

Non-Distributive Features in Welsh Coordination

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Abstract

We consider various analyses of certain asymmetries concerning morphosyntactic features in coordinate structures in Welsh in the light of the theories of agreement and of coordination in LFG. In classic LFG, a very simple view is taken of agreement phenomena such as person, number and gender agreement between finite verbs and their subjects, or gender and number agreement between determiners, adjectives and nominals and similar phenomena. Agreement is generally modelled by means of constraints stated over the grammatical features PER, NUM and GEN of the controller argument: since these features belong to the vocabulary of f-structure, agreement is viewed as a surface syntactic matter. It is well known that agreement with coordinate structures may require some computation of controller agreement features and (Dalrymple and Kaplan 1998) show how the LFG formalism may be extended to express such feature resolution principles, again treating agreement at f-structure. In this paper we focus on a different pattern of agreement under coordination, that of single conjunct agreement, and consider a range of analyses of this phenomenon in Welsh. We argue that these data suggest the need for a more sophisticated view of agreement and sketch several possible analyses. Section One presents the relevant data. Section Two reviews the theories of coordination and agreement in LFG. In Section Three it is argued that the Welsh constructions under consideration really are coordinate structures. Finally, Section Four presents three “solutions” to this puzzle.

1 Single Conjunct Agreement Patterns

Coordinate structures provide an interesting probe for the adequacy of various approaches to morphosyntactic agreement. In many languages, where featurally dissimilar noun phrases are coordinated, the coordinate structures appear to bear a set of resolved or computed features which control agreement: (Dalrymple and Kaplan 1998) provides an extension of the LFG description language to deal with these cases. In other languages, including the Celtic languages Welsh and Irish, a single conjunct may control agreement. In this section we provide a brief sketch of the agreement patterns found in these languages.

In Welsh, a rigidly head initial language, we find that arguments control (person, number and gender) head agreement not just on finite verbs, but also on nominals and prepositions. Only pronominal arguments are agreement controllers, however: heads do not agree with their non-pronominal arguments. Thus finite verbs agree with pronominal subjects in person and number, and take the unmarked third person singular form with all non-pronominal subjects. This is illustrated in the examples in (1) below.

- (1) a. Daeth y dynion.
Came-3S the men
The men came.
- b. Daethant (hwy).
came-3PL (they)
They came.

A form inflected for the person, number and (sometimes) gender of a (pronominal) argument, such as *darllenasant* ‘read-3PL’, *arnoch* ‘on-2PL’ or *dy dŷ* ‘2S house’ is in fact ambiguous between an *agreement form* and a *pronominal incorporating form*. That is, agreement with a pronominal argument is obligatory in Welsh and the pronominal argument itself is optional.¹

¹This last statement finesses the situation very slightly - in fact, finite verbs do not obligatorily agree with their

Under coordination, agreeing heads exhibit what we might call an asymmetrical agreement pattern, agreeing with the first conjunct of a coordinate subject, so long as it is pronominal. The examples below illustrate. In (2a) and (2b) the verb appears in the ‘unmarked’ 3rd singular form with a plural coordinate subject where the first conjunct is non-pronominal, while in (2c) it agrees with the pronominal first conjunct. Precisely the same pattern is illustrated in (2d) and (2e).

- (2) a. Daeth Siôn ac Efyfyn.
 came-3S Siôn and Efyfyn
 Siôn and Efyfyn came.
- b. Daeth Siôn a minnau.
 came-3S Siôn and 1S
 Siôn and I came.
- c. Daethost ti a minnau/Siôn.
 came-2S 2S and 1S/Siôn
 You and I/Siôn came.
- d. Roedd Mair a fi i briodi.
 was-3S Mair and 1S to marry
 Mair and I were to marry.
- e. Roeddwn i a Mair i briodi.
 was-1S 1S and Mair to marry
 I and Mair were to marry.

An identical agreement pattern shows up in nominal structures containing possessor phrases. In Welsh, nominal heads take a proclitic agreeing with pronominal (but not non-pronominal) possessors (the canonical position for possessors is post-head). This is illustrated in (3).

- (3) a. brawd Siôn
 brother Siôn
 Siôn’s brother
- b. dy frawd (ti)
 2S brother 2S
 your brother

If the possessor phrase is a coordinate structure, the nominal head agrees with the first conjunct, just in case it is pronominal (4).²

- (4) a. brawd Siôn a Mair
 brother Siôn and Mair
 Siôn and Mair’s brother
- b. dy frawd ti a Mair
 2S brother 2S and Mair
 your and Mair’s brother

pronominal objects, although they may take agreeing/incorporating forms in the presence of a set of lexically specified presentential particles.

²The alternative reading of (4b) “your brother and Mair” is not of concern here.

The majority of prepositions in the language have a full inflectional paradigm, and inflect to agree with their pronominal (but not non-pronominal) objects. Again, where there is a coordinate argument, the preposition inflects to agree with the first (closest) argument, if it is pronominal, as illustrated below for the inflecting preposition *am* ‘about’.

