

# ON THE REPRESENTATION OF CASE AND AGREEMENT

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## Abstract

Case and agreement are typically modeled in LFG as f-structure phenomena. Inadequacies of this account suggest an alternative, in which grammatical marking is modeled as a separate projection from f-structure, called g-structure.

## 1. Case and Agreement in LFG

### 1.1. Agreement

It has become clear over the past few years that the standard LFG treatment of agreement is inadequate, a fact which was the focus of the agreement workshop at the LFG 05 conference. This inadequacy is a combination of several factors, but it is primarily a conceptual failure. An adequate theory of agreement must begin with a conceptual understanding of the nature and purpose of agreement. This paper<sup>1</sup> will argue that agreement, along with Case marking, involves an additional level of representation in the LFG projection architecture, one which we will call grammatical marking structure, or g-structure.

At the outset, a caveat is in order. It is beyond the scope of this study to discuss every agreement problem that has been discussed in the vast literature on the subject. Thankfully, linguistics has moved beyond the point where agreement is a mere footnote, and discussion of agreement patterns and unusual agreement phenomena currently abound in the theoretical and typological literature. An anonymous reviewer of this paper comments that “the proposal that a g-structure will solve all our problems is unconvincing: we do not really know what our problems are, so why should g-structure solve them?” We demur. Even if we limit our attention to problems that have already been discussed in the LFG literature (as we do for the most part in this paper), there is much to be said about problems facing a theory of agreement. No theory in linguistics has yet solved all problems in *any* area. Our goal is much more modest: we suggest that the proposal to be made here results in a better theory of agreement than the standard LFG approach, and we expect that it will prove fruitful in dealing with other problematic cases of agreement. However, as is the case with any theoretical proposal, this expectation must face the test of further empirical investigation.

The standard LFG analysis of agreement treats it as an f-structure phenomenon. This embodies the claim that agreement is based on grammatical functions. While grammatical functions do play a major role in agreement, a fact we incorporate by treating g-structure as a projection from f-structure, there are additional considerations, primarily c-structural and i-structural, which also play a role.

One non-f-structure factor which plays a role in agreement systems is linear order. This has been discussed in the LFG literature primarily in regard to agreement with coordinate structures. As noted by Sadler (1999), many languages exhibit agreement not with the resolved features of a coordinate structure, but rather with the conjunct which is closest to the agreeing head. This is true in Welsh (1a,b), where the verb precedes the agreement trigger, and in Swahili (1c), where it follows:

- (1) a.   Roedd   Mair a   fi i   briodi.  
          was.3SG Mair and I   to marry  
          ‘Mair and I were to marry.’
- b.   Roeddwn i a   Mair i   briodi.  
          was.1SG I and Mair to marry  
          ‘I and Mair were to marry.’

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<sup>1</sup>I would like to thank Aaron Broadwell, Tracy King, Rachel Nordlinger, Nigel Vincent, and especially Mary Dalrymple for comments on this paper.

- c. Ki- ti na m- gurr wa meza u- mevunjika.  
 7- chair and 3- leg of table 3- be.broken  
 ‘The chair and the leg of the table were broken.’

More surprisingly, Sadler observes that there are also languages in which the farthest conjunct triggers agreement, such as Slovenian:

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

A particularly interesting case of closest conjunct agreement, to which we will return later, is found in Portuguese attributive adjectives (Sadler & Villavicencio 2005).

Linear order shows up in other contexts as well. For example, in Standard Arabic the features in which the verb agrees with a non-pronominal subject depend on whether the subject precedes or follows the verb: if the subject precedes, the verb agrees in both gender and number; if the subject follows, the verb agrees in gender only (Aoun, Benmamoun, & Sportiche 1994).<sup>2</sup>

- (3) a. Naama l- ?awlaad- u.  
 slept.3MSG the- children- NOM  
 ‘The children slept.’
- b. ?al- ?awlaad- u naamuu.  
 the- children- NOM slept.3MPL  
 ‘The children slept.’
- c. \*Naamuu l- ?awlaad- u.  
 slept.3MPL the- children- NOM
- d. \*?al- ?awlaad- u naama.  
 the- children- NOM slept.3MSG

The relevance of the c-structure relation of precedence is surprising under an f-structural account of agreement.

Another non-f-structure factor in agreement is i-structure. One example of a language in which i-structure plays a role is Maithili, discussed by (Dalrymple & Nikolaeva 2005). In Maithili, the verb agrees in person and honorific status with the subject and with one other element. This additional element is chosen not by grammatical function—it can be OBJ (4a), OBL (4b), SUBJ POSS (4c), or OBJ POSS (4d)—but rather by discourse status: it must be a secondary topic.

- (4) a. Həm to- ra kitab d- əit ch- iəuk.  
 I you.HN- OBJ book give- PART be- 1.2NH  
 ‘I gave a book to you<sub>non-honorific</sub>.’
- b. Tō hunkā- sa kiae khisiael chahun?  
 you him.H- INST why angry are.2MH.3H  
 ‘Why are you angry with him<sub>honorific</sub>?’

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<sup>2</sup>In addition, closest conjunct agreement (which is not obligatory in Standard Arabic) is only possible when the subject follows the verb.

- c. Tohar bābu Mohan- ke dekhalthun.  
 your.NH father.H Mohan- OBJ saw.3H.2NH  
 ‘Your<sub>non-honorific</sub> father<sub>honorific</sub> saw Mohan.’
- d. O tora: bāp- ke dekhalthun.  
 he.H your.NH father- OBJ saw.3H.2NH  
 ‘He<sub>honorific</sub> saw your<sub>non-honorific</sub> father.’

