

# Structural Markedness in Formal Features: Deriving Interpretability

Susana Bejar

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Article abstract

This paper argues that the internal structure of formal features plays an important role in the syntax and can account for complex surface phenomena which are otherwise difficult to explain. The hierarchical representation of morphosyntactic features developed in Harley 1994, Ritter 1997 and Harley and Ritter 1998 is incorporated into minimalist checking theory (Chomsky 1998). It is proposed that feature interpretability can be understood as a condition on configurations licensed by the feature geometry. Two principles governing the interaction between feature structure and core syntactic operations are proposed. The first stipulates that only structurally marked features may satisfy a probe. The second permits checking between non-identical features if they are in an implicational relation. Agreement asymmetries in Georgian and Standard Arabic are examined and are shown to be derived from the aforementioned principles.

## STRUCTURAL MARKEDNESS IN FORMAL FEATURES: DERIVING INTERPRETABILITY \*

Susana Bejar  
University of Toronto

### 1. Introduction

In this paper I propose a new approach to the morphology-syntax interface, which incorporates into minimalist checking theory (Chomsky 1995, 1998) the hierarchical representations of morphological features developed in Harley 1994, Ritter 1997 and Harley and Ritter 1998. Looking at data from Georgian and Standard Arabic (SA), I account for problematic agreement facts by analyzing them as markedness effects in the morphology-syntax interface, where markedness is taken to correlate directly with the presence or absence of structure in the geometric representation of a formal feature (FF). The feature geometry is taken to be a licensing mechanism such that features merged into the derivation in configurations not licensed by the geometry are illicit and must be repaired by checking (Cowper 1999).<sup>1</sup> Thus, the internal structure of features not only encodes markedness, but also governs their interactions in the syntax. This view also provides an account of interpretability. According to standard minimalist assumptions (Chomsky 1995, 1998), FFs are either interpretable or uninterpretable at interface levels, and this parameter motivates checking relations. Uninterpretable features force checking because they need to be deleted so as not to crash the derivation at the interface. The approach advocated in

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1 Whether the feature geometry has some independent status, or whether it simply encodes conditions on semantic compositionality and interpretability is not at issue here. On purely esthetic grounds I prefer the latter view, but this remains to be established. See Cowper and Hall 1999 for related work on this matter.

this paper makes it possible to derive the property of interpretability from the geometry, such that there need not be uninterpretable features per se, only uninterpretable configurations.<sup>2</sup>

I propose two principles governing the interaction of features in the computation based on their structural representations (cf. Bejar 1998, 1999).<sup>3</sup>

- (1) **Markedness Principle:** A feature *F* may only be the goal of a Probe if it is structurally marked.
- (2) **Implicational Principle:** A goal *F'* may satisfy a probe *F* either under identity with *F* or if *F'* implies *F* (cf. Chomsky's 1998 principle of nondistinctness).

The Markedness Principle (MP) stipulates that only structurally marked features may satisfy a probe (the notion of structural markedness is explained in the next section), thus constraining the class of features that can participate in syntactic operations. For example, if a probe is initiated by an uninterpretable phi-feature, for instance number, only a structurally marked number feature ([plural] or [dual]) can satisfy the probe.

The Implicational Principle (IP) stipulates (contra Chomsky 1995, but in the spirit of Chomsky 1998) that a goal need not be identical to the probe, so long as the FF of the goal implies the FF of the probe. We will see in the next section that implicational relations are encoded as structural dependencies in the feature geometry, such that the existence of a dependent feature implies the existence of its dominating node. For example, if a feature *G* is structurally dependent upon a feature *F*, as in (3), then, if *F* initiates a probe, the probe can be satisfied either by a goal *F* or by a goal *G*.

- (3) 
$$\begin{array}{c} F \\ | \\ G \end{array}$$

By broadening the matching criterion for probes and goals, the Implicational Principle augments the range of licensed checking relations.

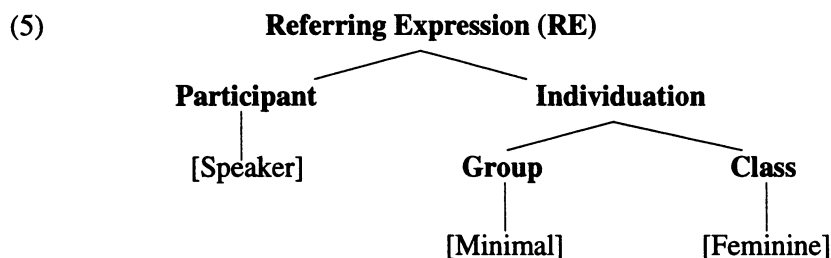
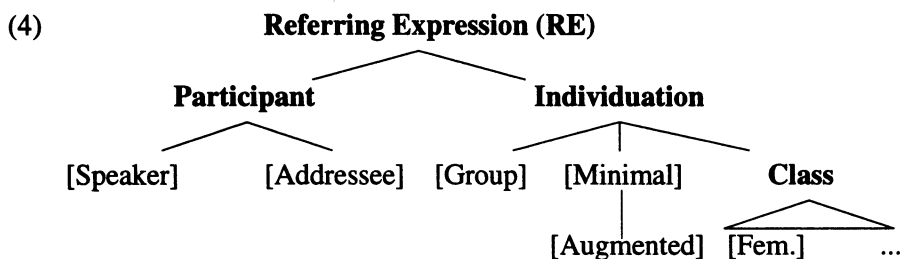
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2 This paper does not deal with [case], the 'quintessentially uninterpretable' feature (Chomsky 1995). The focus here is on uninterpretable phi-features.

3 A note on terminology is indispensable at this point. Following Chomsky 1998, henceforth I refer to the uninterpretable FF which triggers Attract as the 'probe', and the attractee is referred to as the 'goal'.

### 1.1 Feature geometry: preliminary assumptions

I assume a slightly modified subset of the geometry proposed by Harley and Ritter 1998, and adopt this for the representation of formal phi-features in the computation.<sup>4</sup> Harley and Ritter's geometry is given in (4). The geometry I adopt for the purposes of this paper is given in (5).



