

## Toward a Theory of the Grammatical Use of Lexical Information

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We take the lexicon to consist of the set of formatives available to the syntax. More specifically, as hierarchical syntactic structures are recursively assembled by the Merger (or insertion) of meaningful formal objects into syntactic structure, the lexicon constitutes the universe of available objects.

Each such object, which we will call a *lexeme*, is associated with a set of properties in various domains; these properties include *inter alia* the truth-conditional meaning (reference) of the object and information defining its sound shape. Information of the latter type includes that of a purely phonological nature and, functioning more indirectly, morphological information which must be taken into account in order that the phonological shape of a lexeme be completely determined.<sup>1</sup> For example, to derive the Russian equivalents of the English sentences *The cats are on the mat* or *I see the cats*, the syntax needs to access a lexeme associated with a) semantic information denoting the species *felis catus*, b) the phonological representation for the stem {kot-}, and c) a certain amount of morphological information, including the following:

- a value for number (singular or plural), freely chosen;
- a value for grammatical case (from an inventory of six), as assigned by syntactic context;
- a value for declension class, inherent to the stem, which selects the function mapping number and case onto the correct desinence (giving *koty* in the former example, *kotov* in the latter); and
- a value for animacy, inherent to the stem, which can affect the spell-out of the accusative case.

<sup>1</sup>On some views of morphology (e.g., Distributed Morphology), the lexical insertion of ‘pieces’ (pairing bundles of formal information with bundles of meaning information) can take place at a later stage of the syntactic derivation. We do not mean to rule this out in principle.

But while these lexical properties have been discussed in terms of their effect on the object they are associated with in the lexicon, the effect of some lexical properties may be spread across word boundaries from one lexeme to another in a way mediated by syntactic structure. Familiar examples in the Slavic languages include *Concord*, whereby lexical properties for case, number, gender, and animacy are spread from a noun to its attributives, and *Predicate Agreement*, which spreads features for gender, number, and person from subject nominal phrase to verbal predicate. We call lexical features affecting the spell-out of their host lexeme *morphological*; features whose phonological effects entail feature spread from a host lexeme to a receptor are *morphosyntactic*. These feature classes are not mutually exclusive, as a feature can have effects in both domains. A third category, that of *syntactic features*, affects the derivation above the level of the word, without morphological expression. Less important to the present discussion, syntactic features include the ‘EPP feature’, associated with a functional category and requiring that its Specifier position be filled, thereby engendering movement (displacement).<sup>2</sup>

The aggregate of these three kinds of lexical properties can be termed grammatical, or *formal*, features. The present paper is a contribution toward exploring the structure and function of formal features in grammar, with a focus on morphosyntactic features. In particular, we ask how morphosyntactic features are valued, how they are spelled out, and how they relate to other forms of lexical information. Basing our discussion on material from Slavic, we will argue that Concord and Predicate Agreement should be unified. There are *prima facie* reasons not to do so, both conceptual/theoretical and empirical. We will address these issues and argue that an elaborated theory of lexical features makes such a unification desirable. In the process, however, the nature and role of lexical features will differ from that assigned to them in the theory we took as our point of departure.

This paper is organized as follows. Section 1 offers a sketch of the role of formal features in the Minimalist Program (see, for example, Chomsky 2000, 2001, 2002, 2004a, 2004b, 2005). It is important for our

<sup>2</sup>The term ‘EPP’ has become opaque and merely descriptive; more or less the same function is more recently attributed to an ‘edge feature’ (Chomsky 2004b).

discussion to understand the essential role of such features in this theory, as they regulate the operation *Agree* responsible for structural case assignment and movement. In section 2 a Minimalist analysis of numeral phrases in Slavic proposed in earlier work by the present author (Rappaport 2002, 2003) is summarized, highlighting some aspects of the analysis which stand in some dissonance to the assumptions outlined in section 1. The next two sections proceed to make specific proposals in the direction of resolving this dissonance. Section 3 adopts and develops the idea (Frampton and Gutmann 2000, to appear) that *Agree* is actually a process of *feature sharing*, rather than a copying of feature values. Section 4 proposes a further articulation of lexical features, distinguishing formal features from what we will call *referential features*. In our view, referential features find their primary *raison d'être* in the lexicon by serving to value formal features when those values are predictable from lexical meaning. We will then show that formal features are used to implement both Concord and Predicate Agreement, but the role of referential features in valuing formal features can be leveraged to distinguish what is traditionally called 'semantic agreement' and 'formal' or 'grammatical' agreement. We will offer an account of why the clause-level process of Predicate Agreement often exhibits greater semantic transparency than does the more local process of Concord (cf. the 'Agreement Hierarchy' of Corbett 1979, 1983). The conclusions of the paper are summarized in section 5.