There are further problems with the idea that agreement is an f-structure phenomenon. The agreement of attributive adjectives with their nominal heads, a phenomenon familiar from many languages, is puzzling. Generally, heads agree with their dependents (verbs with subjects and objects, prepositions with objects, nouns with possessors), leading to the expectation that the function of agreement is to mark certain information on heads. However, attributive adjective agreement appears to be the agreement of a dependent with a head. While modeling attributive adjective agreement formally is not a problem, its existence raises conceptual problems in understanding the nature of agreement. One possible solution would be to model agreement at a level of representation in which head-dependent relations are not the same as those at f-structure.

It is even possible for an agreement trigger to not be an element of f-structure. This can be seen, for example, in Hindi-Urdu, where a verb is third person masculine singular if both the subject and object are Case-marked (Butt 1993, *inter alia*).

- (5) Naadyaa ne ciṭṭ<sup>h</sup>ii ko lik<sup>h</sup>- aa hai.  
 Nadya(F) ERG note(F) ACC write- PERF.M.SG be.PRES.3SG  
 ‘Nadya has written a (particular) note.’

In this sentence, the verbal forms *lik<sup>h</sup>aa* and *hai* agree with a third-person masculine singular element, but there is no such element in the f-structure of the sentence. This is a case of what is generally treated as “default agreement”, but in the absence of a theory of default agreement, the name is simply a dodge. Crucially, default agreement is not the absence of agreement, as one might expect; rather, it is agreement with a specific set of features which the grammar of the language specifies as the default. This suggests that agreement should be modeled as an aspect of a level of structure which can have non-f-structure elements in it; the default can be defined in terms of elements at this additional level of structure.

None of these phenomena is unexpressible using the standard LFG analysis and formalism. However, the conceptual basis of the theory of agreement is stretched by the analyses of these phenomena. In some cases, particularly those involving linear order, the conceptual inappropriateness leads to a formal expression which is rather convoluted and un insightful.

## 1.2. Case

Another aspect of agreement which is not expressed by standard LFG treatments of agreement is the relationship between agreement and Case. That agreement and Case are related to each other is well known. As pointed out by Nichols (1986), Case and agreement are alternative ways of marking the same sorts of head-dependent relations. The difference between Case and agreement is that the former is marked on the dependent element in the relation, while the latter is marked on the head. Without losing sight of the differences between Case (dependent-marking) and agreement (head-marking),<sup>3</sup> the two should be analyzed as elements of a single dimension of language. LFG does not do this.

The Nichols-type conceptualization of Case and agreement as alternative markings of the same

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<sup>3</sup>As is done in standard transformational accounts, which treat Case and agreement as reflexes of the same SPEC-head relationships.

relationships receives strong support from the grammars of many languages which employ both. In many languages of this kind, one or more elements of the sentence are left without Case (or with the unmarked Case, nominative or absolutive). The verb agrees with one element: a Caseless element. The facts are particularly clear in Hindi-Urdu (Butt 1993), where both the SUBJ and the OBJ are sometimes Case-marked. The agreement facts are that the verb agrees with the highest Caseless NP; as we have already seen, if both SUBJ and OBJ are Case-marked, the verb displays (default) third-person singular masculine agreement.

- (6) a. Naadyaa xat lik<sup>h</sup>- tii hai.  
 Nadya(F) letter(M) write- IMPF.F.SG be.PRES.3SG  
 ‘Nadya writes a letter.’
- b. Naadyaa ne xat lik<sup>h</sup>- aa hai.  
 Nadya(F) ERG letter(M) write- PERF.M.SG be.PRES.3SG  
 ‘Nadya has written a letter.’
- c. Naadyaa ne ciṭṭ<sup>h</sup>ii lik<sup>h</sup>- ii hai.  
 Nadya(F) ERG note(F) write- PERF.F.SG be.PRES.3SG  
 ‘Nadya has written a note.’
- d. Naadyaa ne ciṭṭ<sup>h</sup>ii ko lik<sup>h</sup>- aa hai.  
 Nadya(F) ERG note(F) ACC write- PERF.M.SG be.PRES.3SG  
 ‘Nadya has written a (particular) note.’ (=5) above)

However, this phenomenon is not limited to Hindi-Urdu. For example, in Icelandic, a verb with a dative SUBJ and nominative OBJ or OBJ<sub>0</sub> agrees with the nominative (examples from Otoguro 2005 and Andrews 1982).

- (7) a. Henni leiddust strákar<sup>nir</sup>.  
 her.DAT bored.3PL the.boys.NOM  
 ‘She found the boys boring.’
- b. Henni voru sýndir bílarnir.  
 her.DAT were.PL shown.MPL the.cars  
 ‘She was shown the cars.’

Another such situation is the possessive sentence in Modern Hebrew. Possessive sentences in Hebrew have the structure: ‘be’ – possessor (in the dative) – possessed. Historically, the possessed nominal was the subject. It thus was unmarked for Case and triggered agreement on the verb. Such usage is still considered normative. However, in actual spoken Hebrew, the possessed nominal has been reinterpreted as an object. This means that it is marked with accusative Case (only when definite, as is always the case in Hebrew). As observed by Ziv (1976), the presence or absence of accusative Case is correlated with the absence or presence of agreement in colloquial Hebrew.

- (8) a. Hayta li mexonit kazot.  
 be.PAST.3FSG DAT.1SG car(F) such
- b. ?Haya li mexonit kazot.  
 be.PAST.3MSG DAT.1SG car(F) such  
 ‘I had such a car.’

- (9) a. ?Hayta lanu et ha- mexonit hazot od kše garnu  
 be.PAST.3FSG DAT.1PL ACC the- car(F) this still when live.PAST.1PL  
 be- tel aviv.  
 in- Tel Aviv
- b. Haya lanu et ha- mexonit hazot od kše garnu  
 be.PAST.3MSG DAT.1PL ACC the- car(F) this still when live.PAST.1PL  
 be- tel aviv.  
 in- Tel Aviv  
 ‘We had this car when we were living in Tel Aviv.’

The result again clearly correlates agreement with the absence of Case. The widespread occurrence of such correlations suggests that there is a representational relationship between head- and dependent-marking, a relationship which is not expressed in the standard LFG analysis.