The **bold** type nodes are organizing nodes, the [bracketed] expressions are features. The root node, labelled 'Referring Expression', can be taken to be either a pronominal/nominal element or an agreement marker. The Participant node encodes contrasts between person features, as in (7). The Individuation node captures number (8), and the Class node captures gender (9). The hierarchical relationship between the Individuation and Class nodes is motivated by Greenbergian universals (Harley and Ritter 1998) and by impoverishment facts (Harley 1994, Noyer 1992). See (6) for a list of the universals (Greenberg 1963) which support the claim that there is a dependency relation between gender and number. See Harley 1994 and Noyer 1992 for a discussion of the impoverishment facts which support the dependency.

- (6) Universal 32: Whenever the verb agrees with a nominal subject or object in gender, it also agrees in number.

<sup>4</sup> The interpretation of feature geometric structures which I appropriate here owes a great deal to work in phonology spanning nearly fifteen years, including Clements 1985, Sagey 1986, Avery and Rice 1989, Rice and Avery 1993, Rice 1994, Drescher 1998, and many others.

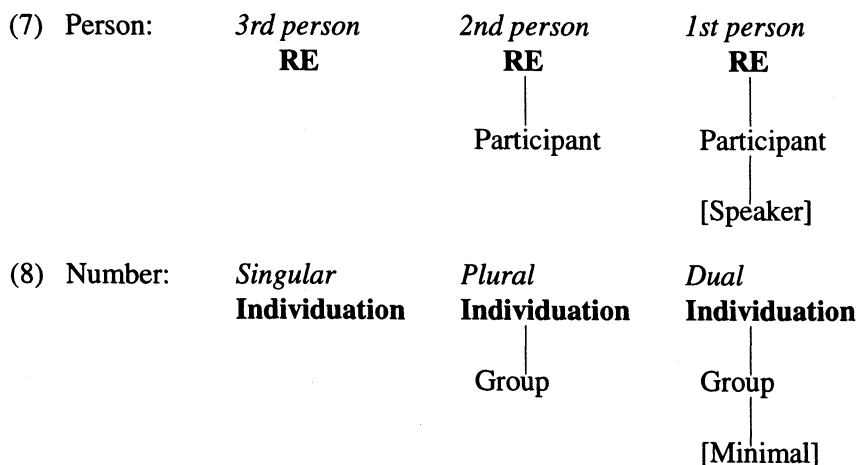
Universal 36: If a language has the category of gender, it always has the category of number.

Universal 37: A language never has more gender categories in nonsingular numbers than in the singular.

Universal 45: If there are any gender distinctions in the plural of the pronoun, there are some gender distinctions in the singular also.

The geometry in (4) has more structure than the geometry in (5) because it is meant to capture a wider range of contrasts than are relevant for either Georgian or Standard Arabic. For example, the feature [augmented] is meant for languages with more than a three-way number contrast (singular, plural, dual, *and* trial or paucal); and the inclusion of both [speaker] and [addressee] under the Participant node is meant for languages with an inclusive/exclusive contrast. In the absence of an inclusive/exclusive contrast, one dependent for the Participant node is sufficient to differentiate 1st and 2nd person (see 7). Harley and Ritter maintain that the choice of [speaker] or [addressee] as the marked Participant feature is a language particular choice. I propose that in both Georgian and SA the marked Participant feature is [speaker], for reasons that will be explained below. Note that Georgian, unlike SA, does not have grammatical gender, so no Class node is assumed for Georgian.

Crucially, feature geometry forces a shift away from the standard view of phi-features. Categories such as '2nd person', 'plural' or 'masculine' are not features *per se*; rather they are cover terms for feature clusters (or the lack thereof) within an organized space.



(9) Gender:	<i>Masculine</i>	<i>Feminine</i>
	<b>Class</b>	<b>Class</b>
		 [Feminine]

The geometry encodes properties of complexity and markedness, such that relative markedness is represented by the presence or absence of structure.<sup>5</sup> According to (7), the representation of 3rd person — the least marked person — is encoded simply by the absence of structure.<sup>6</sup> The representation for 1st person has more structure than the representation for 2nd person, and is therefore more marked. The treatment of 3rd person as unmarked has many precedents in the literature. As noted above, the choice of marking 1st person or 2nd person as a dependent of the Participant node may be a language-particular choice. I propose that 1st person is more marked than second person in Standard Arabic because it supports fewer contrasts (gender and number) than 2nd or 3rd person.<sup>7</sup> In Georgian it is not so clear what the relative markedness between 1st and 2nd person is; however, this question does not bear on my analysis of Georgian, so I will assume the representations in (7) for both languages. The relative markedness within the categories of number and gender (8,9) are uncontroversial and I will not comment further on them.

The geometry also captures the relationships between features, namely dominance/dependency and implicature. Dependent features logically imply the features which dominate them. For example, the presence of the feature [speaker] implies the feature [participant]. This is a one-way implication, as the presence of [participant] does *not* imply the presence of [speaker]. The branching tree structure also encodes constituency in the familiar ways. So any two constituents that can be uniquely identified under a single node may, potentially, function as a natural class. Thus the geometry predicts that number and gender may pattern together as a natural class in opposition to person, but it does not predict that person and number, or person and gender, should behave as a natural class. What does it mean for two morphological categories to pattern together as a natural class? In phonology the members of a natural class may be identified by shared properties as targets or triggers of operations. Or a natural class may be delineated in terms of shared articulatory properties. In

5 Note that I am using 'markedness' and 'complexity' interchangeably for the purposes of this paper.

6 See Heap 1999 on the possibility of radical underspecification.

7 Greenberg 1963 shows that there is an inverse relationship between markedness and contrast, so that, in general, a more marked category supports fewer contrasts than a less marked category. See Universals 37 and 45 in (6).

morphology we can find parallels for these criteria. For example, if two categories are subject to similar operations in parallel contexts, they might be said to form a natural class. I will also consider feature co-occurrence within a single morpheme to be suggestive of a natural class. In other words, if two features can co-occur (to the exclusion of others) in a single morpheme, then they must constitute a constituent in the geometry.<sup>8</sup>

Finally, notice that the geometry in (5) differs formally from the geometry in (4) in that the feature [minimal] is shown as a dependent of Group, and the latter is represented as a class node. This is a non-trivial adjustment meant, first of all, to capture the implicational relationship between plural and dual. Greenberg 1963 establishes that there are no inventories that express dual and not plural. The sisterhood configuration in (4) does not capture this dependency, but the representation in (5) predicts it. Secondly, making Group a class node more clearly articulates the hierarchy between the grammatical categories of person and number.