- (5) a. Roedd Wyn yn siarad amdanat ti a Siôn.
 was-3S Wyn PROG speak about-2S 2S and Siôn
 Wyn was talking about you and Siôn.
- b. Roedd Wyn yn siarad am Siôn a thithau.
 was-3S Wyn PROG speak about Siôn and 2S
 Wyn was talking about Siôn and you.
- c. Roedd Wyn yn siarad amdanom ni a hwy.
 was-3S Wyn PROG speak about-1PL 1PL and 3PL
 Wyn was talking about us and them.

Recalling our earlier remark about ‘agreement morphology’ alternating between an agreement reading and a pronominal incorporation, with the ‘doubling pronoun’ being optional, we should note that there is one significant difference between the agreement pattern found in coordinate structures and that found with simple arguments. With coordinate structures, the pronominal argument must always be independently expressed, despite the presence of agreement morphology on the head.

A similar pattern of asymmetrical agreement is found in Irish and discussed in (McCloskey 1986), from whom the following data is taken. As in Welsh, the finite verb agrees with a leftmost (i.e. closest) pronominal within a coordinate subject, (6), a preposition with a leftmost pronominal within a coordinate object (7), and a nominal with a leftmost pronominal within a coordinate possessor (8). The general agreement pattern in Irish differs systematically from that in Welsh in one respect however. Whereas in Welsh, as we have seen in (1b) and (3b), agreement morphology and proclitics may be optionally doubled by overt pronominals, in Irish such overt (doubling) pronominals are not possible, although emphatic or contrastive nominal particles may occur in the relevant argument position. In similar fashion, just as in Welsh the doubling pronominals are *required* under coordination, so too the doubling emphatic or contrastive particles are *required* under coordination in Irish (while the leftmost pronominal itself is obligatorily absent). This is illustrated in the examples below from (McCloskey 1986).

- (6) Bhíos féin agus Tomás ag caint le chéile.
 be(PAST S1) EMPH and Thomas talk(PROG) with each other
 Thomas and I were talking to one another.
- (7) liom féin agus Eoghan
 with(S1) EMPH and Owen
 with me and Owen
- (8) mo ghabháltas féin agus mo mháthar
 S1 holding EMPH and my mother
 my own and my mother’s holding

Notice that if the leftmost conjunct is not pronominal the head does not bear agreement features, and as in Welsh, a full pronominal may occur as the non-initial conjunct.

- (9) Labhair sé le hEoghan agus mé féin.
 spoke he with Owen and me EMPH
 He spoke to Owen and me.

Though not as common as “resolved” agreement under coordination, similarly asymmetrical agreement patterns are found in other languages outside the Celtic family. (Corbett 1983) gives data for a range of languages in which one single conjunct controls person, number and gender (index) agreement. He observes that crosslinguistically, agreement with the nearer conjunct is more common when the predicate precedes the subject than when the subject precedes the predicate, giving the following examples from Czech and Latin respectively, while (Johannessen 1989) cites the Palestinian Arabic data in (12) (from (van Oirsouw 1987)).

- (10) Půjdu tam já a ty. (Czech)
 will-go(1SG) there I and you
 I and you will go there.
- (11) et ego et Cicero meos flagitabit. (Latin)
 and I and Cicero my will-demand(3SG)
 both my Cicero and I will demand it.
- (12) Gatalen ?el-banat we-l-wlad ?el-bisse. (Palestinian Arabic)
 killed-3PL the-girls and-the-boy the-cat
 The girls and the boy killed the cat.

In the following example from Swahili the conjunct nearest to the agreeing head is the final conjunct and it controls gender (noun classifier) agreement on the (following) head (Corbett 1991):

- (13) ki-ti na m-gurr wa meza u-mevunjika. (Swahili)
 7-chair and 3-leg of table 3-be-broken
 The chair and the leg of the table were broken.

Although less frequent crosslinguistically, (Corbett 1983) shows that agreement may also be controlled by the most distant conjunct. This occurs in Latin (which also exhibits agreement controlled by the nearest conjunct, as shown above), Serbo-Croat and the following predicate agreement example from Slovene:

- (14) Groza in strah je prevzela vso vas. (Slovene)
 horror(FSG) and fear(MSG) has seized(FSG) the-whole village
 Horror and fear have seized the whole village.

To summarise, there is robust crosslinguistic data illustrating the phenomenon of single conjunct agreement. The more common asymmetrical pattern appears to be that in which the closest conjunct to the head controls agreement (but distant agreement is also attested), and this pattern is itself more common where the predicate (agreeing head) precedes the coordinate argument.

2 Coordination and Agreement in LFG

The data presented above demonstrates an apparent difficulty for the interaction of the analyses of agreement and coordination in LFG. In LFG agreement relationships are captured at f-structure.