A Nichols-inspired approach to the relation between Case and agreement allows us to make sense of the complementarity between the two found in such languages as Hindi-Urdu, Icelandic, and Hebrew. The purpose of these morphosyntactic markings is to provide an overt indication of the relation between a head’s argument slots and the elements that fill them. Agreeing with a Case-marked element is uneconomical, as it provides double marking for a single element.

Independently of agreement phenomena, the standard LFG analysis of Case as an f-structure feature of NPs does not provide adequate expression of the nature of Case marking. While Case often reflects grammatical functions, as would be expected if it is part of f-structure, it can also reflect thematic roles, topicality, and the like. This kind of information goes beyond the usual uses of agreement (although, as we have seen, agreement in Maithili can mark topicality), but it is to be expected that dependent marking is richer than head marking. The primary burden of head marking is to point to the argument-filling elements, which is done by expressing their pronominal features. In the case of dependent-marking, the full element is there, so additional information can be encoded by the morphological marking.

The phenomenon of differential Case marking also suggests a different kind of representation for Case than is standard. The basic concept behind differential marking is that more prototypical arguments do not need to be identified by morphological marking (Comrie 1989); this is best expressed theoretically in terms of a formal concept of grammatical marking of argument status.

## 2. The Proposal

In light of problems of this kind, we propose that the LFG projection architecture be enriched by the addition of a level of representation which, as noted above, we propose to call g-structure (grammatical marking structure). The relatively close relationship between grammatical marking and grammatical functions is expressed by modeling g-structure as a projection from f-structure, the  $\gamma$  projection; however, other levels of representation also have a hand in constraining g-structure.<sup>4</sup>

We represent g-structure as an AVM in which the attributes are names of grammatical markings: AGMT, ACC, ERG, etc. The “head” of the g-structure is a representation of the marking head, represented with the attribute name LEX(EME). Each marking lexeme heads its own g-structure; unlike f-structure, subordinate lexemes are not embedded under superordinate lexemes unless they are themselves subject to grammatical marking.

The predicate of a simple English sentence such as (10a) will have a g-structure representation (10b).

- (10) a. She sees him.

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<sup>4</sup>G-structure bears superficial resemblance to the level of morphosyntactic structure (m-structure) which has been hypothesized in some of the LFG literature. However, there is a fundamental difference between the two: m-structure, whose existence we reject, purports to represent all inflectional features. The crucial property of g-structure is that it represents a very narrowly defined set of inflections, those involved in grammatical marking of arguments.

b.

LEX	SEE						
AGMT	<table style="border-collapse: collapse; border-left: 1px solid black; border-right: 1px solid black;"> <tr> <td style="padding: 5px;">LEX</td> <td style="padding: 5px;">SHE</td> </tr> <tr> <td style="padding: 5px;">PERS</td> <td style="padding: 5px;">3</td> </tr> <tr> <td style="padding: 5px;">NUM</td> <td style="padding: 5px;">SG</td> </tr> </table>	LEX	SHE	PERS	3	NUM	SG
LEX	SHE						
PERS	3						
NUM	SG						
ACC	<table style="border-collapse: collapse; border-left: 1px solid black; border-right: 1px solid black;"> <tr> <td style="padding: 5px;">LEX</td> <td style="padding: 5px;">HE</td> </tr> <tr> <td style="padding: 5px;">PERS</td> <td style="padding: 5px;">3</td> </tr> <tr> <td style="padding: 5px;">NUM</td> <td style="padding: 5px;">SG</td> </tr> </table>	LEX	HE	PERS	3	NUM	SG
LEX	HE						
PERS	3						
NUM	SG						

This representation expresses the fact that both arguments of the verb are involved in grammatical marking: *she* is the agreement trigger and *him* is in accusative Case. As in many analyses of Case, we assume that the “unmarked” Case (nominative or absolutive) is formally the absence of Case; there is no g-structure attribute NOM. However, further investigation is required to determine whether this is the correct analysis for all languages; the Case splits in the morphologically ergative languages of Australia may require a more complicated analysis. In any case, “unmarked” here is not a matter of morphological marking, but rather formal status (as shown by such properties as being the citation form).

Case is an attribute rather than a value under this approach. Since Case is not a feature value, the usual specification of the Case of a noun cannot be used. Instead, inside-out designators can be used, as in Constructive Case (Nordlinger 1998):

(11) *him*: (ACC ↑<sub>γ</sub>)

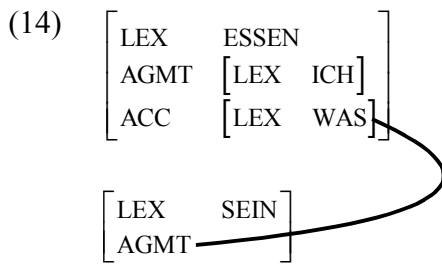
This formalization of Case as a g-structure attribute rather than as an f-structure (or g-structure) value provides a solution for the problem of feature indeterminacy, discussed by Dalrymple & Kaplan (2000). Dalrymple & Kaplan note that in the following German sentence, the form *was* is simultaneously the accusative OBJ of *gegessen* and the nominative SUBJ of *übrig war*:

(12) Ich habe gegessen was übrig war.  
 I have eaten what left was  
 ‘I ate what was left.’

They observe that *was* cannot simply be analyzed as using a disjunction to specify its Case, since in this sentence it is both accusative and nominative, not either nominative or accusative. They opt for representing the value of the f-structure CASE feature as a set: [CASE {NOM, ACC}]. This works, but at a cost. The cost is that every use of *was*, even in cases where it is completely unambiguous, will have the same dual value for the CASE feature. Since forms like *was* are often used unambiguously, this analysis, while technically adequate, is less appealing than a disjunction analysis, which says that each instance of *was* can be identified as either nominative or accusative (or both). Under the present proposal, a disjunctive analysis is possible. The lexical entry of *was* will include:

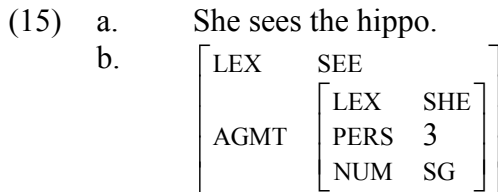
(13) (AGMT ↑<sub>γ</sub>) ∨ (ACC ↑<sub>γ</sub>)

In this particular sentence, there are two inside-out g-structure paths originating at *was*: one through ACC and one through AGMT.