## 1.2 Licensed configurations

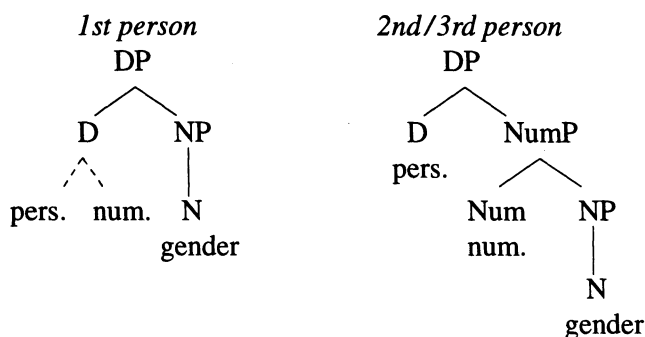
It has been stated above as a hypothesis that a feature is only licensed if it is in the configuration prescribed by the geometry. However, a distinction needs to be drawn between projecting and nonprojecting features. I assume that there is some variation between languages (and perhaps even within languages) with respect to whether or not a particular feature projects. So, for example, in some languages a number feature projects a functional projection NumP, whereas in others it does not (Ritter 1992). If the number feature does not project, then by hypothesis it should appear on the same head as the person feature, in the configuration licensed by the geometry. If, on the other hand, the number feature *does* project NumP, I assume that the selectional properties of the projecting feature should mirror the relational properties encoded in the geometry. In other words, if a feature is projecting, then the hierarchical relations encoded in the geometry should be reflected in the hierarchical relations between projections. Given a number feature that projects NumP, it is thus expected that it should be dominated by a projection on which person features are found, and it should select as its complement a projection on which gender features are found.

Ritter 1993 argues that the existence of two functional projections in nominal structures, DP and NumP, predicts two possible pronominal structures: those

<sup>8</sup> Here again we can expect cross-linguistic variation. For example, in SA person and number cannot be deemed to be a natural class because there is no node in the geometry that dominates both person and number without also dominating gender. However, in Georgian, because there is no Class node, it is possible to group person and number features together as a constituent.

that project a NumP, and those that do not. In her account of Modern Hebrew, she argues that 1st and 2nd person pronouns have NumP, but 3rd person pronouns do not. I will show below that both Georgian and Standard Arabic provide evidence for assigning a projecting Num head to certain pronominal categories and not others. However, contra Ritter, I will argue that 2nd and 3rd person pronouns project NumP, but that 1st person does not.<sup>9</sup>

(10) Pronominal complexes (N is a null referential argument of D):



The representations in (10) will be assumed in the analyses that follow. The necessity for these representations is explained in sections 3.3.1 and 4.3.

## 2. Interpretability

Crucially, if we suppose that licensing by the geometry holds only at the LF interface, then we gain a novel perspective on the quality of interpretability. In the minimalist framework, FFs are either interpretable or uninterpretable at interface levels. The received view is that active features, i.e. features that can trigger Attract or Agree are uninterpretable. They trigger checking operations precisely because they need to be checked and deleted so as not to crash the derivation at the interface. Thus, for example, a phi-feature on T is uninterpretable and must be checked and deleted. This interface condition is satisfied by Agree, whereby the phi-features on T are checked against those of a DP in the domain of T (this operation may or may not trigger displacement of the DP itself; Chomsky 1998).

<sup>9</sup> It is interesting that this approach sets up conflicting natural classes on different levels. 2nd and 3rd person are a natural class with respect to syntactic structure because they both contain NumP; 1st and 2nd person are a natural class with respect to morphological/featural content because they both contain Participant nodes. The potential for complex surface manifestations of these classes should be apparent.



Feature geometry dovetails naturally with this framework if we consider the potential for mismatch between the distribution of features in the geometry and the base distribution of features in the syntax. So, continuing the above example, it can be argued that phi-features on T are uninterpretable because they are not in a configuration licensed by the geometry. The root node of the geometry of phi-features is a referring expression, most properly D or N. T is not a referential category, so it cannot license phi features. Attracting a DP (or the FFs of a DP) to the TP creates a licensed configuration for the unlicensed phi-features on T.

If licensing (or the failure to license) is a requirement only at the interface, then there is no reason to expect that the Merge configuration of features should conform to the geometry. Recall from section 1.1 the implicational relation between dependent features and their dominating nodes. If a dominating feature F and a dependent feature G are merged on separate heads (we will see a natural example of this below) then we have a mismatch between the syntax and the geometry. I argue that such a configuration is motivation for movement to repair the uninterpretable configuration by bringing together dominant and dependent nodes in a checking relation. Under this view, features are not inherently uninterpretable; but they may be merged into an uninterpretable configuration. Movement has the potential to create an interpretable configuration out of an uninterpretable one.<sup>10</sup>

### 3. Georgian: Evidence for Structural Markedness

In this section I will examine verbal agreement in Georgian, and argue that this data provides evidence for both the geometric treatment of phi-features and the Markedness Principle. For the purposes of this paper, discussion is restricted to transitive verbs in the present tense series.

Georgian verbal agreement is notoriously complex, in part because the verb enters into agreement with both the subject and the object, but person-number markers compete for surface realization, resulting in seemingly irregular exponences (Harris 1981). Sometimes the features of the subject are realized, but sometimes not. Likewise for the object. Furthermore, the position in which a particular argument's features may be realized varies.

<sup>10</sup> I suspect that there is no room for mismatch with respect to selectional restrictions, i.e. only non-selectional mismatches can be repaired through movement, but selectional mismatches are fatal. Otherwise we would expect to find merged objects like [D+TP] or [C+DP], which are unattested. Indeed, failing this assumption, the very existence of the familiar selectional pattern C selects TP, T selects vMax, v selects VP, etc., would be remarkable.