### **1. The role of formal features in the Minimalist Program**

The heart of the computational system underlying the linguistic faculty is the *narrow syntax*, a single cycle in which hierarchical syntactic structure is recursively assembled (by the operation *Merge*) and the core processes of syntactic feature copying, structural case assignment, and movement are implemented by the operation *Agree*. Moreover, during the course of this cycle, portions of structure are passed (by the operation *Transfer*) to the external systems of speech production/perception and cognitive representation (the Sensorimotor and Conceptual-Intentional Systems, respectively) through the intermediation of *Phonological Form* (PF) and *Logical Form* (LF), respectively.

In the Minimalist Program, the core syntactic processes are driven by the need for features to acquire values during the derivation. Features,

which should be understood as lexical information of a particular form, consist of a *type* and a *value*. A feature delivered to an interface level must be meaningful ('interpretable') to the system on the other side of the interface. A feature without a value is by definition uninterpretable at any interface.

A valued feature may be interpretable at one interface, but not at the other. A feature defining tongue body height for the proper pronunciation of a vocalic segment is interpretable to PF, not to LF. A feature specifying referential definiteness is meaningful to the latter, not to the former. The narrow syntax must not only deliver interpretable features to the interfaces, but also ensure that ONLY interpretable features are so delivered. Thus, it is necessary to distinguish PF-interpretable and LF-interpretable features. Recalling the discussion in the introduction to this paper, the morphological feature of declension class and the morphosyntactic feature of structural case are PF-interpretable, but LF-uninterpretable, as is purely phonological information. Number, gender, animacy, and person can certainly be PF-interpretable; Chomsky's assumption is that these features are LF-interpretable as well, although we will re-evaluate this assumption below.

A basic principle of Chomsky's approach is that all and only LF-interpretable features have values on Merge. PF-interpretable features (sometimes, confusingly in our view, called 'uninterpretable features') are included among lexical features because they are required to derive a legible PF representation. Rather than stipulating by list which lexical features are LF-interpretable and which not, the distinction is directly derivable from valuedness. The appropriate definitions are given in (1); it is important to understand that any reference to a feature should be taken to refer to a token of that feature, not a type (for example, a particular instance of the number feature in context, not the number feature generalized across all contexts), since features of the same type can be valued in one context, and unvalued in another.

- (1) a. A feature must have a value in order to be interpretable.
- b. A feature is potentially PF-interpretable if and only if it is unvalued when its host lexeme is Merged. In order to be PF-interpretable, it must acquire a value during the course of the derivation.

- c. A feature is LF-interpretable if and only if it is valued when its host lexeme is Merged. Because such a feature is never unvalued, its potential interpretability is always realized.

Consider some examples. In Russian, the noun *kot* ‘cat’ is associated in the lexicon and Merged in syntactic structure with the valued features [gender: masculine], [animacy: +], [number: singular], and [person: third]; as a noun, it will also be associated with a case feature, but case can be unvalued in the lexicon ([case: ]), to be assigned in syntactic structure. It follows from (1), then, that the first four features are LF-interpretable and that the last is LF-uninterpretable, but potentially PF-interpretable. The derivation cannot converge until the case feature acquires a value in the narrow syntax, because this information will be necessary for PF to deliver a representation legible at the Sensorimotor interface. Conversely, in order to agree with its subject, a predicate is associated on Merge with unvalued features, to be valued during the course of the derivation. In *kot spit* ‘the cat is sleeping’, the predicate, more precisely, the category T(ense), is associated with the features [gender: ], [number: ], and [person: ], because the predicate cannot be spelled out (in all tenses) unless these features are valued. Thus, on T, unlike on N, these features are LF-uninterpretable, but potentially PF-interpretable. This follows from the fact that they are unvalued on Merge.