This is allowed by the disjunction.<sup>5</sup>

G-structure represents actual Case and agreement, not “abstract Case”. An OBJ which is not marked accusative will not be the value of the ACC attribute. Thus, the g-structure of (15a) is (15b).



In this sentence, *the hippo* has no grammatical marking, and thus does not appear in g-structure. This makes g-structure a suitable level on which to define the conditions for differential Case marking. In English, where (roughly) pronouns are Case-marked and lexical nouns are not, the lexical entry of a transitive verb like *see* will include the following specification:

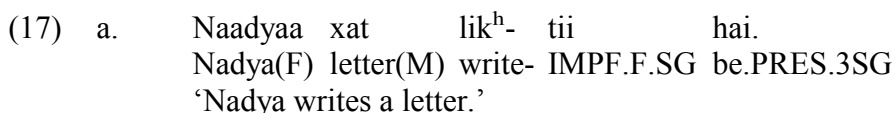
$$(16) \quad (\uparrow \text{OBJ PRED}) = \text{'PRO'} \Rightarrow (\uparrow \text{OBJ})_y = (\uparrow_y \text{ACC})$$

Other conditions for differential marking can be similarly encoded.

G-structure shares certain features with argument structure; not surprisingly, since both are representations of head-dependent relations. For example, just as each argument-taking element has its own a-structure, each marking head has its own g-structure. Unlike c- and f-structure, a- and g-structure are not representations of whole sentences. Thus, as noted above, a subordinate clause which is not itself grammatically marked will correspond to an independent g-structure, not a g-structure embedded in the main clause g-structure.

More interesting is the question of well-formedness constraints on g-structure, and their relation to well-formedness constraints on a-structure. The main well-formedness constraints on a-structure are Biuniqueness, which imposes a one-to-one mapping between arguments and grammatical functions, and the Subject Condition, which requires every verb to have a SUBJ at f-structure. These conditions may be options rather than universally applicable; at least the Subject Condition can be shown not to be active in every language (for example, it does not apply in Modern Hebrew: Falk 2004.) We propose that there is a g-structure analog of Biuniqueness, and perhaps also an analog of the Subject Condition. As with the a-structure Subject Condition, these appear not to be universal.

We attribute the common pattern linking agreement to Caselessness to the g-structure analog of Biuniqueness. Consider the Hindi-Urdu agreement pattern illustrated in (6) above, and repeated here.




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<sup>5</sup>As stated, this is too permissive, as it would also allow the form *was* to be the value of DAT or GEN, as long as it is the value of AGMT or ACC. Formally, this could be handled by conjoining the specification with negative statements for the other Cases. Alternatively, the inside-out specifications given for g-structure might be interpreted as implicitly including negative statements for all other possible attributes. At this stage I am inclined to leave the options open.



- b. Naadyaa ne xat lik<sup>h</sup>- aa hai.  
Nadya(F) ERG letter(M) write- PERF.M.SG be.PRES.3SG  
'Nadya has written a letter.'
- c. Naadyaa ne ciṭṭ<sup>h</sup>ii lik<sup>h</sup>- ii hai.  
Nadya(F) ERG note(F) write- PERF.F.SG be.PRES.3SG  
'Nadya has written a note.'
- d. Naadyaa ne ciṭṭ<sup>h</sup>ii ko lik<sup>h</sup>- aa hai.  
Nadya(F) ERG note(F) ACC write- PERF.M.SG be.PRES.3SG  
'Nadya has written a (particular) note.' (=5) above)

We propose that the basic rule in Hindi-Urdu is that the agreement trigger (the element which is the value of the AGMT attribute at g-structure) is the highest available  $[-r]$  argument:<sup>6</sup>

$$(18) (\uparrow_{\gamma} \text{AGMT}) = (\uparrow [-r]), \text{ subject to the Relational Hierarchy}$$

Now suppose that there is a Biuniqueness condition on g-structure which states:<sup>7</sup>

- (19) In the g-structure of a head, a dependent can be the value of only one attribute and an attribute must have a unique value.

In (17a), the highest core function is SUBJ. The f-structure SUBJ corresponds to the g-structure AGMT, resulting in the verb agreeing with the SUBJ. In (17b), on the other hand, such a choice would result in the following g-structure:

$$(20) \left[ \begin{array}{l} \text{LEX} \\ \text{ERG} \\ \text{AGMT} \end{array} \right\} \left[ \begin{array}{l} \text{LIK}^{\text{H}}- \\ \text{LEX} \quad \text{NAADYAA} \\ \text{GEND} \quad \text{F} \\ \text{NUM} \quad \text{SG} \end{array} \right]$$

This g-structure violates the proposed Biuniqueness condition. Choosing the OBJ as the agreement trigger is therefore the only option available:

$$(21) \left[ \begin{array}{l} \text{LEX} \\ \text{ERG} \\ \text{AGMT} \end{array} \right] \left[ \begin{array}{l} \text{LIK}^{\text{H}}- \\ \left[ \begin{array}{l} \text{LEX} \quad \text{NAADYAA} \\ \text{GEND} \quad \text{F} \\ \text{NUM} \quad \text{SG} \end{array} \right] \\ \left[ \begin{array}{l} \text{LEX} \quad \text{XAT} \\ \text{GEND} \quad \text{M} \\ \text{NUM} \quad \text{SG} \end{array} \right] \end{array} \right]$$

In other words, OBJ is the highest unrestricted argument which can be picked for the agreement trigger that will result in a well-formed g-structure.