In the standard view, an agreement controller has values for the relevant grammatical features and agreeing elements are associated with equations also providing values for these same features of the agreement controller. Thus one structure (the f-structure of the controller) must be compatible with constraints introduced by two different elements. For example, the 3rd singular form of the present tense verb *likes* would be associated with the following constraint over the agreement features of the SUBJECT:

- (15) likes:
 (\uparrow SUBJ NUM) = SG
 (\uparrow SUBJ PER) = 3rd

In this example, both the subject and the finite verb, are associated with *defining* equations over the same f-structure. In some analyses, agreement targets introduce instead non-monotonic *constraining* equations over the values of the controller's agreement features. This captures the intuition that the relationship is asymmetric, and builds in a distinction between realizing a feature and requiring a feature. For example, (Andrews 1982) provides the following entry for the 2nd person plural form of the present tense of the Icelandic verb *elska* 'to love':

- (16) elsku:
 (\uparrow SUBJ PERS) =_c 2nd
 (\uparrow SUBJ NUM) =_c PL

We are not concerned here with the differences between these methods, though they can be rather significant (for some very thought-provoking discussion see (Johnson 1997)). What they have in common are that both model agreement in terms of constraints over *one* f-structure (that of the controller). This differs from the way in which morphologists tend to think about agreement phenomena from a morphological viewpoint as involving both target and controller being specified for an inherent set of person, number and gender features, which are then required (in the syntax) to match.

A treatment of coordination in LFG is outlined in (Kaplan and Maxwell III 1988), from which the following example is taken. Coordinate structures are analysed by means of phrasal expansions such as that shown in (17) and are modelled as sets at f-structure. To account for the distribution of elements across the set, such as the f-structure of the subject *John* and that of the object *apples*, the definition of function-application is extended to hold of sets of functions.

- (17) V → V CONJ V
 ↑=↓ ↑=↓

- (18) John bought and ate apples

$$(19) \left(\left[\begin{array}{l} \text{SUBJ} \left[\begin{array}{l} \text{PRED} \text{ 'John'} \\ \text{NUM} \text{ SG} \end{array} \right] \\ \text{PRED} \text{ 'buy'} \langle (\uparrow\text{SUBJ})(\uparrow\text{OBJ}) \rangle \\ \text{TENSE} \text{ PAST} \\ \text{OBJ} \left[\begin{array}{l} \text{PRED} \text{ 'apple'} \\ \text{NUM} \text{ SG} \end{array} \right] \end{array} \right] \right) \left(\left[\begin{array}{l} \text{SUBJ} \left[\begin{array}{l} \text{PRED} \text{ 'John'} \\ \text{NUM} \text{ SG} \end{array} \right] \\ \text{PRED} \text{ 'eat'} \langle (\uparrow\text{SUBJ})(\uparrow\text{OBJ}) \rangle \\ \text{TENSE} \text{ PAST} \\ \text{OBJ} \left[\begin{array}{l} \text{PRED} \text{ 'apple'} \\ \text{NUM} \text{ SG} \end{array} \right] \end{array} \right] \right) \right)$$

Given this treatment of coordination, we expect constraints over the subject associated with the finite verb, for example, to distribute over the set of f-structures corresponding to a coordinate subject: in fact, the normal situation is for such features to resolve, as in *John and Mary aren't happy*, or (21) below. In a recent paper, (Dalrymple and Kaplan 1998) consider agreement and feature resolution in coordinate structures. They discuss essentially two sets of cases, those in which a somewhat indeterminate feature is checked against *each and every conjunct*, and those in which a feature value is checked against a (resolved) value for *the coordinate structure as a whole*.

The former is exemplified in (20): intuitively, this example is grammatical because the wordform *kogo* is indeterminate enough to be able to satisfy both the requirement that it is ACC (imposed by *lubi*) and the requirement that it is GEN (imposed by *nienawidzi*).

- (20) Kogo Janek lubi a Jerzy nienawidzi. (Polish)
 who Janek likes and Jerzy hates
 ACC, GEN
 Who does Janek like and Jerzy hate?

Cases of indeterminacy involve what Dalrymple and Kaplan call *distributive features*:³ they argue that Case, Vform and Nounclass are all distributive features. To accommodate indeterminacy in feature values, the LFG f-description notation is extended to include *set designation* (giving an exhaustive enumeration of the set in question), so that a feature value for a given wordform may be a set (and 'case checking' constraints check for set membership, not equality).

The second set of cases, that of feature resolution under coordination is exemplified by (21) below. Here the agreeing element introduces agreement features which are distinct from, but related by some simple computation to, those of each conjunct. Dalrymple and Kaplan propose that a subset of features are special in being *non-distributive* (here Number, Gender and Person). They represent

³Recall that under the LFG approach to coordination, a value contributed to a *set* of f-structures distributes over the member f-structures of that set.

coordinate structures as hybrid structures having both elements and (non-distributive) features as illustrated below.

- (21) José y yo hablamos. (Spanish)
 José and I speak-1PL
 José and I are speaking.

- (22)
$$\left[\begin{array}{cc} \text{PER} & 1 \\ \text{NUM} & \text{PL} \\ \left(\left[\begin{array}{cc} \text{PRED} & \text{'Pedro'} \\ \text{PER} & 3 \\ \text{NUM} & \text{SG} \end{array} \right] \right) \\ \left(\left[\begin{array}{cc} \text{PRED} & \text{'PRO'} \\ \text{PER} & 1 \\ \text{NUM} & \text{SG} \end{array} \right] \right) \end{array} \right]$$

The definition of function application is refined to take into account this rudimentary typing of features or properties ((Dalrymple and Kaplan 1998) page 26):

- (23) For any distributive property P and set s : $P(s)$ iff $\forall f \in s.P(f)$
 For any nondistributive property P and set s : $P(s)$ iff P holds of s itself.

