.

4. DIAGNOSTIC DATA: DISTINGUISHING BETWEEN THE TWO ACCOUNTS

Having seen how the DD account operates on the basic data, we are now in a position to evaluate it in comparison with the XPTH. In most contexts, the two accounts make just the same predictions, since the XP trigger in the former account is typically what separates the head from its dependent in the latter account; examples like (18) illustrate this clearly. The task ahead,

[14] Although the XPTH does not require anything analogous to FIRST, a *JL* reviewer notes that the XPTH does need to be supplemented with a rule linking the phrase node to the node for its first word: the whole phrase is assigned the feature [+SM], but the mutation is actually realized on the first word. Note, though, that this requirement is not unique to syntactic SM, but in fact is needed for all instances of triggered mutation – in other words, virtually everywhere in the mutation system. To handle this, we can say that mutation is an EDGE PROPERTY (see Stump 2001: 127), in this case a left-edge property. Edge properties are regulated by the Edge Feature Principle (e.g. Miller 1992), which ensures feature sharing, i.e. the downwards percolation of a feature on a node to one of its daughters; a linear ordering statement would ensure that it is the leftmost node in the phrase which receives the mutation. The mechanisms in question are required independently in the grammars of many languages, and are not specific to syntactic SM or to mutation in general.

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then, is to discover test cases which can distinguish the two hypotheses. Four main areas seem to be relevant:

- Contexts in which an empty category or unrealized subject intervenes between head and valent.
- Finite negative clauses, where only an X (not XP) separates head and valent.
- Head-fronting contexts.
- Co-ordination contexts, with and without ellipsis.

I examine each of these in turn in the following sections.

4.1 *The mutation effects of unrealized elements*

Before looking at the specific details of unrealized elements in subject position, we need to understand something of the usual behaviour of unrealized elements in the mutation system. Mutation in general is regulated by a principle of strict adjacency between trigger and target (see Lieber 1983, Zwicky 1984, Borsley & Tallerman 1996: 8). For instance, in *ei phum telyn* 'her five harp(s)', we have a third person feminine singular possessive proclitic *ei*, which triggers aspirate mutation on the following numeral: *pum* 'five' > *phum*. It cannot, however, trigger aspirate mutation on the non-adjacent noun *telyn* 'harp': **ei phum* ***thelyn***. In spoken Welsh, it is very common for certain small functional elements to be phonetically unrealized, in an appropriate context. Typically, such elements are NOT invisible for mutation purposes, but behave as if they were overtly present, in the sense that they both block mutation arising from some previous potential trigger, and continue to trigger mutations themselves even when unrealized. In this sense, they respect the principle of strict adjacency.

On the first point, blocking, consider (26), where we have the third person plural agreement proclitic *eu*, a morpheme which is itself not a mutation trigger. Like other agreement proclitics, it is often unrealized in the spoken language (hence the strikeout). However, even when *eu* is only covertly present, for many speakers it blocks mutation from occurring across it:

(26) Gwnaeth Aled (~~eu~~) gwerthu nhw.
do.PAST.3S Aled 3P sell.INF them
'Aled sold them.'

So under the XPTH, the subject XP *Aled* does not trigger syntactic SM on the verb (giving *werthu*), because *Aled* does not immediately precede the verb: the mutation is blocked by the intervening proclitic, whether or not *eu* is overt. An analogous effect must be recognized in the DD account: even if *eu* is unrealized in (26), it continues to 'count' as the relevant FIRST, since otherwise the prediction would be that the verb *gwerthu* would undergo SM, as it is separated from its head, the initial auxiliary *gwnaeth*.

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The second point concerns mutation triggers which are phonetically unrealized. These are in fact quite common, but they typically continue to trigger the same mutation as if they were overt. For instance, toponyms are frequently preceded by the definite article, which, as noted earlier, triggers SM on feminine singular nouns: so, for instance, *y waun* (<*gwaun*) 'the meadow', *y foel* (<*moel*) 'the bare hilltop'. Often, the triggering article itself is absent in the placename, but, crucially, the mutation remains: *Waun*, *Foel*. Similarly, clause-initial finite verbs may bear SM, generally considered to be triggered by the null counterpart of the (optional) affirmative particles *fe* or *mi*, which themselves trigger SM.

In general, then, phonetically unrealized elements play a full part in the mutation system, as the principle of strict adjacency predicts. This means that 'immediate precedence' in the statement of the XPTH in (8) does not refer just to immediately preceding overt items, but includes syntactically present but phonetically unrealized items. We can conclude that in any framework which tries to predict the occurrence of syntactic SM under either the XPTH or the DD account, some empty categories are crucially present. They block a mutation which might otherwise be triggered by some earlier item, and they trigger mutation themselves, just as if overt. This is quite a surprising finding for two very surface-oriented models of grammar, but the conclusion seems inescapable.