The valuation of uninterpretable features is implemented by the operation *Agree*. It is important for our purposes to attempt a clear definition of this operation; we summarize some of its properties in (2), based on Chomsky 2001.

- (2) a. Features consist of a *type* and, optionally, a *value*. For example:
- Valued feature: [case: nominative]
  - Unvalued feature: [case: ]
- b. A syntactic object is *active* if it contains an unvalued feature
- c. Two features on different syntactic objects *match* if they contain the same type, regardless of their value
- d. Two syntactic objects  $\alpha$  and  $\beta$  undergo the operation *Agree* iff:
- $\beta$  is in the search space of  $\alpha$  (is c-commanded by  $\alpha$  and is appropriately local);  $\alpha$  is called the *probe*, and  $\beta$  – the *goal*.
  - $\alpha$  and  $\beta$  contain at least one pair of matching features
  - Both  $\alpha$  and  $\beta$  are active

- e. On the application of Agree, any unvalued matching features on either category are assigned the value of its counterpart.

Beyond the core definition stated in (2) we need to elaborate on three points. All will be important to the ensuing discussion.

First, this operation invokes movement ('displacement', internal Merge) if the probe has the 'EPP feature', which encodes the necessity for a filled Spec position ('second Merge'). T has this feature;  $v^*$ , the functional category associated with transitive verb phrases, does so optionally. No movement occurs without Agree, and Agree cannot apply without reference to lexical features.

Second, it is important to distinguish two mechanisms of case agreement: *structural* and *inherent* case. Structural (or 'configurational') case is assigned as follows: a lexeme with an unvalued case feature is inserted into syntactic structure, and it is valued in the syntax, independently of any lexical properties, by Agree. It follows from (1) that structural case is LF-uninterpretable. Inherent (or *lexical*) case is implemented differently. Lexemes are selected for Merge because their case feature is assigned a particular value in the lexicon. The operation Agree is not involved. It follows from (1c) that inherent case is LF-interpretable.

When the case feature of a nominal is valued, that nominal becomes inactive and cannot undergo further movement. A nominal Merged without a case feature, on the other hand, may move more than once until its case feature is valued. This approach assumes that when the category T serves as probe for a nominal goal which will become the clausal subject, the nominal is assigned Nominative case; when category  $v^*$  serves as the probe for a nominal which will become the clausal direct object, the nominal is assigned the Accusative case. These facts do not fall out directly from the properties summarized in (2), and must be stipulated either as part of the definition of Agree or of the corresponding categories T and  $v$ .

Finally, a probe is  *$\phi$ -incomplete* if it is not associated with the full suite of  $\phi$ -features. An example is the 'defective Tense category' of Raising and Exceptional Case Marking constructions, which is taken to have only a person feature, rather than the usual set of at least person and number features. Defective T does not value features in the goal (e.g., case) (Chomsky 2001). As a consequence, the subject of nonfinite clauses (whose T does not express agreement with the subject) is free to

move on as a yet higher probe Agrees with it, assigns case to it, and possibly causes it to move. An example is given in (3a), with structure (3b):

- (3) a. Johns seems to be intelligent  
 b. John T seem [John T<sub>def</sub> be [John intelligent]

T<sub>def</sub> and the lowest instance of *John* are active and Agree, and *John* raises (assuming T<sub>def</sub> has the EPP feature), but due to the defective nature of T<sub>def</sub>, the case feature on *John* is not valued, and *John* remains active. The noun is thus free to Agree with the higher, finite T.

## 2. A Minimalist analysis of numeral phrases in Slavic: Problems and questions

This section begins by summarizing an analysis of numeral phrases in Russian and Polish I have developed in earlier work (Rappaport 2002, 2003). We then turn to addressing certain questions this analysis raises for the theory sketched in section 1.