The Biuniqueness condition on g-structure is essentially an economy condition on grammatical marking. It disallows multiple marking of the same element. As such, it is a natural condition on

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<sup>6</sup>We use the notation  $(\uparrow[-r])$  to refer to the class of grammatical functions which have the feature  $[-r]$ ; i.e. {SUBJ, OBJ}., without regard for whether the arguments in question are  $[-r]$  at a-structure.

<sup>7</sup>Only one of these directions actually needs to be stipulated here: the requirement that every g-structure attribute have a unique value, like f-structure Uniqueness, is a consequence of the operation of unification.

g-structure. On the other hand, not all languages obey Biuniqueness. For example, in Warlpiri agreement is independent of Case marking. It appears, then, that g-structure Biuniqueness is an option rather than an absolute requirement.<sup>8</sup>

For the Hindi-Urdu example, (17d), Biuniqueness rules out both SUBJ and OBJ as agreement triggers, as they are both Case marked, i.e. both correspond to values of Case attributes in g-structure. However, Hindi-Urdu requires the verb to be marked with agreement. While this is, at its core, a morphological requirement, it is possible that it is enforced at g-structure by an analog of the Subject Condition, which we can call the Agreement Trigger Condition. Whether a purely morphological matter or the result of a g-structure condition, the consequence is that there is an AGMT which corresponds to nothing in f-structure.

(22)

LEX	LIK <sup>H</sup> -							
ERG	<table style="border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding-right: 5px;">LEX</td> <td style="padding-left: 5px;">NAADYAA</td> </tr> <tr> <td style="border-right: 1px solid black; padding-right: 5px;">GEND</td> <td style="padding-left: 5px;">F</td> </tr> <tr> <td style="border-right: 1px solid black; padding-right: 5px;">NUM</td> <td style="padding-left: 5px;">SG</td> </tr> </table>	LEX	NAADYAA	GEND	F	NUM	SG	
LEX	NAADYAA							
GEND	F							
NUM	SG							
ACC	<table style="border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding-right: 5px;">LEX</td> <td style="padding-left: 5px;">CITṬ<sup>H</sup>II</td> </tr> <tr> <td style="border-right: 1px solid black; padding-right: 5px;">GEND</td> <td style="padding-left: 5px;">F</td> </tr> <tr> <td style="border-right: 1px solid black; padding-right: 5px;">NUM</td> <td style="padding-left: 5px;">SG</td> </tr> </table>	LEX	CITṬ <sup>H</sup> II	GEND	F	NUM	SG	
LEX	CITṬ <sup>H</sup> II							
GEND	F							
NUM	SG							
AGMT	<table style="border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding-right: 5px;">GEND</td> <td style="padding-left: 5px;">M</td> </tr> <tr> <td style="border-right: 1px solid black; padding-right: 5px;">NUM</td> <td style="padding-left: 5px;">SG</td> </tr> </table>	GEND	M	NUM	SG			
GEND	M							
NUM	SG							

The grammar of Hindi-Urdu will specify that a g-structure element with no corresponding f-structure must have the features [GEND M, NUM SG], thus providing a formal expression of the status of masculine singular in Hindi as the default agreement.

### 3. Adjectives

#### 3.1. Attributive Adjectives

The very common phenomenon of agreement between a noun and its attributive adjectives presents a conceptual challenge to theories of agreement. Such agreement is exemplified below in Hebrew.

- (23)
- a.    bayit        xadaš  
       house(M) new.M  
       ‘a new house’
  - b.    dira            xadaš- a  
       apartment(F) new- F  
       ‘a new apartment’
  - c.    batim            xadaš- im  
       houses(MPL) new- MPL  
       ‘new houses’
  - d.    ha-    dirot                    ha-    xadaš- ot  
       DEF- apartments(FPL) DEF- new- FPL  
       ‘the new apartments’

There are several puzzling facets to this kind of agreement.

The first puzzle, as noted above, is that this agreement exists at all. Agreement is head-marking.

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<sup>8</sup>Given the observation in the previous footnote, it is only the requirement that a dependent can be the value of only one attribute that is violable.

Here, however, the agreeing element is not the syntactic head at either c-structure or f-structure, but rather an adjunct; the head is the element triggering the agreement. As a result, given standard assumptions, one must either analyze this kind of agreement as a completely different kind of phenomenon from other cases of agreement, a kind of dependent marking, or analyze attributive adjectives as if they are predicational, with a SUBJ that is identified with the head of the larger NP. We take it as self-evident that the former approach is undesirable, as it takes what is essentially a unified phenomenon and splits it. The latter approach is less obviously wrong, but it glosses over differences between attributive and predicative adjectives. A g-structure-based analysis allows us to overcome this puzzle: since mismatches between levels can be shown to exist, and even be an integral part of a parallel-architecture conception of language, it is possible for the adjective to be a g-structure head, even if it is not a head at c-structure or f-structure.

A second puzzle concerns the agreement features. As the examples show, the Hebrew attributive adjective agrees with the head noun in number, gender, and definiteness. While agreement in number and gender is expected—agreement generally involves pronominal features, and number and gender are pronominal features—agreement in definiteness is not. In this respect, attributive adjective agreement should be contrasted with predicative adjective agreement, where number and gender agreement remain obligatory but there is no agreement for definiteness.

- (24) a. Ha- bayit haya xadaš.  
 DEF- house was new.MSG  
 ‘The house was new.’
- b. Ha- dirot hayu xadaš- ot.  
 DEF- apartments were new- FPL  
 ‘The apartments were new.’
- c. \*Ha- dirot hayu ha- xadaš- ot.  
 DEF- apartments were DEF- new- FPL  
 ‘The apartments were new.’
- d. \*Ha- dirot hayu xadaš.  
 DEF- apartments were new.MSG  
 ‘The apartments were new.’