Consider now the unrealized subjects shown in (27) and (28):

(27) Pwy$_i$ brynodd t_i delyn? (*telyn*)
who buy.PAST.3S harp
'Who bought a harp?'

(28) Prynodd *pro* delyn. (*telyn*)
buy.PAST.3S harp
'He/she bought a harp.'

Under the XPTH, the categories *wh*-trace and *pro*, shown in (27) and (28) respectively, are the XP triggers for the mutation on the direct objects.[15, 16] A null pronominal subject can also be assumed in imperatives (and indeed can be realized as an overt pronoun in informal speech):

(29) Rho *pro* dipyn o egni iddi. (*tipyn*)
put.IMPERATIVE.2S bit of energy to.3FS
'Put a bit of energy into it.'

[15] For convenience, I will refer to the various unrealized elements in the grammar using the terms which have become standard in the P&P model (e.g. *pro*, trace, etc.).

[16] Although some work within HPSG has argued against the existence of *wh*-traces (e.g. Ginzburg & Sag 2000, Bouma, Malouf & Sag 2001), more recent work such as Borsley (2005), Levine & Hukari (2006) argues in favour of them. The mutation data lend support to the idea that *wh*-traces should be recognized in the syntax, and I will assume from now on that this must be the case.

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Again, given the presence of *pro*, the mutation in (29) is predicted by the XPTH.

Within Word Grammar, unrealized words were until recently considered to play no part in the syntax (Hudson 2007: 172). In more recent work (e.g. Hudson 2003, Creider & Hudson 2006, Hudson 2007: 172–181) this position has been overturned in favour of an approach in which unrealized or covert words are a legitimate part of the syntax; extensive evidence for covert subjects is cited from Ancient Greek, Icelandic, and other languages. Null subject constructions like (28) are now also assumed to have a covert subject pronoun (Hudson 2007: 174f.), and the same holds for imperatives, thus accounting for the mutation triggered by the separation of the verb from its valent *tipyn* 'a bit', in (29).

However, *wh*-traces like that in (27) are highly problematic for the DD account. Within Word Grammar, *wh*-traces are not amongst the set of unrealized words; instead, the dependency is shown by structure-sharing, and there is no empty category (or anything else) intervening between the verb and its object in (27). Citing a similar example from Welsh, Hudson (2007: 127) suggests that 'extracted subjects seem to behave like unrealized pronouns separating the object from the verb'. Indeed, unless some element intervenes between verb and object, the SM is not predicted to occur. In fact, though, there is good evidence that here the unrealized element (contra Hudson) CANNOT be pronominal. First, note that although a resumptive pronoun strategy is available in *wh*-extractions from certain lower positions on the NP accessibility hierarchy (Willis 2000, Borsley et al. 2007: chapter 4, Willis 2008), it is absolutely not available for extractions from subject and direct object position, thus ruling out the possibility that the unrealized subject in (27) is in any sense pronominal.[17] Second, if there were an unrealized pronoun in subject position in (27), one would expect the verb to be plural when the *wh*-phrase is plural, since finite verbs agree in number with pronominal but not lexical subjects in Welsh. But this is ungrammatical:

(30) Pa ddynesau welodd / *welson y ddraig?
which women see.PAST.3S see.PAST.3P the dragon
'Which women saw the dragon?'

We are therefore left with a problem for the DD account which has no apparent solution. Various empty categories must clearly 'count' in the calculation of dependency distance generally, but if *wh*-traces are not

[17] Adger & Ramchand (2005) propose a base-generated account of *wh*-constructions with 'gaps' in Scottish Gaelic, whereby *wh*-trace is actually analysed as a *pro* without phi-features. However, as Willis (2008) notes, the data which motivate this account have no counterpart in Welsh. It therefore seems premature to draw the same kind of conclusion for the data at hand.

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recognized, then the DD account cannot correctly predict the occurrence of mutation in (27).[18]

4.2 *X but not XP separates head and valent*

The XPTH distinguishes between heads and phrasal categories, predicting that only the latter trigger syntactic SM. In Word Grammar, on the other hand, there is no inherent distinction between words and phrases. Hudson (1990: 104) notes that 'the grammar refers only to the relations between pairs of words', and 'the notion "phrase" can be defined in W[ord] G[rammar] in terms of dependency relations, but it is probably never needed in the grammar – i.e. no rules refer to "phrase", "noun-phrase", "verb-phrase" etc.'. In fact, '[g]rammars make no reference to any unit longer than the word' (Hudson 1990: 10). So nothing in the Word Grammar model suggests that words and phrases should behave differently for syntactic purposes. Evidence from finite negative clauses in Welsh, however, shows that this is problematic for the DD account. Finite clauses are negated using the negative adverbial element *ddim*:

(31) Gwnaeth Megan ddim cysgu / *gysgu.
do.PAST.3S Megan NEG sleep.INF (+SM)
'Megan didn't sleep.'