The basic problem in numeral phrases of most Slavic languages can be succinctly stated using the terminology of Babby 1985, 1986, 1987: *heterogeneous* morphosyntax is observed in direct case positions, but *homogeneous* morphosyntax is observed in oblique case positions. Contrast, for example:

- (4) a. V fil'me vystupaet pjat' izvestnyx aktërov.  
 in film appear<sub>3RD SG</sub> five well-known<sub>GEN PL</sub> actors<sub>GEN PL</sub>  
 'Five well-known actors appear in the film.'  
 b. V fil'me ona vystupaet s pjat'ju izvestnymi  
 in film she appears<sub>3RD SG</sub> with five<sub>INST</sub> well-known<sub>INST PL</sub>  
 aktërami.  
 actors<sub>INST PL</sub>  
 'She appears in the film with five well-known actors.'

In (4a), the morphology of the constituents of the numeral phrase suggest that the numeral is the head: it takes the case dictated by the clausal syntax (the accusative, homophonous in this declension class with the nominative) and assigns the genitive to a governed complement. The morphosyntax of 'five well-known actors' is analogous in Russian in this position to that of 'a group of well-known actors'. In (4b), on the other hand, it is the quantified noun which takes the case dictated by the clausal syntax (the instrumental), and the numeral agrees with it; here the

Russian equivalent of ‘five’ has the morphosyntax of an attributive modifier. This paradox is well-known and has engendered an extensive literature.

The solution we proposed assumes the following. First, in all numeral phrase constructions, the noun is the head of the phrase and the numeral is its modifier. Second, all Russian nouns have a case feature which can be valued or unvalued in the lexicon; recall that while structural case is assigned to unvalued lexical features, inherent case results from the selection of a noun with a valued case feature. Nouns also have features for person, number, gender, and animacy, valued in the lexicon, which we will designate by the commonly-used term  $\varphi$ -features (‘phi’ to suggest ‘formal’). Adjectives have case and  $\varphi$ -features, all of which must be unvalued in the lexicon; these features are valued under agreement with their head by Concord. The thrust of our proposal was that numerals have a case feature which may be valued or unvalued (as do nouns), but  $\varphi$ -features which must be unvalued (like adjectives). To summarize:

| (5)        | Inherent values for $\varphi$ - features? | Inherent value for case? |
|------------|---|--------------------------|
| Noun       | Yes                                       | Optional                 |
| Numeral    | No  | Optional                 |
| Adjectives | No  | No                       |

In a direct case position, as in (4a), heterogeneous morphosyntax results from a noun with unvalued case and a numeral with [case: Quantitative]. The operation Agree applies to copy that case feature onto the noun (and any agreeing modifiers). A morphological rule spells out the Quantitative case on nouns and adjectives as syncretic with the Genitive; it gives the familiar citation form for the numeral, traditionally considered to be the Nominative. In an oblique case position, as in (4b), homogeneous morphosyntax results from a noun with valued case and a numeral with unvalued case. The operation Agree applies to the Numeral just as to any agreeing modifier.

There are a total of six other logical possibilities. A suite of syntactic principles and morphological factors conspire to block legible interface representations under these scenarios (see the cited papers for details).

Now we are in a position to turn to certain aspects of this analysis which do not lie completely at peace with the theory outlined in section 1.

First, the analysis does not conform to the typology of case assignment which requires that inherent (interpretable) case is selected and structural (uninterpretable) case is valued by Agree. Presumably the Quantitative case on a noun following a numeral is interpretable; it is inherent in that it is governed (assigned by a particular lexeme), and yet in direct positions it is valued by Agree, rather than being selected.

The case typology as stated presupposes an independent notion of what information is interpretable at LF, that we can reliably distinguish interpretable and uninterpretable features in terms of their content. We submit that this is not the case, that short of circularity, there is no coherent sense of interpretability that imbues this typology with any empirically verifiable content (see Legate 2002 for more discussion). The fact that the Russian preposition *bez* 'without', for example, governs the Genitive case is an instance of inherent case; but is the Genitive case in this context actually interpretable to the Conceptual-Intensional System in anything like the sense that number is? The Russian word *kniga* 'book' is associated in the lexicon with the  $\phi$ -feature [gender: feminine]; in what sense is this an LF-interpretable feature? It seems a dubious enterprise to seek interpretive function for these features, and therefore it is impossible to correlate such a function with being valued in the lexicon.