(Dalrymple and Kaplan 1998) introduce a representation for person and gender features which enables a simple statement of the computation involved in resolution (number resolution is essentially semantic in nature). Resolving features are expressed by means of marker sets encoding complex values, as illustrated in (24) ((Dalrymple and Kaplan 1998) page 27).⁴ Given this representation, resolution involves simply set union, and “resolution rules” are simply stated as annotations.

- (24) $\{S\}$: 1st person singular, 1st exclusive nonsingular
 $\{S,H\}$: 1st person inclusive nonsingular
 $\{H\}$: 2nd person
 $\{\}$: 3rd person

- (25)
$$\text{NP} \rightarrow \begin{array}{ccc} \text{NP} & \text{CONJ} & \text{NP} \\ \downarrow \in \uparrow & & \downarrow \in \uparrow \\ (\downarrow \text{PER}) \subseteq (\uparrow \text{PER}) & & (\downarrow \text{PER}) \subseteq (\uparrow \text{PER}) \end{array}$$

With this background, consider now the data on asymmetric agreement with coordinate structures presented in Section 1. It should be clear that these data do not fit comfortably with this combined analysis of agreement and coordination in LFG. Coordinate structures are sets at f-structure: properties holding of a set of f-structures are either distributed over the members of that set (distributive

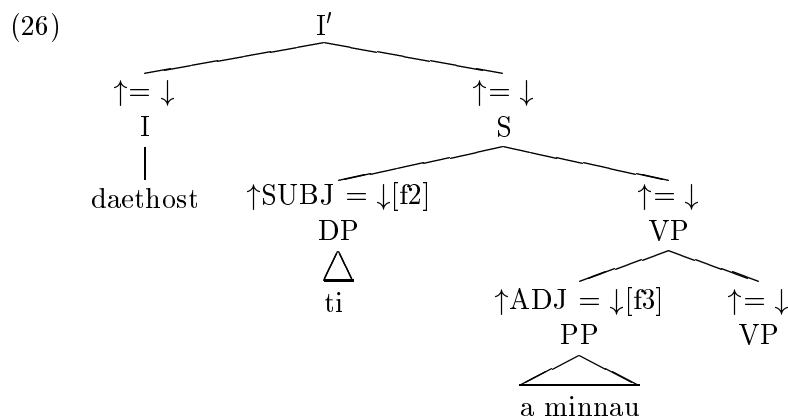
⁴Languages lacking the inclusive/exclusive distinction do not have the marker set $\{S\}$: $\{S,H\}$ is then defined simply as first person.

properties) or they hold of the set itself (non-distributive properties). In languages showing asymmetric agreement under coordination, however, neither assumption about the agreement features is correct, however. It seems that either some different treatment of agreement is required, or some different treatment of the (coordinate) structures themselves. In the following section, we consider whether it is appropriate to consider the Welsh structures as coordinate structures in the sense of the c-structure and f-structure analysis outlined above.

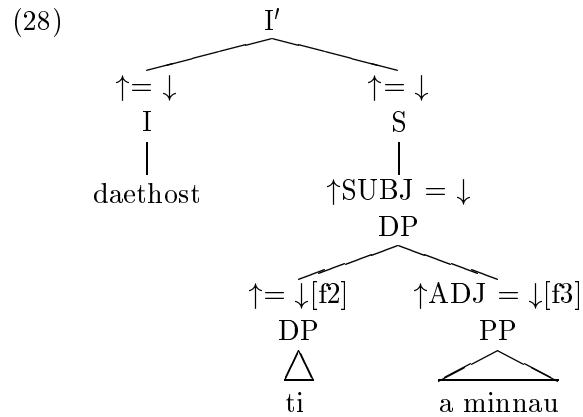
3 Coordinate Structures

Several alternatives to the multiply headed coordinate structure shown in (17) are discussed in the generative literature. For example, (Johannessen 1989) argues for a headed structure at least partly on the basis of asymmetrical agreement data. We shall have little to say about constituent structures *per se* in this paper. In an interesting paper, (Borsley 1994) presents a defensive of ‘special’ coordination schemas such as (17), pointing out several severe deficiencies in proposals for alternative structures. In fact, these c-structure concerns are very largely orthogonal to our own, since agreement is treated at f-structure in LFG, and thus the key point is whether or not it is appropriate to associate a *set* of f-structures with these constructions.

If these constructions do not map to a set of f-structures, the alternative is that they might correspond to some sort of head - dependent structure, with the first “conjunct” mapping to the relevant grammatical function and the rest of the coordinate structure being an adjunct. There are two logical possibilities. The first is some sort conjunct union analysis (Hale 1975, Aissen 1985) in which the rest of the coordinate structure is an adjunct “upstairs” and the second is an analysis under which the non-initial “conjuncts” are adjuncts “downstairs” to the grammatical function associated with the initial “conjunct”. These are shown schematically below for a case like (2c) (in each case, we finesse the matter of how the conjunction is represented at f-structure under this hypothesis):