Adverbial *ddim* cannot be modified, which suggests that it is a word but not a phrasal category; Borsley & Jones (2005) also analyse adverbial *ddim* in this way. As such, it is not predicted to be a trigger for the mutation under the XPTH.

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[18] Within the HPSG model (Borsley 1999), there is no biclausal analysis of control and raising predicates, and thus both PRO and NP-trace are eliminated. In Word Grammar, a structure-sharing analysis is assumed for all typical instances of 'functional control' (i.e. both control and raising); the basic analysis for English is given in Hudson (1990: 232–239). It is therefore reasonable to suggest that both 'raising' examples and 'control' examples such as (i) and (ii) – shown with PRO as the subject of the embedded clause purely for expository purposes – actually contain NO unrealized subjects, just as in the HPSG approach:

(i) Mae Aled yn dymuno [PRO canu 'r delyn].
be.PRES.3S Aled PROG want.INF sing.INF the harp
'Aled wants to play the harp.'

(ii) Dymunodd Aled [PRO ganu 'r delyn]. (*canu*)
want.PAST.3S Aled sing.INF the harp
'Aled wanted to play the harp.'

A structure-sharing analysis of control and raising infinitivals gives the right results as far as mutation is concerned, since no covert elements exist as subject of the lower verbs. The DD approach, then, correctly predicts that no SM occurs on *canu* 'sing' in (i), where there is no separation from the head *dymuno* 'want', and also correctly predicts that SM does occur on *canu* in (ii), where the lower verb is separated from the head *dymunodd* 'wanted' by the subject *Aled*.

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Under the DD account, it is reasonable to assume that the non-finite verb *cysgu* 'sleep' is a valent of the initial finite auxiliary *gwnaeth* 'did'. Since *cysgu* is separated from *gwnaeth*, it is predicted to undergo syntactic SM. If *ddim* is missing (i.e. the clause is affirmative), then the prediction is correct, and the separated valent bears SM:

(32) Gwnaeth Megan gysgu. (*cysgu*)
do.PAST.3S Megan sleep.INF
'Megan slept.'

On the other hand, this prediction is incorrect in (31): **gysgu*. The contrast between (31) and (32) is apparently inexplicable under the DD account (see also Hudson 2007: 127f.), but is predicted under the XPTH: *Megan* is the XP trigger in (32), whereas *ddim*, as it is not phrasal, is not a trigger in (31).

An obvious question is whether *ddim* in (31) might form a constituent with the following non-finite verb *cysgu* 'sleep', in which case it could be argued that it is *ddim cysgu* which is separated from the head *gwnaeth*, and *ddim* could perhaps be seen as the target for mutation as a FIRST.[19] According to Borsley & Jones (2005: section 5.2.1), post-subject *ddim* does not behave like a pre-modifier of the following verb and does not form a constituent with it. However, a referee for *JL* notes that there are cases where *ddim* does form a constituent with the following material, as shown by co-ordination, and by the occurrence of *ddim* with following material in sentence fragments, as Borsley & Jones (2005: 104) also illustrate:

(33) Ddim yn gweithio.
NEG PROG work.INF
'Out of order' (lit. 'Not working', e.g. as a note on faulty machines)

It seems, then, that *ddim* can be a pre-modifier, which might rescue the DD account. But the apparent conflict here arises because there are actually a number of distinct negative elements with the form (*d*)*dim*, perhaps as many as six (Borsley & Jones 2005: section 6.6 outline this in full). The two elements that concern us here are the post-subject adverb *ddim*, and the distinct negative element *ddim* which pre-modifies aspect phrases (as in (33)) and predicate phrases. Whereas the adverb *ddim* in (31) does not form a constituent with the following material, pre-modifying *ddim* in (33) does. In case there is any doubt that these are distinct elements, Borsley & Jones (2005: 133) show that they can co-occur:

(34) Dw i ddim [ddim yn poeni].
be.PRES.1S I NEG NEG PROG worry.INF
'I don't not worry.'

[19] Negative *ddim* itself in examples like (31) appears to bear SM (<*dim*), but there is evidence that *ddim* (and not *dim*) is the basic form of the negative adverbial, in other words that the mutation is not triggered (in a synchronic sense) at all; see Borsley & Jones (2005: section 6.3).

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It seems, then, that *ddim* in (31) does not pre-modify *cysgu* – which means that the DD account is left with a separation between a head, *gwnaeth*, and its valent, *cysgu*, but with no SM occurring on the valent. I conclude that this lack of mutation on *cysgu* in (31) is indeed problematic for the DD account. By contrast, the XPTH predicts correctly that syntactic SM does not follow the negative adverb *ddim*.