Whether a feature is valued or not on Merge should be treated as an empirical matter, determined by what PF needs to know to deliver a legible representation to the Sensorimotor system. Consider as an example the Russian word *xolostjak* 'bachelor', denoting an unmarried man; the property of being unmarried is not relevant to the grammar, but its masculine gender is. Consequently, gender is a formal (in this case, morphosyntactic) feature, but unmarriedness is not. The gender feature is lexically valued for a noun but not, say, an adjective, because the distributional facts show that the gender value of the adjective is dependent upon the noun, and not vice versa. In contrast, the declension class of a noun has no referential content and it is not LF-interpretable, but it has to be lexically valued, because PF needs access to it. Nothing is gained by imposing the requirement that only LF-interpretable features can value potentially PF-interpretable features (1c).

Recall from our previous discussion that it must be somehow stipulated that T and v\* assign structural case on Agree, and further that these categories assign distinct cases (Nominative and Accusative,

respectively). This feature assignment has been treated in a way completely distinct from the normal valuation of LF-uninterpretable features. A more straightforward way to implement structural case assignment would be to assign the corresponding valued case features to T and v\*, respectively, so that these features are copied by Agree from these probes to an appropriate goal, just as other valued features assign values to unvalued counterparts. This approach, however, is ruled out on principle and excluded by (1): the case feature on T and v\* is neither LF-interpretable nor (potentially) PF-interpretable. Dispensing with the notion of LF-interpretability makes it possible to implement this more direct approach.

Second, the numeral phrase analysis sketched above explicitly treats homogeneous agreement, implemented by Agree, as an instantiation of Concord, analogous to the agreement of attributives with their head. What appears to be heterogeneous agreement is also the result of a phrase-internal Agreement of a noun with a quantifier modifier. That is, the operation Agree applies between the numeral and nominal in all instances. The difference between homogeneous and heterogeneous agreement lies in the direction of value copying: heterogeneous morphosyntax results from copying a feature value from probe to goal (downward), while homogeneous morphosyntax results from copying a feature from goal to probe (upward). This distinction is of no significance: the definition of Agree given in (2) reveals no sensitivity to the direction of copying. On our analysis the direction of feature valuation is derivative of the distinction, located in the lexicon, between whether it is the numeral or noun which has a valued case feature.

Third, as is explicit in our treatment of homogeneous morphosyntax, this analysis of Slavic numeral phrases unifies Concord and Predicate Agreement, such that they utilize the same features and operations. This is in conflict with Chomsky 2004, where we find the explicit stipulation that a probe must be a head and it can only apply to a complement of that head.<sup>3</sup> We propose dispensing with this requirement and making it possible to leverage Agree to implement Concord. This seems to be a

<sup>3</sup>In fact the restriction is even narrower: a probe must be the head of a phase (v\* or C). The justification entails restricting search space and computational memory, but it isn't clear how relaxing the restriction in the way we suggest burdens mental computations.

simplification of the theory, to be preferred in the absence of compelling evidence to the contrary.

This move, however, entails a problem. Agree would necessarily apply to a modifier/head pair before the head has case; how could the case, assigned later, be transmitted to the modifiers? Not only would the modifiers have already been by-passed in the cycle, but once the case feature on the head is assigned by T or v\*, this head is inactive and the modifiers could no longer Agree with it. A solution is required and we will propose one in section 3 which makes the unification possible, as well as offering other benefits.

Finally, there is considerable evidence that Predicate Agreement in Slavic is expressed only in the presence of a Nominative case subject. Example (6) illustrates the typical case of a predicate agreeing with a Nominative case subject:

- (6) Sobaki guljajut.  
Dogs<sub>NOM PL</sub> stroll<sub>3RD PL</sub>  
'Dogs are strolling.'

But when the subject takes a quantitative form different from the Nominative, there is no predicate agreement:

- (7) a. Po sobake guljaet v každy parke.  
each dog strolls<sub>3RD SG</sub> in every park  
'One dog is strolling in each park.'  
b. Okolo pjati sobak guljalo.  
about five<sub>GEN</sub> dogs<sub>GEN PL</sub> strolled<sub>3RD SG NEUT</sub>  
'About five dogs were strolling.'  
c. Sobak pjat' guljalo.  
dogs<sub>GEN PL</sub> five strolled<sub>3RD SG NEUT</sub>  
'About five dogs were strolling.'  
d. Pjat' sobak guljalo.  
five dogs<sub>GEN PL</sub> strolled<sub>3RD SG NEUT</sub>  
'Five dogs were strolling.'