This contrast in agreement features is not unique to Hebrew; it is found in other languages in which the attributive adjective agrees with the noun in definiteness (such as other Semitic languages and Scandinavian languages).

Contrasts between attributive adjective agreement and predicative adjective agreement are not limited to languages with definiteness agreement. Even in other languages, there appears to be a preference to have more agreement with attributive adjectives than with predicative adjectives. For example, in German attributive adjectives agree in gender, number, and Case, and predicative adjectives do not.

The picture that emerges from these considerations is the following. Since attributive adjectives agree with the nouns they modify, and we are modeling agreement as a property of (g-structure) heads, attributive adjectives must be represented as heads at g-structure. However, their agreement properties are different from those of predicative adjectives: they are often richer, and may involve definiteness, which is a property one expects to find on NPs, not APs. This suggests to us that the relation between the adjective and noun is closer than the relation between head and dependent. We propose that the attributive adjective is a co-head with the NP, and that the “agreement” morphology on the adjective is an extension of the nominal morphology on the head noun. The g-structures of (23d) and the adjectival predicate in (24b) are as follows:

(25) a. (=23d)

$$\left[ \begin{array}{l} \text{LEX} \quad \{ \text{XADAŠ, DIRA} \} \\ \text{GEND} \quad \text{F} \\ \text{NUM} \quad \text{PL} \\ \text{DEF} \quad + \end{array} \right]$$

b. (=24b)

$$\left[ \begin{array}{l} \text{LEX} \quad \text{XADAŠ} \\ \text{AGMT} \quad \left[ \begin{array}{l} \text{GEND} \quad \text{F} \\ \text{NUM} \quad \text{PL} \\ \text{DEF} \quad + \end{array} \right] \end{array} \right]$$

More precisely, the g-structure of the adjective-noun complex subsumes the g-structures of the noun and the adjective. The phrase structure rule adjoining the adjective copies the g-structure of the noun.

(26)  $\text{NP} \rightarrow \text{NP} \quad \text{AP}$

$$\begin{array}{l} \uparrow = \downarrow \quad \downarrow \in (\uparrow \text{ADJ}) \\ \uparrow_{\gamma} = \downarrow_{\gamma} \quad \downarrow_{\gamma} \subseteq \uparrow_{\gamma} \end{array}$$

The relevant elements in the lexical entries for the adjectival forms *haxadašot* and *xadašot* are:

(27) a. *haxadašot*  $(\uparrow_{\gamma} \text{LEX}) \subseteq \text{XADAŠ}$   
 $\% \text{TRIGGER} = (\uparrow_{\gamma} (\text{AGMT}))$   
 $(\% \text{TRIGGER GEND}) = \text{F}$   
 $(\% \text{TRIGGER NUM}) = \text{PL}$   
 $(\uparrow_{\gamma} \text{DEF}) = +$

b. *xadašot*  $(\uparrow_{\gamma} \text{LEX}) \subseteq \text{XADAŠ}$   
 $\% \text{TRIGGER} = (\uparrow_{\gamma} (\text{AGMT}))$   
 $(\% \text{TRIGGER GEND}) = \text{F}$   
 $(\% \text{TRIGGER NUM}) = \text{PL}$   
 $(\uparrow_{\gamma} \text{DEF}) \neq +$

### 3.2. Case Agreement

Another kind of agreement which is sometimes exhibited by adjectives is Case agreement, as in these examples from Modern Greek.

(28)

a.	o	arxeos	ðromos
	the.M.NOM	ancient.M.NOM	street.NOM
b.	ton	arxeo	ðromo
	the.M.ACC	ancient.M.ACC	street.ACC
c.	tou	arxeou	ðromou
	the.M.GEN	ancient.M.GEN	street.GEN

Since Case is dependent-marking, its use in what appears to be head-marking is puzzling. We will outline an analysis under which adjective agreement is a kind of extended dependent-marking, drawing heavily on the analysis of Nordlinger (1998).

Nordlinger observes that in the Australian language Wambaya, as in many dependent-marking languages, attributive adjectives agree in Case with the nouns they modify. In Wambaya, as in other Australian languages, attributive adjectives can be separated from the nouns they modify. The Case

agreement is required whether the adjective forms a constituent with the noun or not:

- (29) a. [Galalarrinyi- ni bugayini- ni] gini- ng- a dawu.  
 dog.M- ERG big.M- ERG 3MSG.SUBJ- 1OBJ- NFUT bite  
 ‘The big dog bit me.’
- b. [Galalarrinyi- ni] gini- ng- a dawu [bugayini- ni].  
 dog.M- ERG 3MSG.SUBJ- 1OBJ- NFUT bite big.M- ERG  
 ‘The big dog bit me.’

In the discontinuous structure, the dependent-marking nature of the Case agreement is clear. Both ‘dog’ and ‘big’ need to be marked with ergative Case so they can be identified as parts of the same dependent element. While such marking is in some sense redundant in the cross-linguistically more common continuous structure, it presumably serves the same basic function; perhaps it is an aid to parsing.

Formally, in Nordlinger’s f-structure–based analysis, Case inflection carries with it an inside-out designation specifying the grammatical function that the noun bears; in our g-structure–based analysis, it carries an inside-out designation of the Case (g-structure attribute) that it marks. For example, ergative Case marking carries the following specification in the two theories:

- (30) a. Nordlinger’s analysis (f-structure): (SUBJ ↑)  
 b. Our analysis (g-structure): (ERG ↑<sub>γ</sub>)

The extension to attributive adjectives requires an extension of the starting point of the inside-out path from ↑ to (ADJ ↑).

- (31) (ERG (ADJ ↑)<sub>γ</sub>)

The designation (ADJ ↑)<sub>γ</sub> points to the value of ERG in *dawu*’s g-structure. Under both Nordlinger’s formulation and ours, Case marking on attributive adjectives is thus a kind of extended dependent-marking, and thus not really agreement.