As noted above, the XPTH predicts that phrases, but not words, will be triggers for syntactic SM, while the DD account predicts that there should be no difference: any element separating a head from its valent would be followed by SM. Ideally, we would need other test cases in which some mutable element is immediately preceded by an X and not an XP.[20] There are certainly other adverbial elements which, like *ddim*, cannot be modified, suggesting that they might also be non-phrasal. Two examples are *hefyd* 'too, also' and *erioed* 'never'. Both of these can be followed by SM, as shown for *erioed* in (35):

(35) Weles i erioed gymaint o bobl mewn un stafell. (*cymaint*)
see.PAST.1S I never so.many of people in one room
'I never saw so many people in one room.'

Are these adverbial elements then problematic for the XPTH (though not, of course, for the DD account)? There are three possible responses. The first is that elements like *erioed* and *hefyd* might be lexical triggers for SM. This seems very unlikely, however: we expect lexical triggers to form a constituent with the target of mutation (such as a triggering head preposition and its mutated object), which these adverbial elements do not. Moreover, they are never listed as lexical triggers by traditional Welsh grammars, such as the highly reliable Morgan (1952).

The second response is that elements like *erioed* and *hefyd* might be 'transparent' in some way, so that they are invisible as far as a preceding trigger is concerned; if this were the case, then the trigger for SM would be the subject XP in (35). However, we have already seen in section 4.1 that in general, mutation operates according to a strict adjacency principle. The idea of elements which are phonetically overt, but invisible for mutation purposes, would be both unprecedented and stipulative.

The third possibility is that – unlike *ddim* – these adverbials actually are phrasal categories, and as such are predicted to trigger SM under the XPTH. Evidence that this third position is correct comes from the fact that these

[20] The reader will wonder if there are other contexts in which some mutated element is immediately preceded by X and not XP. Such contexts occur, but involve compounds, where the marked word order Dependent + Head always induces SM on the head; see, for instance, Tallerman (1999). This environment is distinct from the context for syntactic SM which is the main subject of enquiry here.

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adverbials can either be expanded into full phrases, as in (36), or replaced by a full phrase with the same meaning, as in (37):

(36) Welais i [**erioed yn fy mywyd**] gymaint o bobl.
see.PAST.1S I never in 1S life so.many of people
'I never in my life saw so many people.'

(37) Gallwch **hefyd**/ **yn** **ogystal** e-bostio.
can.FUT.2P also PRED as.well e-mail.INF
'You can also e-mail/You can e-mail as well.'

This behaviour contrasts on both counts with that of the post-subject negative adverb *ddim*. I conclude, then, that the adverb *ddim* truly is non-phrasal, and is thus correctly predicted not to be a trigger for SM under the XPTH, while remaining problematic for the DD account, which predicts incorrectly that it should be followed by SM.

In section 3.2, the non-availability of phrasal categories led to the complication of the DD account using FIRSTS. Here, the notion 'phrase' seems to make a crucial contribution to the analysis of syntactic SM. Thus, we have further evidence that 'phrase' is a category required in a grammatical model.

4.3 *Head fronting*

In this section I examine the effects of a construction in which a non-finite verb is fronted. The data in (38) illustrate some basic facts involving the fronting of an entire aspectual verb phrase:

(38) (a) Mae Gwyn *(yn) canu emyn.
be.PRES.3S Gwyn PROG sing.INF hymn
'Gwyn is singing a hymn.'

(b) (*Yn) canu emyn mae Gwyn.
PROG sing.INF hymn be.PRES.3S Gwyn
'Gwyn is singing a hymn.'

In (38a) we see that the progressive aspect marker *yn* is obligatorily present; but in the focussed version (38b), the progressive aspect marker is – idiosyncratically – obligatorily absent: other aspect markers do not disappear under fronting.

Now consider the following data ((39) and (40) are from Thomas 1996: 517, and (41) and (42) are from Morgan 1952: 432). The normal word orders are shown in (39) and (41), and two very formal examples with fronting are shown in (40) and (42). As in (38b), the progressive marker *yn* disappears under fronting. But unlike in the earlier examples, here the head non-finite verb alone is fronted, leaving the complements *in situ* in (40) and (42).

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(39) Yr oeddent *pro* yn cofio [gweld un o
PRT be.IMPF.3P PROG remember.INF see.INF one of
'r gorymdeithiau].
the processions
'They remembered seeing one of the processions.'

(40) Cofio yr oeddent *pro* weld un o 'r
remember.INF PRT be.IMPF.3P see.INF one of the
gorymdeithiau. (*gweld*)
processions
'They remembered seeing one of the processions.'

(41) Y maent *pro* yn gwrthod [profedigaeth Crist a
PRT be.PRES.3P PROG reject.INF tribulation Christ and
'i Groes].
3MS cross
'They are rejecting the tribulation of Christ and his cross.'

(42) Gwrthod y maent *pro* brofedigaeth Crist a 'i
reject.INF PRT be.PRES.3P tribulation Christ and 3MS
Groes. (*profedigaeth*)
cross
'They are rejecting the tribulation of Christ and his cross.'