In such cases, the neuter singular form is the default utilized in purely impersonal clauses. This correlation is encoded in the definition of Agree. If this operation applies, the  $\phi$  features of the predicate are valued by the subject and the subject is assigned the Nominative case. If the operation does not apply, then neither of these events occurs. One cannot apply without the other.

In contrast to this pattern, Predicate Agreement is possible with a numeral phrase in subject position even if the latter is not (according to our analysis) in the Nominative case:

- (8) a. V xode operaciji byli ubity 20 boevikov.  
 during operation were<sub>NOM PL</sub> killed<sub>PL</sub> 20 combatants<sub>GEN PL</sub>.  
 ‘In the course of the operation 20 combatants were killed.’
- b. Mnogo založnikov byli ubity.  
 many hostages<sub>GEN PL</sub> were<sub>NOM PL</sub> killed<sub>PL</sub>.  
 ‘Many hostages were killed.’

It is conceivable that the quantifier is the head of the subject phrase and it stands in the Nominative case and is associated with the  $\phi$ -feature [number: plural]. But we have argued in contrast that the head of this phrase is the noun (e.g., *boeviki* in (8a)) and that it is in an oblique case because it is in the scope of a case-assigning quantifier (just as distributive *po* assigns the Dative, numerals assign the Genitive). In any event, either system has to address the possibility of alternate predicate forms:

- (9) V komnatu vošlo/vošli 5 čelovek.  
 into room entered<sub>NEUT SG/PL</sub> 5 people<sub>GEN PL</sub>.  
 ‘Into the room entered 5 people.’

This matter will be taken up in section 4.

### 3. Agree as Feature Sharing

We have opted in our analysis of numeral phrases to unify Concord and Predicate Agreement by proposing that both be implemented by the operation Agree. As noted in the previous section, this leads to a technical problem which needs to be solved: how can the case feature of a modifier be valued by the modified noun if the noun has not yet been assigned case at the time Agree applies to them?

Frampton and Gutmann (2000, to appear) discuss the problems inherent in two constructions in which a structural case assigner must Agree with more than one goal. The first involves English expletive constructions such as (10a) (with structure (10b)):

- (10) a. There were children in the room.  
 b. EXPL T be [children in the room]

They follow Chomsky 2000 in assuming that the lexical representation for EXPL includes an unvalued person feature. T, which assigns the structural case Nominative, has to agree with both the expletive subject

and its associate *children* in order that the unvalued features of both be valued. If T Agrees first with *children*, then T is rendered inactive and unavailable to then Agree with EXPL and value its [person: ] feature. Say instead that T Agrees first with EXPL. Unlike a nominal, EXPL has no valued  $\phi$  features to pass on to T. The  $\phi$ -features on T are only valued when T turns next to Agree with *children*. The [person: ] feature on EXPL, then, is never valued.<sup>4</sup>

A similar problem arises in a more arcane example discussed by Frampton and Gutmann 2000: Exceptional Case Marking (ECM) constructions in Icelandic with a participle (expressing case) in the lower clause. Consider (11a), from Andrews 1982:445, with the structure given in (11b) (underlining indicates the original copy of nominals which move):

- (11) a. Þeir telja hana (vera) sagða (vera) vinsæla.  
 they<sub>NOM</sub> believe her<sub>ACC</sub> (to-be) said<sub>ACC</sub> (to-be) popular<sub>ACC</sub>  
 ‘They believe her to be said to be popular.’  
 b. they T<sub>PRES</sub> – [they [v\* [believe [her<sub>ACC</sub> T<sub>DEF</sub> be Prt<sub>ACC</sub> say [her  
 T<sub>DEF</sub> be popular]]]]]

Prt will host the participial form of the transitive verb ‘to say’. Like an attributive, Prt has unvalued gender and number features, but no person feature. Again, a case assigner, here, v\*, must Agree with both *her* and Prt and assign case to them. Once v\* Agrees with ‘her’, the closer and more accessible of the two, v\* is rendered inactive and there is no source of the Accusative for the participle. If somehow v\* first agreed with the farther element, Prt, the situation would be analogous to the English expletive construction: v\* would not yet have values for gender and number to pass on to Prt.