$$(27) \left[\begin{array}{l} \text{PRED} \quad \langle \text{'came'} \langle (\uparrow \text{SUBJ}) \rangle \rangle \\ \text{SUBJ} \quad \left[\begin{array}{l} \text{PRED} \quad \langle \text{'PRO'} \rangle \\ \text{PER} \quad 2 \\ \text{NUM} \quad \text{SG} \end{array} \right] \\ \text{ADJ} \quad \left[\begin{array}{l} \text{PRED} \quad \langle \text{'PRO'} \rangle \\ \text{PER} \quad 1 \\ \text{NUM} \quad \text{SG} \end{array} \right] \end{array} \right]$$



$$(29) \left[\begin{array}{l} \text{PRED} \quad \langle \text{'came'} \langle (\uparrow \text{SUBJ}) \rangle \rangle \\ \text{SUBJ} \quad \left[\begin{array}{l} \text{PRED} \quad \langle \text{'PRO'} \rangle \\ \text{PER} \quad 2 \\ \text{NUM} \quad \text{SG} \\ \text{ADJ} \quad \left[\begin{array}{l} \text{PRED} \quad \langle \text{'PRO'} \rangle \\ \text{PER} \quad 1 \\ \text{NUM} \quad \text{SG} \end{array} \right] \end{array} \right] \end{array} \right]$$

What these proposals have in common is that they treat non-initial conjuncts as adjuncts. But as we will see, the non-initial conjunct instead has the properties of the grammatical function it would instantiate as a member of a set of f-structures under the coordinate structure analysis.

[1]. For example the coordinate structure as a whole (that is, the set of f-structures) serves as controller in the examples (2d,e) repeated here for convenience:

- (30) Roedd Mair a fi i briodi.
 was-3S Mair and 1S to marry
 Mair and I were to marry.

- (31) Roeddwn i a Mair i briodi.
 was-1S 1S and Mair to marry
 I and Mair were to marry.

[2]. Note also that the *a/ac phrase* does not have the sort of mobility we associate with adjuncts, but appears in an absolutely fixed position with respect to the head. Interestingly, there *is* a subordinating use of the conjunction *a/ac*, introducing absolute clauses, and the adverbial clause so introduced can precede, interrupt or follow the clause which it modifies (examples from (Thorne 1993) pages 382- 383).

- (32) Ac yntau heb waith, ni fedrai ffordio iro llaw y swyddogion.
 And 3SM without work, NEG was.able.3S afford grease hand the officers
 And being unemployed, he could not afford to grease the palm of the officers.
- (33) Nid hawdd fu hi i JWH, ac yntau'n heddychwyr, foddhau ei eglwys yn St
 NEG easy was 3SF for JWH and 3SM-PT pacifist, please 3SM church in St
 Albans.
 Albans
 It wasn't easy for JWH, being a pacifist, to please his church in St Albans.
- (34) Yr oeddwn eisoes yn hen ŵr, a minnau'n blentyn.
 PT was-1S already PT old man, and 1S-PT child
 I was already an old man, when I was a child.

[3]. Semantically, the *a/ac phrase* has the sort of status that is associated with a conjunct within a coordinate structure. Consider examples of coordination in possessive constructions, such as (35).

- (35) gwallt du a llygaid gwyrdd Mair
 hair black and eyes green Mair
 Mary's black hair and green eyes

The 'inside' and 'outside' adjunct analyses associate the following structures with (35) respectively, where the grammatical function borne by the NP is represented simply as GF:

- (36)
$$\left[\text{GF} \left[\begin{array}{l} \text{PRED 'hair'} \\ \text{ADJ} \left\{ \begin{array}{l} \left[\text{PRED 'eyes'} \right] \\ \left[\text{ADJ} \left\{ \left[\text{PRED 'green'} \right] \right\} \right] \\ \left[\text{PRED 'black'} \right] \right\} \right. \\ \left. \left[\text{POSS} \left[\text{PRED 'Mair'} \right] \right] \right. \end{array} \right. \right. \end{array} \right]$$

$$(37) \left[\begin{array}{l} \text{GF} \left[\begin{array}{l} \text{PRED} \text{ 'hair'} \\ \text{ADJ} \left\{ \left[\text{PRED} \text{ 'black'} \right] \right\} \\ \text{POSS} \left[\text{PRED} \text{ 'Mair'} \right] \end{array} \right] \\ \text{ADJ} \left\{ \left[\begin{array}{l} \text{PRED} \text{ 'eyes'} \\ \text{ADJ} \left\{ \left[\text{PRED} \text{ 'green'} \right] \right\} \end{array} \right] \right\} \end{array} \right]$$

The interpretation under which the property of having *green eyes* is associated with *hair* is simply incoherent, and is certainly not the interpretation associated with (35), but this is the sort of interpretation that we would expect for the sort of f-structure schematized in (36). Similarly, the structure in (37) may be expected to map to similarly unhelpful semantics under which *green eyes* is associated with the dominating (presumably verbal) predicate.

Crucially, the possessor *Mair* is in fact interpreted as a semantic argument of both *hair* and *eyes*, precisely as one would expect if the f-structure were a set, with the possessor distributed over the members of the set, that is, if the f-structure representation of (35) were that of a coordinate structure.