In these examples, we have a non-finite verb with a complement: *cofio* 'remember' in (39) takes the (bracketed) non-finite VP or clausal complement (depending on the analysis) and *gwrthod* 'reject' in (41) takes an object, also bracketed. In the unmarked word orders, the complements do not bear SM, but in the fronting constructions in (40) and (42), the complement in each case does bear SM. Why does syntactic SM occur? Here an analysis can be given in terms of both the XPTH and the DD account.

Under the XPTH, the trigger is the null subject *pro*, shown immediately preceding the complement bearing the mutation in (40) and (42). However, we need to assume that when the non-finite verbal head fronts, the progressive aspect marker *yn* is not 'left behind', even covertly, since if it were it would intervene between the subject and the complement, and should block the mutation triggered by *pro*.[21] I suggest that the aspectual particle fronts along with the verb but is syntactically unrealized, and phonetically

[21] The trigger is *pro* rather than an overt pronoun in (40) and (42) because these are very formal contexts, where null subjects are definitely preferred. However, an overt pronoun or full noun phrase in subject position would have just the same mutation effect in these contexts.

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null.[22] There is, though, no reason to think that the fronted non-finite verb itself is associated with a gap in the syntax (i.e. a verb trace). In HPSG, the unbounded dependency gaps created by XP-fronting and other processes are generally analysed as empty categories, and these can indeed intervene between a mutation trigger and a potential target. Conversely, the head-fronting seen in this section is not an unbounded process, but rather appears to be clause-bound, just like so-called long head movement in Middle Welsh and Breton (e.g. Borsley, Rivero & Stephens 1996).

A similar fronting construction also occurs in clauses without aspect markers. Again in very formal Welsh, a non-finite verb may front, leaving its complement(s) behind. An example is given in (43), with normal word order, and (44), with marked word order, from Thomas (1996: 505):[23]

(43) Gwnaeth yr arbenigwyr brofi cemigion eraill ddoe.
do.PAST.3S the specialists test.INF chemicals other yesterday
'The specialists tested other chemicals yesterday.'

(44) Profi a wnaeth yr arbenigwyr gemigion eraill
test.INF PRT do.PAST.3S the specialists chemicals other
ddoe. (*cemigion*)
yesterday
'The specialists *tested* other chemicals yesterday.'

[22] Good, though indirect, evidence that progressive *yn* is syntactically unrealized comes from the behaviour of a homophonous item. The predicate marker *yn* also disappears when the predicate is fronted:

(i) Mae Bangor [yn ddinas hyfryd].
be.PRES.3S Bangor PRED city pleasant
'Bangor is a pleasant city.'

(ii) [Dinas hyfryd] ydy Bangor.
city pleasant be.PRES.3S Bangor
'Bangor is a pleasant city.'

We know that these two *yn* morphemes are distinct because they have different mutation effects: progressive *yn* triggers no mutation, while predicative *yn* triggers SM: *dinas* > *ddinas* in (i). Crucially, though, there is NO mutation on the fronted predicate in (ii), which strongly suggests that predicative *yn* is syntactically absent here, and not merely phonetically unrealized; compare the behaviour of phonetically unrealized elements noted in section 4.1, where we saw that mutation effects typically remain even if a mutation trigger is unrealized. It seems, then, that there is something exceptional about the *yn* morphemes. If progressive *yn* is also genuinely (syntactically) absent under fronting in (40) and (42), we need not worry about its covert presence intervening between the mutation trigger and target.

[23] For completeness, note that in the unmarked word order in (43), the non-finite verb *profi* 'test' bears SM (> *brofi*). The XPTH accounts for this because the verb follows a subject XP, and the DD account also predicts SM because the verb is separated from its preceding parent, the finite verb *gwnaeth* 'did'. Both accounts also correctly predict the lack of mutation on *profi* in (44), the XPTH predicting no mutation because *profi* does not follow an XP, and the DD account predicting no mutation because the parent of *profi* follows it, rather than preceding it. This mutation is not relevant to the point made in the text.

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Here, the object of the non-finite verb, *cemigion* 'chemicals', bears SM in (44) only. This is predicted by the XPTH because only in (44) does an XP, *yr arbenigwyr* 'the specialists', immediately precede the object.

Compare now the DD account of the verb-fronting contexts for mutation. Under (24), this is straightforward, since a valent in each case is clearly separated from its parent, the fronted head verb. So in (40), *gweld* 'see' is separated from the fronted head *cofio*; in (42), *profedigaeth* 'tribulation' is separated from the fronted head *gwrthod*; and in (44) *cemigion* 'chemicals' is separated from the fronted head *profi*. Each of these valents is correctly predicted to bear SM. The slight complication for the XPTH, concerning progressive marker *yn* in the first two cases, is not relevant for the DD account.

In sum, both the XPTH and the DD account make the correct predictions in this section, but the XPTH clearly requires the additional assumption that there is no unrealized aspectual *yn* to block the mutation in (40) and (42).