Case agreement on predicative adjectives is, as Nordlinger observes, a different situation. It is not a core case of Case agreement, but rather an extension of it. The functional purpose of extending Case agreement to predicate adjectives is clear, but as a more peripheral use of the construction, we might expect to find languages in which attributive adjectives agree in Case but predicate adjectives do not. One such language is Classical Arabic (Ferguson & Barlow 1988: 11), where the Case on the predicate adjective is governed by the verb. The usual Case is nominative, but the verb *kaana* ‘be’ governs accusative.

- (32) a. al- muʕallim- i al- jadiid- i  
 DEF- teacher(MSG)- GEN DEF- new.MSG- GEN  
 ‘of the new teacher’
- b. Muḥammad- u kabiir- u.  
 Muhammad- NOM old- NOM  
 ‘Muhammad is old.’
- c. Kaana Muḥammad- u kabiir- an/\*un.  
 was Muhammad- NOM old- ACC/\*NOM  
 ‘Muhammad was old.’

In Lithuanian (Timberlake 1988) agreement of predicate adjectives in Case is optional, and governed by semantic factors.

- (33) a. Karas padarè jì            ?neturtinga / neturtingu.  
 war    made    him.ACC    ?poor.ACC / poor.INSTR  
 ‘The war made him poor.’
- b. Visi itarè jì            kalta            / kaltu.  
 all    suspect him.ACC    guilty.ACC / guilty.INSTR  
 ‘Everyone suspected him of being guilty.’

We take this to confirm the correctness of an analysis which treats this kind of agreement as more peripheral than that of attributive adjectives. Formally, we analyze it as combining head- and dependent-marking (formally, outside-in and inside-out designators):

- (34) (ERG ( $\uparrow_{\gamma}$  AGMT))

As long as ERG is an attribute of the verb and AGMT is an attribute of the adjective, the resulting g-structure does not violate Binuqueness.

### 3.3. Non-subject Relative Participles

Participles used as noun-modifiers are a relative-clause-like construction in which the participial head functions similarly to adjectives.<sup>9</sup> As observed by Doron & Reintges (2005), a participial form which relativizes a non-subject displays a conflict in its agreement patterns. On the one hand, it could be expected to agree with its subject, like a verb. On the other hand, due to its adjective-like nature, it might be expected to agree with the relative head, i.e. the noun to which it is an adjunct.

The theory of g-structure makes specific predictions about agreement in this situation. The participial relative is an f-structure adjunct to the noun; in g-structure it is a co-head with the noun. Thus, in languages with definiteness agreement the participial relative might exhibit definiteness agreement, but it would be with its g-structure co-head: the head of the relative construction. Definiteness agreement with the subject is impossible, just as predicative items never agree in definiteness with their subjects. Case agreement is also expected to be with the head noun; while Case agreement with subjects is also possible, it is a less central use of Case agreement. On the other hand, agreement in number and gender is predicted to be an area in which languages may differ. Languages in which there is agreement with the head noun in Case and/or definiteness might be expected to prefer agreement with the subject in number and gender, in order to include more varied information in the agreement.

Doron and Reintges’ survey bears this out. In Standard Arabic, the participle agrees with the relative head in Case and definiteness, and with subject in number and gender.

- (35) Qaabal-    tu    l-    marʔat-    a    [l-    jaalis-    a  
 meet.PERF- 1SG DEF- woman(FSG)- ACC    DEF- sitting.MSG- ACC  
 zawj-            u-    haa].  
 husband(MSG)- NOM- POSS.3FSG  
 ‘I met the woman whose husband is sitting.’

On the other hand, in Older Egyptian there is no agreement in Case and definiteness. The participle agrees with the relative head in number and gender.

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<sup>9</sup>These constructions do not involve relative pronouns, and the discussion here does not extend to “agreement” patterns for relative pronouns.

- (36) Mx?t tw n(j)t rŕ [fŕ- ? (-w)- t m?ŕt  
 scale.FS this.FSG of.FSG Re carry- IMPF- PASS- PRTC.FSG justice  
 jm- s rŕ nb]  
 in- 3FSG day every  
 ‘this scale of Re in which justice is carried every day’

#### 4. Agreement, Coordination, and Linear Order

We turn now to the role of linear order of conjuncts in agreement. As noted above, a common situation is for the agreeing head to agree with the features of the closest conjunct rather than with the resolved features of the conjoined noun phrase. In standard LFG this is problematic: if the verb agrees with the SUBJ, it should reflect the features of the SUBJ, not of part of the SUBJ. While it is possible to mechanically specify the correct agreement features by, for example, allowing the coordinate structure to resolve to the features of the closest conjunct, such analyses have an artificial feel to them. We agree with Sadler’s (1999) evaluation that in such analyses “the intuition that the target really does agree with the first conjunct is captured only indirectly”. Sadler’s proposed solution is similar to ours: agreement is represented at a level of representation distinct from f-structure: m-structure in her case, g-structure in ours.

Under the g-structure analysis, the Welsh verb will specify its agreement target as follows:

- (37)  $(\uparrow_{\gamma} \text{AGMT}) = f_{\gamma}, f = (\uparrow \text{SUBJ}(\epsilon)) \wedge \exists f', f' = (\uparrow \text{SUBJ}(\epsilon)) \wedge \uparrow \prec_f f' \prec_f f$

The agreement trigger is either equal to the SUBJ or a subset of it, the former if it is a simple SUBJ, the latter if it is a coordinate structure. However, there cannot be a closer SUBJ.

This analysis puts the burden of choosing the appropriate features for agreement on the head, rather than on the coordination construction itself. This is correct from the conceptual perspective, since agreement is about the relation between head and dependent. It also allows us to make sense of the pattern of adjective agreement in Portuguese noun phrases (Sadler & Villavicencio 2005).