[4]. Pronominal coordinate structures (that is, those showing asymmetric or initial conjunct agreement, for which we are considering a head-adjunct f-structure representation) do not differ from non-pronominal coordinate structures in terms of their interaction with other syntactic phenomena. Anaphoric pronouns and pronominal clitics show precisely the same pattern of concord with an asymmetric (pronominal initial) coordinate structure as with other coordinate structures. This can be exemplified with the Welsh personal passive construction, which involves the verb *cael*, ‘get’ used as a passive auxiliary and the main verb in non-finite, VN form. The non-finite main verb is preceded by a pronominal clitic agreeing with the passive subject. The pair of examples below exemplify a passive, the first involving a pronominal initial coordinate subject. In each case the (passive) pronominal clitic agrees with the coordinate structure *as a whole*, that is, as though feature resolution has occurred in the coordinate subject.

(38) Ni chaffodd ef a'i milwyr eu lladd yma.
 NEG got-3S he and-3SM soldiers 3PL kill there
 He and his soldiers were not killed there.

(39) Ni chaffodd Pwyll a'i milwyr eu lladd yma.
 NEG got-3S Pwyll and-3SM soldiers 3PL kill there
 He and his soldiers were not killed there.

Finally, (McCloskey 1986) notes an incorrect prediction of the conjunct union analysis, under which the first conjunct *is* the SUBJECT or OBJECT, and so on, while the other conjunct takes on some sort of ‘upstairs’ function (such as ADJUNCT). He observes that the initial (subject) conjunct does not behave like a SUBJECT. In Irish, a relative clause formed on the immediately dominated subject position obligatorily involves a gap on subject position, rather than a (null) pronominal, the presence of the latter being signalled by verb agreement. This restriction does not extend to coordinate subjects, and in particular to those which are pronominal initial, thus (41) is grammatical. This

suggests that the pronominal conjunct is not itself the SUBJECT (in our terms, it is a member of the set of f-structures which together provide the SUBJECT function).

- (40) *na tithe a rabhadar pro ceannaithe againn
 the houses COMP be(PAST P3) bought by-us
 the houses that had been bought by us
- (41) na daoine a rabhadar pro -féin agus a gelann mhac ábalta ar
 the people COMP be(PAST P3) EMPH and their family sons(GEN) able on
 iascach.
 fishing
 the people that they and their sons were capable of fishing

An analagous argument may be made for Welsh. A relative clause on prepositional object position requires the use of agreement morphology on inflecting prepositions and the absence of the pronominal itself - the latter condition is suspended in the case of a coordinate object:

- (42) y dyn y soniais amdano *ef
 the man that spoke-1S with-3S him
 the man who I spoke to him
- (43) y dyn y soniais amdano ef ac Ann
 the man that spoke-1S with-3S him and Ann
 the man who I spoke to him and Ann

The evidence, then, is that all coordinate structures, whether they have pronominal conjuncts or not, are represented as sets at f-structure. Coordinate structures with a pronominal initial conjunct differ from other coordinate structures *only* as far as the head-argument agreement between a finite verb and a subject, or a prepositional head and its object, or a nominal head and its possessor is concerned. This strongly suggests that they should be treated equivalently. Note further that predicate agreement and pronominal anaphora show that semantic feature resolution operates with both pronominal and non-pronominal coordinate structures, a fact which will be of significance when we consider analyses in the following section.

- (44) Roeddwn i ac Emyr yn ysgrifenywyr rhagorol.
 was-1S 1S and Emyr PT writers excellent
 Emyr and I were excellent writers.
- (45) Mae Siôn ac Emyr yn ysgrifenywyr rhagorol.
 is Siôn and Emyr PT writers excellent
 Siôn and Emyr are excellent writers.

To conclude this section, we summarise the puzzle that pronominal coordinate structures represent. We have good reason to conclude that coordinate structures in Welsh, whether or not they contain pronominals, involve multiply-headed c-structures which map to sets of f-structures. On the one hand, evidence from anaphora and predicate agreement suggests that the coordinate structure bears semantically resolved person and number agreement features, while on the other hand evidence from head-argument agreement suggests that the coordinate structure bears the agreement features associated with an initial, pronominal conjunct.

4 Asymmetric Agreement in Coordination: Several Analyses

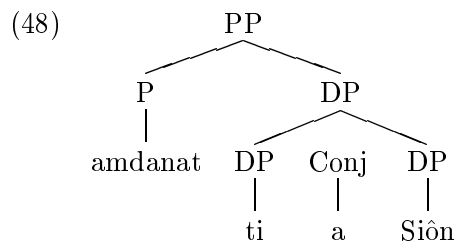
We noted above that there are two fundamental aspects to the treatment of the phenomenon of agreement in LFG. The first is that the ‘agreement features’ such as person, number, gender and case are f-structure (rather than e.g. c-structure) features, and the second is that agreement is modelled by means of constraints stated over one and the same structure, rather than in terms of matching between features on separate and different structures (a lengthy defence of this view of agreement is given within a similar non-derivations framework, HPSG, in (Pollard and Sag 1994)). In this section we explore several potential analyses which are consistent with these assumptions.