4.4 *Co-ordination*

4.4.1 *Ordinary co-ordination*

We saw in (10) (repeated here as (45)) that in co-ordination contexts, syntactic SM only occurs on the first conjunct in the string, and not on any subsequent conjuncts:

(45) Prynodd y ddynes delyn newydd, corn/*gorn a
buy.PAST.3S the woman harp new horn (+SM) and
ffidil. (*telyn*)
fiddle
'The woman bought a new harp, a horn and a fiddle.'

As noted in section 3.1, Borsley (1999) accounts for this pattern via the XPTH: the entire co-ordination construction is the complement of the verb, so the prediction is that mutation occurs only on the initial segment of the whole phrase.

By contrast, in Word Grammar the phrase has no status, and each conjunct of the co-ordination has its own relationship with the verb head. In fact, it is axiomatic in Word Grammar that a dependency relationship which exists between a head and one of the conjuncts must also be shared by each of the conjuncts within the co-ordination. As Hudson (1990: 412) notes: 'Dependency relations that cross the boundaries of the co-ordination … must be shared "across-the-board" by all the conjuncts'. In general, this principle (formalized as the Dependency in Co-ordinate Structure Principle, Hudson 1990: 413) is useful in Word Grammar, because it accounts neatly for 'incomplete-conjunct' examples such as *I drank* [*coffee*

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at eleven] [*and tea about four*].[24] Here, *drank* is a head which must be in a dependency relation with *coffee* in the first conjunct and *tea* in the second conjunct. But then the same principle unavoidably applies in examples like (45) as well. Each of the conjuncts in the co-ordination in (45) is regarded as a dependent of the verb *prynodd* 'bought', so each of them is also predicted to undergo SM under (24), as each is a valent separated from its head. Since each conjunct contains a separate valent with its own relationship to the head verb, the concept of FIRST will not rescue the situation: each conjunct contains a mutation target, not merely the initial conjunct.

Once again, then, the XPTH makes the correct predictions, whereas the DD account apparently cannot explain the pattern of mutation found in co-ordinate structures. The dependency account predicts a relationship between the head verb and each conjunct (more specifically, the head of each conjunct) which leads to an incorrect analysis of mutation. Here, then, we have a third context in which the notion 'phrase' is crucially required for a coherent account of syntactic SM, but is unavailable under the DD account.

4.4.2 *Co-ordination and ellipsis*

This section examines co-ordination with ellipsis in the non-initial conjunct. Thomas (1996: 518) notes that both (46) and (47) are grammatical:

(46) Aeth *pro* i weld eglwys Llandaff yn y bore ac
go.PAST.3S to see.INF church Llandaff in the morning and
yn y prynhawn gastell Caerdydd. (*castell*)
in the afternoon castle Cardiff
'He went to see Llandaff church in the morning and in the afternoon, Cardiff castle.'

(47) Aeth i weld eglwys Llandaff yn y bore ac yn y prynhawn **castell** Caerdydd. (=(46))

The initial segment of the direct object in the second conjunct can either take SM, as in (46) where we find *gastell*, or else it can retain the radical consonant, giving *castell* as in (47). Clearly, whatever each account predicts about the mutation contrast in these examples will depend on what structure is proposed, as well as what theoretical assumptions are made.

In the discussion of sentence fragments such as (13) in section 3.2, I noted that the XPTH analysis treats ellipsis as involving bare arguments without any invisible structure. The same must therefore apply in these cases. The

[24] However, as Bob Borsley points out to me, this principle appears problematic in light of left conjunct agreement: heads in Welsh agree only with the initial conjunct in a following co-ordinate structure:

(i) Gwelais [i a Mair] ddraig.
see.PAST.1S I and Mair dragon
'Mair and I saw a dragon.'

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mutation in (46) is triggered by the preceding phrase, the adverbial PP *yn y prynhawn* 'in the afternoon'. Why, though, is there no mutation in (47)? Here I suggest that there is a hiatus, a slight pause of the type which often occurs following adverbials. It is already known that various morphophonological processes are suppressed following pauses in Welsh. For instance, the enclitic *'r* form of the definite article, which normally follows a vowel, is suppressed across a pause of this kind (Thorne 1993: 97, Hannahs & Tallerman 2006: 792), so that we find *yma y* and not *yma'r* in (48) (‖ = pause):

(48) Ni alwodd neb **yma** ‖ **y** dydd o'r blaen.
NEG call.PAST.3S no-one here the day before
'No one called here the other day.' (Thorne 1993: 97)

It therefore seems reasonable to suggest that SM can also be suppressed in this way in (47).