Consider the present tense paradigm for the transitive verb *xedav-s* 'see'.<sup>11</sup>

Table 1  
Present inflection: *xedav-s* 'see' (Carmack 1997)<sup>12</sup>

SUBJECT		OBJECT			
	1SG	1PL	2SG	2PL	3
1SG			<b>g-xedav</b> I see you	<b>g-xedav-t</b> I see you(PL)	<b>v-xedav</b> I see her/them
1PL			<b>g-xedav-t</b> we see you	<b>g-xedav-t</b> we see you(PL)	<b>v-xedav-t</b> we see her/them
2SG	<b>m-xedav</b> you see me	<b>gv-xedav</b> you see us			<b>ø-xedav</b> you see her/them
2PL	<b>m-xedav-t</b> you(PL) see me	<b>gv-xedav-t</b> you(PL) see us			<b>ø-xedav-t</b> you(PL) see her/them
3SG	<b>m-xedav-s</b> she sees me	<b>gv-xedav-s</b> she sees us	<b>g-xedav-s</b> she sees you	<b>g-xedav-t</b> she sees you(PL)	<b>ø-xedav-s</b> she sees her/them
3PL	<b>m-xedav-en</b> they see me	<b>gv-xedav-en</b> they see us	<b>g-xedav-en</b> they see you	<b>g-xedav-en</b> they see you(PL)	<b>ø-xedav-en</b> they see her/them

The above paradigm contains a series of four prefixes and three suffixes, as shown in (11), taken from Carmack 1997.

(11)	PREFIX	GLOSS	SUFFIX	GLOSS
	v-	1 subject	-s	3 subject
	m-	1 object	-en	3PL subject
	gv-	1PL object		
	g-	2 object	-t	plural

### 3.1 Person agreement

Note the complexity with respect to the realization of person features. In general, the verb prefix shows agreement with person of the object (as in 12), except when the object is 3rd person, in which case there is person agreement with the subject (13).

11 Georgian exhibits split-ergativity across tense/aspect. Present tense (so-called Series I) verbs display a nominative-accusative case marking pattern.

12 Note that there is no grammatical gender in these forms. Carmack uses 'she' for 3rd person, except for 3rd person objects which are ambiguous with respect to number. I have followed him in this regard.

- |  |  |
|--|--|
| (12) a. <b>m</b> -xedav<br>1-see<br>"You see <b>me</b> ."  | b. <b>gv</b> -xedav<br>1.PL-see<br>"You see <b>us</b> ."                   |
| c. <b>m</b> -xedav-s<br>1-see-3<br>"She sees <b>me</b> ."  | d. <b>gv</b> -xedav-s<br>1.PL-see-3<br>"She sees <b>us</b> ."              |
| e. <b>g</b> -xedav<br>2-see<br>"I see <b>you</b> ."        | f. <b>g</b> -xedav-t<br>2-see-PL<br>"I see <b>you</b> (PL)." <sup>13</sup> |
| g. <b>g</b> -xedav-s<br>2-see-3<br>"She sees <b>you</b> ." | h. <b>g</b> -xedav-t<br>2-see-PL<br>"She sees <b>you</b> (PL)."            |
- 
- |  |  |
|--|--|
| (13) a. <b>v</b> -xedav<br>1-see<br>"I see her/them."      | b. <b>v</b> -xedav-t<br>1-see-PL<br>" <b>1</b> .PL (we) see her/them." |
| c. <b>∅</b> -xedav<br>2-see<br>" <b>You</b> see her/them." | d. <b>∅</b> -xedav-t<br>2-see-PL<br>" <b>You</b> (PL) see her/them."   |

Furthermore, person features tend to be spelled out on the prefix, but when the subject is 3rd person these are spelled out on the suffix.

- |   |   |
|---|---|
| (14) a. <b>m</b> -xedav<br>1-see<br>"You see me." | <b>g</b> -xedav<br>2-see<br>"I see you."        |
| b. <b>m</b> -xedav-s<br>1-see-3<br>"She sees me." | <b>g</b> -xedav-s<br>2-see-3<br>"She sees you." |

This data shows that 3rd person subjects and objects pattern differently from 1st and 2nd person subjects and objects. Subjects only enter into person agreement when the object is 3rd person. Person features are only realized on the suffix when the subject is 3rd person. The Markedness Principle predicts the first fact. 1st and 2nd persons are structurally marked but 3rd person is

<sup>13</sup> There is an asymmetry between 1st and 2nd person with respect to the realization of the plural feature. In the 1st person, person and plural features co-occur on the same prefix, but in the second person the plural feature is realized as a separate suffix. This is discussed in greater detail in section 3.3.1.

structurally unmarked. The Markedness Principle predicts that structurally unmarked forms should not participate in Agree, from which it follows that Person agreement should be sensitive to 1st and 2nd person objects, but not 3rd person objects.

One might suspect that the relevant factor here could be specificity (1st and 2nd persons are inherently specific, in opposition to 3rd, which is not), but Georgian does not exhibit a definiteness effect in object shift. If specificity were the underlying root of the split, we would expect object agreement with specific 3rd person objects, but not with generic 3rd person objects, but I have seen no evidence for this.

An apparent counter-example to the present claim is the set of suffixes realized in the context of 3rd person subjects. I do not have a full account of these at present; however, I do not believe that they are agreement markers of the same sort as the prefixes and *-t*. The 3rd person subject markers are synthetic with tense and mood, in other words each tense/mood triggers a different series of 3rd person subject suffixes. The other agreement markers are insensitive to tense and mood.<sup>14</sup>

### 3.2 Number agreement

The realization of number agreement is more complex than the realization of person. First, there is positional variance. Plurality is realized on the prefix for 1st person objects, but on the suffix in all other cases (see 11). Second, there is inconsistency with respect to which argument triggers number agreement. Carmack describes this phenomenon as a markedness pattern.<sup>15</sup> In constructions with 1st person objects, both the plurality of the subject and the object are morphologically marked, as in (15). But in constructions with 2nd person objects the plurality of the object is only marked if the subject is singular (16). And when the object is 3rd person the plurality of the object is never marked at all (17).

- |         |             |                   |
|---------|-------------|-------------------|
| (15) a. | m-xedav     | "you(SG) see me." |
| b.      | gv-xedav    | "you(SG) see us." |
| c.      | m-xedav-t   | "you(PL) see me." |
| d.      | gv-xedav-t  | "you(PL) see us." |
| e.      | m-xedav-s   | "she sees me."    |
| f.      | gv-xedav-s  | "she sees us."    |
| g.      | m-xedav-en  | "they see me."    |
| h.      | gv-xedav-en | "they see us."    |

<sup>14</sup> This is an oversimplification, however for our purposes it is true.

<sup>15</sup> Carmack credits these observations to John Robertson.