4.1 Non-Distributive but not Resolution by Union

One possible line of attack on the problem is to adopt and adapt the (Dalrymple and Kaplan 1998) approach. This would involve taking the agreement features person, number and gender to be non-distributive, and therefore undergoing resolution, as in (Dalrymple and Kaplan 1998), but to depart from the assumption that resolution is by set union. Instead, in Welsh, the coordinate c-structure schema would explicitly equate the value of the PER, NUM and GEN features of the mother with those of the first daughter.⁵ This approach permits us to maintain *both* the assumption that agreement is an f-structure phenomenon and the assumption that agreement is not feature matching but the satisfaction of multiple constraints by one f-structure.

$$\begin{array}{rcl}
 \text{DP} & \rightarrow & \text{DP} \quad \text{CONJ} \quad \text{DP} \\
 & & \downarrow \in \uparrow \quad \downarrow \in \uparrow \\
 (46) & & (\downarrow \text{PER}) = (\uparrow \text{PER}) \\
 & & (\downarrow \text{NUM}) = (\uparrow \text{NUM}) \\
 & & (\downarrow \text{GEN}) = (\uparrow \text{GEN})
 \end{array}$$

(47) amdanat ti a Siôn
 about-2S 2S and John
 about you and Siôn



⁵Finite verbs do not reflect the gender of their subjects, but Ns agree in gender with their 3rd person possessors and Ps with their 3rd person objects.

$$(49) \left[\begin{array}{l} \text{PRED 'am'} \langle (\uparrow \text{OBJ}) \rangle \\ \text{OBJ} \left[\begin{array}{l} \text{PER } 2 \\ \text{NUM } \text{SING} \\ \left(\left[\begin{array}{l} \text{PRED 'Siôn'} \\ \text{PER } 3 \\ \text{NUM } \text{SG} \end{array} \right] \right) \\ \left(\left[\begin{array}{l} \text{PRED 'PRO'} \\ \text{PER } 2 \\ \text{NUM } \text{SG} \end{array} \right] \right) \end{array} \right] \end{array} \right]$$

The advantage of this approach is that it permits us to maintain the notion that the agreement features PER, NUM and GEN are non-distributive. However, there are several aspects which make this analysis unattractive. For one thing, the intuition that the target really does agree with the first conjunct is captured only indirectly, by means of a feature passing mechanism of the sort which is generally eschewed in LFG. Secondly, the approach is perversely at odds with the intent of the (Dalrymple and Kaplan 1998) proposal. That proposal extended the formalism to permit the grammar to express what is essentially semantic resolution in a syntactic agreement environment, but in the approach here, the agreement features associated with the coordinate structure as a whole are precisely *not* those required for “semantic” agreement for cases such as (38), (39), (44), (45) and the following examples:

(50) Fe a fi, aethon ni ddim yno.
 him and me, went-1PL we not there
 Him and me, we did not go there.

(51) Pan glywodd Math a Gwydion yr hanes, roedden nhw'n drist iawn.
 when heard-3S Math and Gwydion the story, were-3PL they-PT sad very
 When Math and Gwydion heard the story, they were very sad.

4.2 First Conjunct Agreement

A second approach is to model assymmetric agreement directly by associating with the f-structure head constraints over the f-structure corresponding to the first conjunct. To capture both *amdanat (ti)* ‘about you’ and *amdanat ti a fi* ‘about you and me’, we need to introduce disjunction into the lexical entry for the agreeing head. We also need to ensure that no part of any other conjunct precedes the first (agreement controlling) conjunct: one way of doing this is by ensuring that the conjunct that the head constrains linearly precedes the other conjuncts. Below is the (part of the) lexical entry for an agreeing head:

(52) *amdanat*:
 $(\uparrow \text{PRED}) = \text{'about'} \langle (\uparrow \text{OBJ}) \rangle$
 $\downarrow \in (\uparrow \text{OBJ})$

- $(\downarrow\text{PER}) = 2\text{nd}$
 $(\downarrow\text{NUM}) = \text{SG}$
 $\forall x, x \neq \downarrow, x \in (\uparrow\text{OBJ}), \downarrow <_f x$

The definition of f-precedence is:

- (53) f_1 f-precedes f_2 if and only if there are c_1 and c_2 such that c_1 is a rightmost element in $\mu^{-1}(f_1)$, c_2 is a rightmost element in $\mu^{-1}(f_2)$, and c_1 precedes c_2 . (page 250 (Bresnan 1995))

This approach also treats agreement as a matter of co-specification of a single f-structure rather than as feature matching. Note that it is also consistent with semantic resolution: it combines unproblematically with the computation of ‘resolved’ features on the f-structure corresponding to the coordinate structure as a whole. The peculiarity of Welsh is simply that agreeing heads do not state constraints over this structure. So, for example, the subject in (54) may be represented as in (55).

- (54) 'Roeddit ti a'th gi yn cael eich gweld.
 were-2S you and-2S dog PT get 2PL see
 You and your dog were seen.