In Portuguese noun phrases, both feature resolution and closest conjunct agreement are possible. The two may be mixed in a single adjective, with closest conjunct agreement for gender and feature resolution for number.

- (38) a. o sofrimento e a experiência vividas  
 the suffering(MSG) and the experience(FSG) lived.FPL  
 ‘the lived suffering and experience’
- b. ... para um país com fome de capitais e tecnologia  
 to a country with hunger for capital(MPL) and technology(FSG)  
 externas  
 external.FPL  
 ‘...to a country in need of external capital and technology’

Under the analysis proposed here, the adjective can choose its features individually from different noun phrases, rather than picking a single noun phrase with which to agree. This can be accomplished by an adjective-introducing phrase structure rule such as the following. The local variable %CLOSEST is defined in terms of the closest nominal to which the AP is an adjunct, and the linear order of the choices represents what Sadler and Villavicencio report to be the preferred option.

$$\begin{array}{l}
 (39) \quad \text{NP} \rightarrow \text{NP} \qquad \qquad \qquad \text{AP} \\
 \qquad \qquad \uparrow = \downarrow \qquad \qquad \qquad \downarrow \in (\uparrow \text{ADJ}) \\
 \qquad \qquad \qquad \qquad \qquad \qquad \% \text{CLOSEST} = f_{\gamma}, f = (\text{ADJ} \downarrow) \wedge \not\exists f', f' = (\text{ADJ} \downarrow) \wedge f \prec_f f' \prec_f \downarrow \\
 \qquad \qquad \qquad \qquad \qquad \qquad (\downarrow_{\gamma} \text{GEND}) = (\% \text{CLOSEST GEND}) \vee (\uparrow_{\gamma} \text{GEND}) \\
 \qquad \qquad \qquad \qquad \qquad \qquad (\downarrow_{\gamma} \text{NUM}) = (\uparrow_{\gamma} \text{NUM}) \vee (\% \text{CLOSEST NUM})
 \end{array}$$

Prenominal adjectives are similar, although there is a greater tendency for number agreement to also be with the closest conjunct. Naturally, the closest conjunct is the last one for postnominal adjectives and the first one for prenominal adjectives.

Since each AP picks its agreement features independently, it is also possible to have different agreement on different elements within the same noun phrase. Sadler and Villavicencio report such examples involving prenominal determiners and postnominal adjectives.

- (40) a. os mitos e lendas brasileiras  
 the.MPL myths(MPL) and legends(FPL) Brazilian.FPL  
 ‘the Brazilian myths and legends’
- b. os programas e instituições brasileiras  
 the.MPL programs(MPL) and institutions(FPL) Brazilian.FPL  
 ‘the Brazilian programs and institutions’

Villavicencio (personal communication) reports that intuitions vary on whether this can be done with both a prenominal and postnominal adjective. There is a tendency for speakers to interpret such a sentence with each adjective scoping over only the closer noun. However, it is apparently possible for some speakers to interpret this with each adjective scoping over the entire coordination.

- (41) nas gélidas salas e corredores escuros do  
 in.the.FPL frozen.FPL rooms(FPL) and corridors(MPL) dark.MPL of.the  
 Centro de Arte Rainha Sofia  
 Center of Arts Queen Sofia  
 ‘in the dark, frozen rooms and corridors of the Queen Sofia Arts Center’  
 ‘in the frozen rooms and dark corridors of the Queen Sofia Arts Center’

## 5. Syntactic and Semantic Agreement

The approach we are taking to agreement distances it somewhat from the core of the syntactic system. The well-known fact that agreement is sometimes determined by semantic properties rather than morphosyntactic features suggests that this is correct.

The semantic aspect of agreement can be seen, for example, in the preferred agreement patterns in Portuguese. Portuguese prefers feature resolution in coordination for number; this is presumably a consequence of the fact that coordinated elements are semantically plural. Since a coordination of a masculine and a feminine is not semantically masculine, there is no semantic pressure to disprefer closest conjunct agreement.

Another set of cases of this kind is discussed by Corbett (1988) in Slavic languages. The Russian noun *vrač* ‘doctor’ is formally masculine, but may refer to a woman. When it does, both (morphosyntactic) masculine and (semantic) feminine agreements are possible, with the morphosyntactic agreement preferred for attributive modifiers and semantic agreement for predicates.

- (42) Novyj vrač skazala ...  
 new.MSG doctor(M) said.FSG ...  
 ‘The new woman doctor said ...’



The Serbo-Croatian nouns like *gazda* ‘master’ are morphosyntactically feminine but semantically masculine. In the singular masculine agreement is used, while in the plural both are possible. Stacked modifiers may even exhibit different agreement, with the one closer to the head agreeing morphosyntactically and the one farther from the head agreeing semantically.

- (43) a.      naši           /   naše           gazde  
           our.MPL   /   our.FPL   masters(F)  
           ‘our masters’
- b.      ovi            privatne        zanatlije  
           these.MPL   private.FPL   artisans(FPL)  
           ‘these private artisans’

We have already seen the possibility of different agreements on attributes to the same noun in Portuguese. Since each adjective-noun combination is a distinct g-structure head, this does not pose a challenge.

## 6. A Beginning...

As noted at the outset (and by one of the reviewers of this paper), we have not covered the full range of agreement phenomena in language. However, we believe that the phenomena we *have* discussed support the approach to agreement (and Case) that we have proposed here.

The core concept at the center of LFG’s approach to the structure of language is the idea that language consists of multiple parallel dimensions of representation. The levels of structure hypothesized in LFG analyses model these dimensions. The claim of this paper is that the marking of head-dependent relations is one such dimension of linguistic structure, and that where LFG analyses of Case and agreement have gone wrong in the past in not recognizing the status of grammatical marking, seeing it instead as part of the network of functional relations.

It is our hope that this paper will serve as the beginning of new studies of Case and agreement phenomena, and thus will be a positive addition to the ongoing discussion within LFG concerning the proper analysis of agreement.

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