- |         |            |                     |
|---------|------------|---------------------|
| (16) a. | g-xedav    | "I see you(SG)."    |
| b.      | g-xedav-t  | "I see you(PL)."    |
| c.      | g-xedav-t  | "We see you(SG)."   |
| d.      | g-xedav-t  | "We see you(PL)."   |
| e.      | g-xedav-s  | "She sees you."     |
| f.      | g-xedav-t  | "She sees you(PL)." |
| g.      | g-xedav-en | "They see you."     |
| h.      | g-xedav-en | "They see you(PL)." |
|         |            |                     |
| (17) a. | v-xedav    | "I see her."        |
| b.      | v-xedav    | "I see them."       |
| c.      | v-xedav-t  | "We see her."       |
| d.      | v-xedav-t  | "We see them."      |
| e.      | xedav      | "You see her."      |
| f.      | xedav      | "You see them."     |
| g.      | xedav-t    | "You(PL) see her."  |
| h.      | xedav-t    | "You(PL) see them." |
| i.      | xedav-s    | "She sees her."     |
| j.      | xedav-s    | "She sees them."    |
| k.      | xedav-en   | "They see her."     |
| l.      | xedav-en   | "They see them."    |

Carmack's description of the data is elegant enough, however the question of why a grammar would derive this result is not satisfactorily addressed. His analysis of the markedness pattern involves postulating morphological affix frames which compete for lexical insertion on the basis of specificity. Unlike other late insertion accounts of Georgian agreement (cf. Halle and Marantz 1993), in his approach there is no competition between individual affixes, but rather between groups of affixes. A more highly specified combination of prefix and suffix will block a less highly specified combination of prefix and suffix. So, for example, in the construction meaning 'they see you(pl)' the highly specified affix frame [*g\_en*] blocks the semantically adequate but less highly specified frames \* [*g\_s*], \* [*g\_t*], \* [*\_en*], \* [*\_s*], \* [*g\_*], \* [*\_t*], \* [*\_*]. This analysis captures most of the facts, however the question of why the Georgian agreement system has these configurations of affixes is left unexplored. Furthermore, one must accept the existence of such affix frames as primitives of the grammar.

In Halle and Marantz 1993 it is postulated that at the level of Morphological Structure (i.e. post-syntactically) a clitic cluster attaches as a sister to the

inflected verb. This clitic cluster incorporates all the features of 1st and 2nd person arguments fused into a single terminal node. After fusion, a fission rule splits off a plural feature from the fused clitic cluster and this is realized as the plural suffix *-t*. Like Carmack 1997, this analysis captures the facts, but the postulated operations are ad hoc and not predictable from earlier states of the derivation; nor do they follow from any core principles of the grammar.

### 3.3 Analysis of Georgian agreement

In this section I show that the Georgian agreement pattern can be derived from the interaction between cyclic agreement and the Markedness Principle. To begin, I propose that agreement in Georgian is not a unique operation, but rather it is distributed across the functional heads light  $\nu$  and T. In the course of the derivation, first light  $\nu$  probes for person features and then T is merged and probes for number.

(18) Step	Object in the computation				Operation
i.		$\nu$	V	NP <sub>obj</sub>	→ Agree (Person)
ii.		<u><math>\nu</math></u>	V	<u>NP</u> <sub>obj</sub>	→ Merge NP <sub>subj</sub>
iii.	NP <sub>subj</sub>	$\nu$	V	NP <sub>obj</sub>	→ Merge T
iv.	T NP <sub>subj</sub>	$\nu$	V	NP <sub>obj</sub>	→ Agree (Number)
v.	T <u>NP</u> <sub>subj</sub>	$\nu$	V	NP <sub>obj</sub>	

Recall that the verb always indexes the person features of the object (unless the object is 3rd person) and the number features of the subject (unless the subject is singular). This pattern follows from locality and the Markedness Principle if the locus of person agreement is light  $\nu$  and the locus of number agreement is T. At the point in the derivation when the person probe takes place (18ii) the subject is not merged yet and the object is the closest goal to the probe. At the point in the derivation when the number probe occurs (18v) the subject is the nearest goal. The fact that the features of 3rd person are never indexed follows from the Markedness Principle. When the person feature of the object is structurally unmarked, it cannot satisfy a probe. In just this case, the verb will agree with the person feature of the subject. The derivation in (18) does not predict this outcome, but the picture in (18) is not complete. In just this case the verb will agree with the person feature of the subject following movement of light  $\nu$  to T, as shown in (19):

(19) Step	Object in the computation					Operation
i.		$v + V$	$t_v$	$NP_{obj}$	$\rightarrow$	Agree (Person)
ii.		$\underline{v} + V$	$t_v$	$\underline{NP}_{obj}$	$\rightarrow$	Merge $NP_{subj}$
iii.		$NP_{subj} v + V$	$t_v$	$NP_{obj}$	$\rightarrow$	Merge T
iv.	T	$NP_{subj} v + V$	$t_v$	$NP_{obj}$	$\rightarrow$	Move $v + V$
v.	$[T + [v + V]]$	$NP_{subj} t_v + V$	$t_v$	$NP_{obj}$	$\rightarrow$	Agree (Number)
vi.	$[T + [v + V]]$	$\underline{NP}_{subj} t_v + V$	$t_v$	$NP_{obj}$	$\rightarrow$	Agree (Person)
vii.	$[T + [\underline{v} + V]]$	$\underline{NP}_{subj} t_v + V$	$t_v$	$NP_{obj}$		

In the case where the probe is not satisfied at step (19ii) due to the Markedness Principle, the light  $v$  may probe for person a second time from its vantage point in (19vii), in which instance it will be the subject that is the nearest goal. By hypothesis, light  $v$  cannot probe the subject from its position in (19iii) because this would entail entering into a checking relation with the subject in its Merge position, which violates minimalist assumptions.

Herein, when referring to the transitive paradigm, I will refer to the chart in table 2, which is organized according to the person features of the object, and the number features of the subject, in keeping with the posited cycles.

Table 2  
x/y = subject/object

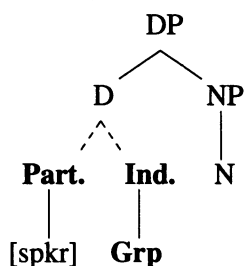
		BLOCK A			BLOCK B			BLOCK C		
		1/1	2/1	3/1	1/2	2/2	3/2	1/3	2/3	3/3
SG.S	SG.O	—	m_∅	m_s	g_∅	—	g_s	v_∅	∅_∅	∅_s
	PL.O	—	gv_∅	gv_s	g_t	—	gv_t	v_∅	∅_∅	∅_s
PL.S	SG.O	—	m_t	m_en	g_t	—	g_en	v_t	∅_t	∅_en
	PL.O	—	gv_t	gv_en	g_t	—	g_en	v_t	∅_t	∅_en

Now let us consider the second cycle of agreement in greater depth. This is the crucial cycle, from which we expect Carmack's markedness pattern to emerge. Every instance in which the number features of the object are indexed on the verb falls into one of two scenarios: either the subject is singular, or the object is 1st person. I will discuss each of these scenarios in the following sections, where it is shown how Carmack's markedness pattern can be derived from the principles and representations introduced so far.