- (55)
$$\left[\begin{array}{l} \text{PER} \quad 2 \\ \text{NUM} \quad \text{PL} \\ \left\{ \begin{array}{l} \left[\begin{array}{l} \text{PRED} \quad \text{'dog'} \\ \text{PER} \quad 3 \\ \text{NUM} \quad \text{SG} \\ \text{POSS} \quad [\text{PRED} \quad \text{PRO}] \end{array} \right] \\ \left[\begin{array}{l} \text{PRED} \quad \text{'PRO'} \\ \text{PER} \quad 2 \\ \text{NUM} \quad \text{SG} \end{array} \right] \end{array} \right\} \end{array} \right]$$

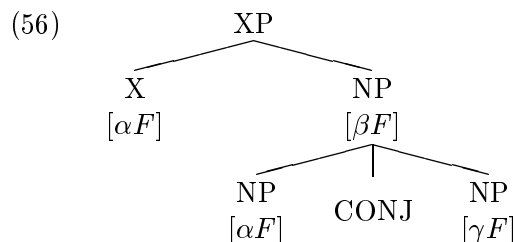
This approach captures directly the asymmetry in head-argument agreement, but at a severe cost for the lexicon. On the other hand, there is in any case an irreducible aspect to this lexical proliferation, since, as we have seen, pronominal incorporation is impossible from coordinate structures.⁶

4.3 Distinguishing Morphological and Semantic Agreement

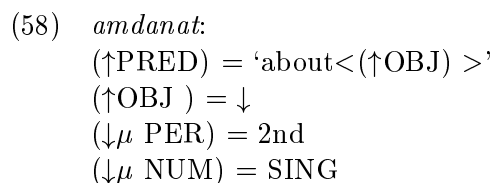
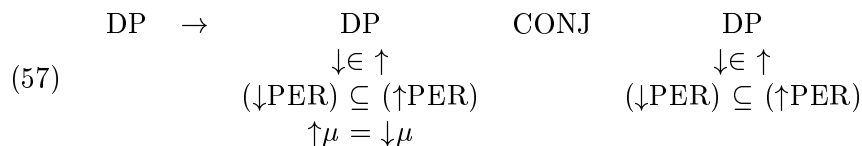
The difficulty that the Welsh data poses is really that morphosyntactic and semantic agreement come apart under coordination. As several examples in this paper show, although a head finite

⁶In this approach, the head directly constrains the first conjunct's agreement features rather than those of the coordinate structure as a whole. An alternative possibility, pointed out to me by Yehuda Falk, is that the agreeing head has its own (intrinsic) PER and NUM features in the f-structure, which should be linked to those of a referential element. The structure in which the head agrees with the first conjunct is the best as determined by a set of ranked OT constraints. Clearly, this approach embraces a “matching” rather than a “constraining” view of agreement.

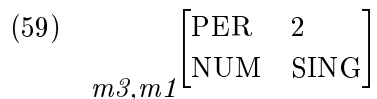
verb, noun or preposition agrees (syntactically) with the initial conjunct, it is a set of semantically resolved agreement features which is relevant to other agreement processes. This situation can be represented schematically as follows (though, of course, we are not proposing a treatment based on trees).



A third approach to the problem departs from the view that all agreement is at f-structure and distinguishes between a set of semantically motivated agreement features (at f-structure) and a set of purely morphosyntactic agreement features, which are represented at m-structure.⁷ We assume that the default relationship between these two sets (outside of certain syntactic constructions) is an identity mapping.⁸ The behaviour of the (semantically motivated) PER and NUM features at f-structure is captured by the analysis of (Dalrymple and Kaplan 1998) outlined above, but morphosyntactically the coordinate structure is associated with the agreement features of the first conjunct - and it is these features which the agreeing head specifies constraints over. The essence of this idea is captured in the coordinate schema and lexical entry below:



In this approach, then, the f-structure of the coordinate structure in (54) is indeed as in (55), while the m-structure of both *f1* and *f3* is as follows:



⁷This level is first proposed in the context of work on parallel grammars in (Butt et al. 1996). We assume here the architecture proposed in (Frank and Zaenen 1998), which uses the following mappings: c-structure \rightarrow f-structure \rightarrow m-structure

⁸(Spencer and Sadler 1999) argues on the basis of periphrasis and deponent verbs that it is necessary to distinguish between a set of morphosyntactic features and a set of f-structure features, which are generally, but not always, related by an identity mapping. Similarly, separate sets of features are proposed for agreement mismatches in Serbian by (Zlatić and Wechsler 1997) in the framework of HPSG.

5 Conclusion

In focussing on one small set of data concerning agreement under coordination in Welsh, this paper has attempted to raise some questions about the standard approach to agreement in LFG. We have presented three “solutions” to the difficulties posed by asymmetric agreement in coordinate structures. The first of these provides the coordinate structure with a set of features appropriate for head-argument agreement, but at the cost of other phenomena involving agreement features (such as predicate nominal agreement and anaphora). The second expresses directly the intuition that heads agree with first conjuncts in Welsh, and combines appropriately with the resolution rules of (Dalrymple and Kaplan 1998). The machinery, however, is less than graceful and the linearity of the phenomenon (that is, the observation that it is the first conjunct *because* this is the closest to the head) is not directly captured. The third approach proposes that agreement features exist both at f-structure and at m-structure, and treats Welsh head-argument agreement as a morphosyntactic matter. This in turn raises rather fundamental questions about the number and motivation of levels in LFG. What is clear, however, is that the simple and homogeneous view of agreement phenomena cannot be maintained.

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