Let us assume that the same kind of account, involving suppression of an expected mutation across a pause, can also be given in the DD analysis of (47). What, though, triggers the mutation in (46)? I noted in section 3.2 that Word Grammar regards ellipsis as syntactically complete, but containing unrealized words (Hudson 2007: 180). The ellipsis in the second conjunct corresponds to the string *aeth* pro *i weld* '(he) went to see' in the first conjunct, shown by strikeout below:

(49) (a) Aeth *pro* i weld yn y prynhawn gastell
go.PAST.3S to see.INF in the afternoon castle
Caerdydd. (*castell*)
Cardiff
'He went in the afternoon to see Cardiff castle.'
(b) ~~Aeth *pro* i weld~~ yn y prynhawn gastell Caerdydd. (*castell*)

The DD account predicts the mutation in (49a) straightforwardly, since the valent *castell* 'castle' is separated from its preceding head, *gweld* 'see'.[25] In the version with ellipsis (49b), it would seem reasonable to expect the same account of the mutation to be available. Note, however, that the DD account would need to ensure that a phonetically unrealized head has the same status as an overt head here, because the crucial prediction is that *castell* bears SM owing to its separation from *gweld*. In other words, the elided portion MUST be syntactically visible in (49b)/(46) or the mutation is not predicted. However, in the discussion of sentence fragments in section 3.2, we saw that elided material must NOT be syntactically visible for mutation purposes, hence the stipulation in (11)/(24) that only overt heads 'count' in the calculation of dependency distance, but not phonetically unrealized heads. Thus, sentence fragment objects such as the one in (13) do not bear SM. There

[25] The soft mutation of *gweld* 'see' in *i weld* 'to see' is lexically triggered by the functional element *i*, and is not relevant to the current discussion.

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seems to be no possible way to reconcile these two contradictory requirements within the DD account. We would require 'visible' unrealized words in the co-ordination construction and 'invisible' unrealized words in sentence fragment ellipsis, and this would have to be simply stipulated. In this instance, then, the XPTH account again seems preferable.

4.5 *Predicative complements and quotative verbs*

In this final brief data section, I indicate some directions for future research by examining two constructions which prove challenging to both the XPTH and the DD account. Verbs with predicative complements are normally not useful for testing hypotheses about syntactic SM, because the initial word of the complement is typically a functional element with no mutable initial consonant, such as predicative *yn* (see note 22) or *fel* 'as'. However, a 'bare' predicative complement can also occur in naming contexts, but unexpectedly, this does not undergo syntactic SM:

(50) Gelwir y dref **Caerdydd**/*Gaerdydd.
call.PRES.IMPERS the town Cardiff (+SM)
'The town is called Cardiff.' (Morgan 1952: 250)

(51) Gelwir y lle caeëdig cyntaf **cae**/*gae.
call.PRES.IMPERS the place enclosed first field (+SM)
'The first enclosure is called a "cae" [field].'

(52) Gelwir hwy **llywodraethwyr**/*lywodraethwyr.
call.PRES.IMPERS them governors (+SM)
'They are called governors.' (Morgan 1952: 251)

Regarding (50), it might be thought that a proper noun would not mutate, but in fact it is standard to mutate native placenames following a mutation trigger, e.g. *i Gaerdydd* 'to Cardiff'. In any case, this explanation would be unavailable for (51) and (52). These data are problematic both for the DD approach and for the XPTH. The latter predicts mutation after the preceding XP (the object of the impersonal verb), and the DD approach predicts mutation because the valents in bold are separated from the head verbs.

We are left, then, with an unforeseen absence of mutation in (50) to (52). However, this context is not entirely unique. A referee for *JL* asks if the same absence of mutation occurs in reported speech, which indeed it does:

(53) Dywedodd yr Athro Davies: 'Pleser o 'r mwyaf i
say.PAST.3S the Professor Davies pleasure of the greatest to
ni yw … '.
us be.PRES.3S
'Professor Davies said "It's the greatest pleasure for us … ".'

(54) Dywedodd y cadeirydd: 'Cyfrinach y llwyddiant yw … '.
say.PAST.3S the chairman secret the success be.PRES.3S
'The chairman said "The secret of success is … ".'

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Thus, we find no mutation at the start of the reported speech in these examples: *pleser*, not **bleser*, in (53), and *cyfrinach*, not **gyfrinach*, in (54), despite the fact that these words occur in what is normally a triggering context (i.e. following an XP under the phrase-based account).

It appears, then, that these contexts in which syntactic SM unexpectedly fails to occur – both (50)–(52) and (53)–(54) – have a common (quotative) thread, and thus constitute a natural class of exceptions to the general principle. The fact that neither of the analyses under discussion predicts this environment shows that further work on mutation contexts is still required.

4.6 *Summary*

We have seen throughout this section that the XPTH is able to predict the correct outcome in all the data analysed (apart from section 4.5), whereas the DD account has been shown to make incorrect predictions in a variety of contexts, involving unrealized (*wh*-trace) subjects, negative finite clauses, coordination and ellipsis. In just one context, verb fronting, the two accounts made the same predictions, though the XPTH required a small additional assumption regarding aspectual *yn* which was not needed by the DD account. At this point, it seems reasonable to conclude that, in empirical terms, the XPTH is the superior analysis. We have also seen that the availability of the notion 'phrase' is crucial in the analysis of syntactic SM. A phrase-based account turns out both to be empirically more accurate and also to encounter fewer theoretical problems than a dependency account.