## 3.3.1 First person objects

*When the object is first person, full number agreement for both arguments of the verb is realized.* This is because number and person are synthetic in 1st person forms due to the fact that 1st person forms do not project a NumP (cf. 10). Thus, the number feature is a dependent of the same syntactic head as person (presumably D), and therefore person and number form a structural constituent in the 1st person.

(20) *1.PL person*



When light  $v$  Agrees with the person features of the object, the number features are checked as a free rider. Note that there is an asymmetry in the realization of 1.PL person arguments. We have just seen that when the person feature of a 1.PL *object* is probed, person and number are jointly realized as the prefix *gv-*. But when a 1.PL *subject* is probed, person and number are realized separately as *v-* and *-t* respectively. This follows from cyclicity. We only see agreement with a 1st person subject if the object is 3rd person and fails to satisfy the probe by light  $v$ . In the 2nd cycle T will probe before the head-adjoined light  $v$ , the number feature of the subject will be discharged first as *-t*, leaving only the bare person feature for the subsequent probe. The fact that there is no special 1.PL suffix to match the special 1.PL prefix *gv-* is predicted by the geometry. The Participant node is higher in the geometry than the Group node. This representation allows that under a probe for person, both person and number features may potentially be treated as a constituent because the Participant node commands the Group node. This is borne out by the existence of the prefix *gv-*. But in a probe for Number, it is not the case that both person and number features may be treated as a constituent, because the Group node does not command the Participant node.



### 3.3.2 Second person objects

*If the object is 2nd person, the number features of the object are contrasted only when the subject is singular.* This statement is straightforwardly derived from the Markedness Principle. If the subject is singular, its number feature is structurally unmarked and cannot satisfy a probe. This allows a further number feature (that of the object) to enter into the checking relation (see Block B in table 2).

### 3.3.3 Third person objects

*If the object is 3rd person, the number features of the object are never contrasted.* The third generalization – 3rd person objects never mark number – is derivable from the fact that 3rd person objects do not enter into a checking relation with light *v* and are therefore not within the checking domain of *T*.

## 3.4 Summary

I have argued that the Georgian agreement pattern derives from an interaction between the structural markedness of phi-features and core locality principles, in a manner consistent with the Markedness Principle proposed in the introduction. Let me point out, furthermore, that the domains established by the cycle in the computation are also consistent with the hierarchy encoded in the geometry. The higher node (Participant) is checked before the lower node (Group). In the 1st cycle the features of the participant node are checked, in the second cycle the number node is checked. For the purposes of this paper, I assume that the morphology of the prefix corresponds to the probe by *v*, and the morphology of the suffix to the probe by *T*.

## 4. Licensing and Interpretability in Standard Arabic

I now turn to the imperfect conjugation of the SA verb. The paradigm is given in (21). Notice the inconsistent position of exponence of the [feminine] gender feature. In singular and dual forms, [feminine] is realized on the prefix, as in (22). However in plural forms, [feminine] is realized on the suffix, as in (23).

## (21) SA Imperfect conjugation of /ktb/ 'to write':

	<i>Singular</i>	<i>Dual</i>	<i>Plural</i>
3M	yaktubu	yaktubaani	yaktubuuna
3F	taktubu	taktubaani	yaktubna
2M	taktubu	taktubaani	taktubuuna
2F	taktubiina	aktubaani	taktubna
1	?aktubu	*	naktubu

- (22) a. huwa y-aktub-u al-kitaab-a  
 he 3M-write-E<sup>16</sup> DEF-book-ACC.SG  
 "He is writing the book."

- b. hiya t-aktub-u al-kitaab-a  
 she 3F-write-E DEF-book-ACC.SG  
 "She is writing the book."

- (23) a. humu y-aktub-uuna al-kitaab-a  
 they(M) 3-write-PL DEF-book-ACC.SG  
 "They(M) are writing the book."

- b. hunna y-aktub-na al-kitaab-a  
 they(F) 3-write-F.PL DEF-book-ACC.SG  
 "They(F) are writing the book."

The SA lexicon includes the 3F prefix *t-*, the 3M prefix *y-*, and the F.PL suffix *-na*. Based on the available pieces of inflection, we might expect the 3F.PL form of the verb to be *\*taktubuuna* or even *\*taktubna* instead of the attested *yaktubna*. The attested form is especially interesting because of the incongruous realization of the prefix *y-* which otherwise is only realized on 3rd person masculine forms (i.e. structurally unmarked forms). Noyer 1992 appeals to rules of lexical insertion (Halle and Marantz 1993, cf. Halle 1997) to account for this anomalous form. His analysis assumes the feature specifications in (24) and utilizes the Paninian principle that more highly specified rules precede more general ones. Thus, given a [3F.PL] form, the [F.PL] suffix *-na* will be selected over all the rest, because it is the most highly specified. The insertion of *-na* discharges the [feminine] and 'plural' (i.e. [group]) features on the form, leaving only the unmarked 3rd person, which is subsequently discharged by the elsewhere form *y-*.

16 Here 'E' stands for the Elsewhere morpheme. *-u* is the least marked morpheme of the set. It has a tendency to correlate with unmarked number, but this is not always the case.

- (24)
- |       |           |
|-------|-----------|
| -uuna | PL        |
| -na   | F.PL      |
| y-    | elsewhere |
| t-    | F         |

While a large subset of the facts are correctly predicted by this analysis, its explanatory value is not fully satisfying. Such an account ultimately reduces to the lexical 'accident' that some lexical pieces are more highly specified than others. We are left, again, with an unanswered question: why do certain features tend to cluster together in the lexicon, resulting in more highly specified forms, whereas other features seem to be constrained by co-occurrence restrictions. For example, in SA imperfect verbal morphology, the following distributional patterns emerge.