5. Conclusions: unrealized elements, 'phrase', and the learnability of mutation contexts

One area for debate surrounding current models of grammar concerns levels of abstractness, particularly as regards material which is phonetically unrealized but which must nonetheless be recognized in the syntax. Welsh syntactic SM provides evidence in this debate. Given such contrasts as (17) vs. (18), the mutation is clearly a relatively superficial phenomenon, and yet it appears that it cannot be adequately described without reference to unrealized elements.

In general, the XPTH account requires phonetically unrealized material to be visible in the syntax. Much of this material involves elements which are, in a sense, phonetically optional. These include unrealized words such as proclitics and other functional elements (section 4.1), which are often omitted in informal contexts, but which behave as if present as far as mutation is concerned. They continue to trigger mutation as if overtly present, and to block other potential triggers from causing a mutation, again as if overt. These are the least abstract of all unrealized elements, since it is equally

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possible for them to be phonetically overt. The null subject *pro* also represents a phonetically optional pronoun, and this must be recognized in the syntax under the XPTH account, as we saw in section 4.1. The most straightforward account of syntactic SM needs to recognize the syntactic presence of all these phonetically unrealized elements. If any of them are not acknowledged, the account of syntactic SM (and indeed, of Welsh mutation in general) will be considerably more complicated. Somewhat more abstract (in the sense that these are not phonetically optional) are the gaps associated with unbounded dependencies. As we saw in section 4.1, *wh*-trace must be recognized in the syntax as a trigger for SM under the XPTH.

Ideally, all the unrealized elements which a particular grammatical model recognizes should behave in the same way as far as mutation is concerned, either being uniformly 'present' for mutation purposes, or uniformly absent. If there are differences, then these should be based on systematic distinctions, rather than on stipulations. The XPTH account, based on HPSG, comes very close to fully achieving this goal, and is able to give a straightforward account of syntactic SM with no internal inconsistencies. The DD account, on the other hand, has a number of problems involving unrealized elements. Unrealized elements must sometimes 'count' for the calculation of dependency distance (*pro* and elided material in co-ordinations), but in other cases must definitively not count (the elided material resulting in sentence fragments). Importantly, *wh*-traces are not recognized within Word Grammar, but this results in incorrect predictions (section 4.1). It seems, then, that on theoretical as well as empirical grounds, the XPTH is the more satisfactory account of Welsh syntactic SM.

How learnable are these two competing accounts? It might seem that a construction would be more easily learned if it has a clear function. However, proponents of the XPTH have not regarded syntactic SM as having any function, and indeed have pointed out that there is no reason even to expect a single syntactic process to have a single function (Borsley & Tallerman 1996: 31). The DD account, on the other hand, has what might (superficially) be regarded as an attractive feature: it suggests a function for syntactic SM, namely that the mutation signals the separation of a dependent from its head. We saw in section 3.2, however, that the DD account must be revised as in (24), in order to take into account the mutation of targets which are not themselves a dependent of the preceding head in question, but a dependent of the separated dependent. Given the need for this revision, it would seem that the spirit of the functional explanation is seriously undermined.

We have seen that a Word Grammar account also has a number of problems which relate specifically to the absence of the notion 'phrase'. The revision to the DD account in (24) was itself necessitated by the unavailability of phrases. The problems with negative finite clauses seen in section 4.2 also stem from the lack of a distinction between phrases and heads in the

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system. And the problems with co-ordinate structures in section 4.4.1 arise because Word Grammar is unable to recognize the existence of the entire direct object of a verb as a unit, whatever its internal structure. On the other hand, the general success of the XPTH account seems to support the validity, indeed the psychological reality, of phrases.

Finally, we can ask how typical is the DD environment as a context for mutation in general? In fact, the dependency account suggests an environment which is very atypical for mutation. It is notable that the statements of all other contexts for triggered mutation in Welsh (and indeed, in languages with consonantal mutation generally) can be formulated in terms of adjacency. In other words, as we saw in section 4.1, the mutation trigger is strictly adjacent to the target. This crucial requirement (along with a c-command requirement between trigger and target) has been a consistent feature of work on mutation; see, for instance, Lieber (1983), Zwicky (1984) and Roberts (2005: 93), the latter proposing that mutation in general occurs under head-government. The XPTH, under the formulation in (8), also requires the triggering XP to be adjacent to and to c-command the target. In this respect, the XPTH proposes a mutation context which is very similar to that of all other mutations. The DD account, on the other hand, suggests that in this one case, it is the very lack of adjacency which triggers the mutation. Again, other things being equal, it seems that an account which standardizes the environment for syntactic SM as much as possible with the environments for other mutations is preferable to an account which does not.

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