(25) Positional paradoxes:

- i. Number is realized on the suffix in 2nd and 3rd person, but on the prefix in 1st person;
- ii. Person is realized on the prefix, except in feminine forms<sup>17</sup>;
- iii. Gender is realized on the prefix, except in 2nd person forms.

(26) Feature co-occurrence:

- i. Person and marked number features only co-occur in 1st person;
- ii. Person and gender features only co-occur in 3rd person forms;
- iii. Gender and number features only co-occur in plural forms.

A central premise of this paper is that these kinds of facts are not simply reducible to lexical idiosyncrasy, but rather they reflect properties of the feature system itself. Thus, it is no accident that the feminine and plural features interact noticeably throughout the inflectional system of SA, and not solely in the imperfect paradigm. For example, templatic patterns in the SA case paradigm are disrupted in feminine plural forms. Even more striking, a similar relationship between feminine and plural features can be seen throughout the Afro-Asiatic family, including Egyptian Arabic, Beja (Cushitic), Saho (East Cushitic), Tunisian Jewish Arabic, Mehri, Soqotri, Hebrew, Tigre, Ugaritic, and others (Noyer 1992).

In the next section I propose an alternative analysis of the SA imperfect paradigm. In this analysis, the redistribution of phi-features results from instantiations of Move F in the syntax. Thus, the manner in which phi-features cluster in the morphology follows directly from the patterning of phi-features

17 The 2.F.SG suffix *-iina* is problematic because it is highly marked and disobeys several of these generalizations. See Bejar and Hall 1999 for discussion of this form.

in the computation; and this patterning is itself conditioned by the structural representation of markedness.<sup>18</sup>

#### 4.1 The syntax of SA agreement

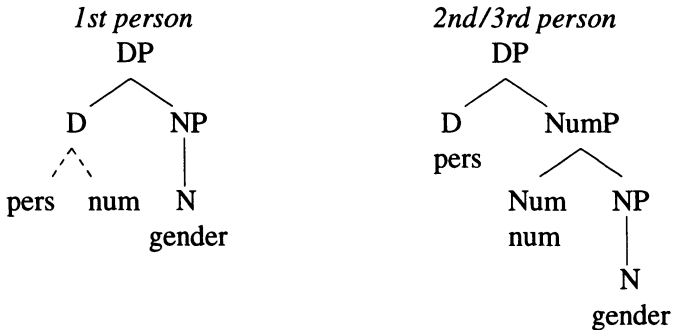
Based on the position of exponence of phi-features in their least marked realizations, I assume that (27) represents the default distribution of features on the imperfect stem in SA (Bejar 1998, 1999, cf. Fassi Fehri 1996).

(27) Default distribution of features on the imperfect stem:

prefix + STEM + suffix  
 person                      number  
 gender

Now let us see how this default distribution corresponds to the base distribution of phi-features in the pronominal DP.<sup>19</sup> Recall the syntactic representations of pronominals given in (10), and repeated below.

(28) Pronominal complexes (N is a null referential argument of D):



The split distribution of phi-features across the functional projections of the pronominal complex correlates, in turn, with a split in the checking of phi-features in the clause. This surfaces as an agreement asymmetry correlated with the structural position of the subject. SA has two subject positions, one pre-verbal and one post-verbal. The basic word order in SA is VSO (see Bolotin 1995 for a different view), but pronominal subjects and focus constructions force SVO

18 I do not mean to suggest that all surface morphology can be handled straightforwardly by the syntax. The aim is to lessen the burden of explanation that is placed on the morphological component (see Halle and Marantz 1993, Noyer 1992).

19 This split distribution of features would also be true for lexical nominals. Presumably gender would be base-generated on N, while other FFs would be spread across D and Num. Throughout the paper nominal representations assume pronominal subjects, for consistency.

word order. Depending on the position of the subject, the verb either agrees with the subject for person and gender (narrow VSO agreement), or for person, gender, and number (broad SVO agreement) (Fassi Fehri 1993, Mohammad 1990, Aoun, Benmamoun and Sportiche 1994; Ouhalla 1994, Ali 1997).

(29) VSO and SVO order, with singular subject (symmetrical agreement):

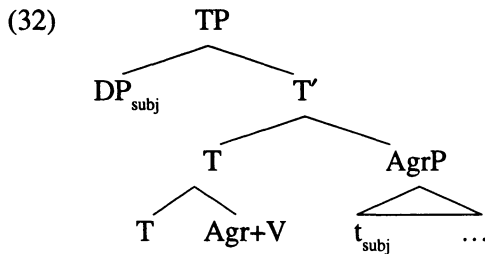
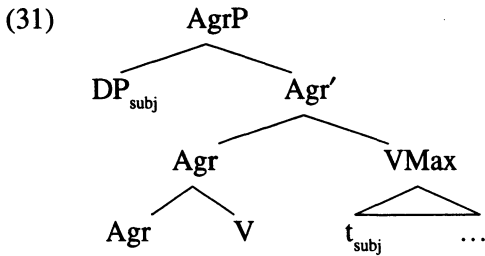
- a. **t-aktub-u**      al-bint-u      al-kitaab-a  
**3F-write-E**      DEF-woman-NOM      DEF-book-ACC  
 "The woman writes the book."
- b. al-bint-u      **t-aktub-u**      al-kitaab-a  
 DEF-woman-NOM      **3F-write-E**      DEF-book-ACC  
 "The woman writes the book."

(30) VSO and SVO order, with plural subject (asymmetrical agreement):

- a. **t-aktub-u**      al-banaat-u      al-kitaab-a  
**3F-wrote-E**      DEF-woman(PL)-NOM      DEF-book-ACC  
 "The women write the book."
- b. al-banaat-u      **y-aktub-na**      al-kitaab-a  
 DEF-woman(PL)-NOM      **3M-write-F.PL**      DEF-book-ACC  
 "The women write the book."
- c. **\*y-aktub-na**      al-banaat-u      al-kitaab-a  
**3M-write-F.PL**      DEF-woman(PL)-NOM      DEF-book-ACC  
 "The women write the book."

Ali 1997 argues that the verb enters into two checking relations with the subject, once in spec-AgrP, then again in spec-TP; the checking of phi-features of the subject DP is distributed across these two positions. Person and gender features are checked in AgrP, as in (31), while number is checked in TP, as in (32). Hence the agreement asymmetry: only those subjects that overtly move to the higher subject position realize all three phi-features overtly. According to Ali 1997, subjects in VSO constructions only move to spec-TP covertly, after spell-out, thus the number feature is not licensed in the agreement morphology of this derivation. Here, as in the case of Georgian, the solution lies in cyclic agreement between the verb and its argument. First the subject moves to spec-AgrP where features of D are checked against Agr+V. Then the subject moves to spec-TP where features of Num are checked against Agr+V+T.<sup>20</sup>

20 I follow Ali 1997 and assume Agr projections, but nothing about the analysis hinges on this. The argument could be recast with light *v* as the locus of the first cycle of agreement.



Each cycle checks a distinct projection of the DP, working top down. The first cycle checks the person features on D, the second cycle checks the number features on Num.<sup>21</sup> As in the case of Georgian, the morphology on the prefix is licensed by the first checking relation, whereas the morphology on the suffix is licensed by the second checking relation.

In the following section I show that this checking pattern interacts with feature movement within the nominal complex to derive the pattern of phi-feature redistribution attested in the agreement paradigm.

#### 4.2 The microsyntax of SA agreement

So far we have abstracted away from the internal structure of phi-features in the SA derivation. Now consider how the 'microsyntax' of phi-features affects the derivation. There are two generalizations to be accounted for. First, gender agreement is never realized by a discrete morpheme. Second, gender is realized on the prefix in the singular, but on the suffix in the plural. I conclude from this pattern that gender is not interpretable in situ. This cannot be attributed to a configurational mismatch, since the Merge configuration respects the geometry. Perhaps it is related to the fact that gender is situated on a null head, and thus cannot be instantiated morphologically in situ (but cf. Bejar 1998, 1999).<sup>22</sup>

21 The special relationship between T and number is a recurring result in these analyses. I have found similar patterns in other languages, and consider this to be an especially intriguing question for future research. Diane Massam first brought this cross-linguistic tendency to my attention.

22 It seems to be that this movement can only be motivated by Greed, but this issue is beyond the scope of the paper.

Whatever the underlying cause, it is interesting that gender ‘migrates’ to Num in the plural and to D in the singular. By hypothesis, this ‘migration’ is some kind of checking relation. The pattern can be accounted for by an interaction between markedness and the Implicational Principle.

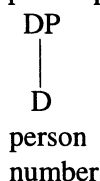
The Implicational Principle is supported because [Fem] is entering into a checking relation not under pure identity but under implicational identity. When [Fem] moves to Num it is checking the Individuation node. [Fem] implies Individuation because [Fem] is a dependent of Individuation. When [Fem] moves to D it is checking the root node. Again, [Fem] implies the root node because [Fem] is a dependent of the root node.

Markedness accounts for the distribution of [Fem]. Num is the closest head to N. When Num has a marked feature, [Fem] cannot move past it. Only when Num is unmarked (singular) can [Fem] move to the higher head D.

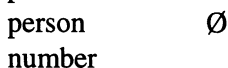
#### 4.3 First person: a different kind of DP

Recall that in Georgian, the lack of a projecting NumP in the representation of the 1st person pronoun accounted for special agreement facts in the transitive paradigm. Certain peculiarities of the SA agreement pattern also make more sense if we assume this representation for 1st person; in particular, the positions of exponence on imperfect verbs with 1st person subjects. Imperfect verbs agreeing with 2nd and 3rd person subjects robustly realize number features in suffix position. In 1st person forms, however, the number contrast is realized on the prefix. The expected plural suffix *-uuna* is not realized.

(33) 1st person pronoun:



(34) prefix + STEM + suffix



Note the similarity between the 1st person paradigm and the narrow VSO paradigm (no number agreement) which occurs only with third person non-pronominal subjects in VSO word order.

## (35) 1st person imperfect paradigm (VSO):

ʔaktubu 1 SG

naktubu 1 PL

## (36) Narrow imperfect paradigm (VSO):

yaktubu 3 M

taktubu 3 F

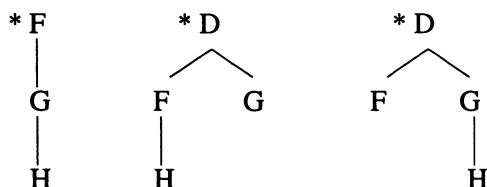
Both paradigms have default *-u* suffixes regardless of the number features on the subject. In the case of narrow agreement, this is because NumP is never checked overtly in VSO word order. I propose that the same is true of the 1st person paradigm, but not because the 1st person subject never moves to spec-TP; recall that pronominal subjects force SVO word order, therefore the subject *must* move to specTP overtly. Rather, the default suffix is realized because the syntactic representation of the 1st person DP *lacks* a NumP. In 1st person constructions, the 1st checking relation discharges the features on D in the verbal prefix position. The second checking relation — which would have discharged the features on Num — is vacuous, and the default *-u* suffix is realized. The realization of the default suffix must be attributed to a morphological well-formedness condition, rather than to the licensing of inflectional features.

## 4.4 Complexity constraint

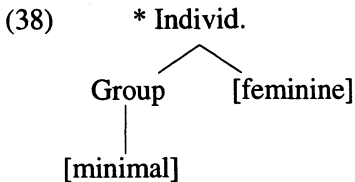
A possible counterexample to this analysis is the absence of a feminine dual suffix. The dual is a marked number ([group [minimal]]) and its failure to pattern with the plural in feminine forms is not predicted. However, there is a principled way to account for its exceptional behavior. I propose that SA is subject to a complexity constraint (cf. Harley 1994) which limits the amount of structure that can co-occur in a feature representation.

## (37) SA Complexity Constraint (CC):

If a feature *G* is a dependent of a feature *F*, then *G* itself can have no dependents. If a Feature *F* has a sister *G*, then neither *F* nor *G* may have a dependent.







This rules out the co-occurrence of [feminine] with [minimal] as well as with [speaker]. The absence of a feminine dual suffix is consistent with this constraint. It also accounts for the total absence of a gender contrast in the 1st person. That the losing feature in these scenarios is a gender feature is predicted by the feature geometry, because gender is the lowest feature class in the hierarchy.

## 5. Conclusion

I have proposed that FFs are like grammatical features in other components of the grammar in that they are neither unstructured nor unordered. And I have argued for a treatment of Georgian and SA agreement in which the patterns of feature co-occurrence and exponence fall out from interaction between the morphological feature geometry and the syntactic structure, rather than from lexical idiosyncrasies.

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