Frampton and Gutmann 2000 propose that Agree does not copy feature values, but causes the probe and goal to share a single feature, whether valued or not. This idea has its analogue in the operation of ‘structure sharing’ from Functional Unification Grammar (Karttunen and Kay 1985, Kay 1984). And it has the flavor of Autosegmental Phonology, as though syntactic features exist on a plane different from that of the categories themselves, with association lines linking the two

<sup>4</sup>Chomsky’s resolution of this paradox is that in such cases Agree applies to everything simultaneously (2004b). We find this problematic, but cannot pursue the issue here.

planes. In the English expletive case (10), regardless of the order in which T Agrees with its two goals, *there* and *children*, the three formatives end up sharing a single person feature, with *children* supplying the value. In the Icelandic Exception Case Marking participle construction (11), the case features of *her* and *Prt* are shared even when neither has a value; at the next cycle,  $v^*$  assigns the value for that feature, which is morphologically realized on both.

Now we can apply feature sharing to Concord. Recall that the problem with using Agree for basic Concord is that when the attributive Agrees with the Noun, the latter does not have a case value; when the latter eventually receives a case value from  $v$ , the Noun and  $v^*$  will be rendered inactive; how will the case value be transmitted to the adjective?

- (12) a. ja [čital [interesnuju knigu]]  
 I read interesting book.  
 ‘I read an interesting book.’

- b. [ja  $v^*$ [ $\varphi$ : ] [V-čitaj- [interesn- [ $\varphi$ : ; case:] knig- [ $\varphi$ : $\varphi$ ; case: ]]]

The answer is provided by feature sharing. Agree applies within the direct object nominal phrase, coalescing the  $\varphi$ -features and case features of the adjective and head noun. Since the  $\varphi$ -features of the noun are valued, they are available on the adjective for eventual spell-out. The shared case feature remains unvalued and the categories active until the cycle headed by  $v$ , which values the feature (as Accusative), available to both noun and adjective. As the nominal phrase is assembled, Agree is applied each time an adjunct is added. When a value is assigned to one category, it is automatically associated with the other categories. In this regard a numeral behaves syntactically just like any (other) modifier. On this approach, a probe need not be the head of the phrase Agree applies to, pace Chomsky’s assumption.

#### 4. A theory of formal versus referential features

The discussion at the end of section 2 led to the expectation that numeral phrase subjects would invoke the default neuter singular agreement, since a) we assume the quantified noun is the head of the subject phrase, and b) it does not stand in the Nominative case. And yet plural predicate agreement is not only possible, but greatly preferred under various

conditions. Indeed current trends point to the expansion of this form. Compare the following examples (from a *Google* search):

- (13) SŠA proigrali Evrope, za которују выступало  
USA lost-to Europe for whom played<sub>3RD NEUT SG</sub>  
pjat' novičkov.  
five new-comers<sub>GEN PL</sub>  
'The USA (team) lost to Europe, for whom five newcomers  
were playing.'
- (14) V to vremena v ètoj komande выступали  
at that time on this team played<sub>3RD PL</sub>  
pjat' igrokov<sub>GEN PL</sub> iz byvšego SSSR  
five players from former USSR  
'At that time five players from the former USSR played on this  
team.'

While the two sentences have analogous numeral phrase subjects, the predicate takes the default neuter singular form in one, and the agreeing plural form in the other. An explanation needs to be provided for both agreement patterns.

The plural predicate form in (14) constitutes a special case of what has traditionally been called 'semantic agreement', which stands in opposition to what grammatical principles dictate to be the 'formal agreement' of (13). Moreover, Corbett 1979, 1983 has demonstrated the existence of an agreement hierarchy, given in (15); he notes that '[f]or any controller that permits alternative agreement forms, as we move rightwards along the Agreement Hierarchy, the likelihood of semantic agreement will increase monotonically (1983: 10)':

(15) attributive - predicate - relative pronoun - personal pronoun  
We wish to demonstrate that the contrast between (13) and (14) is a special case of a larger phenomenon, the traditional contrast between formal and grammatical agreement and that what we have to say about the problem at hand has consequences well beyond. To do this, we discuss two well-documented families of contrasting predicate agreement in Slavic: those involving a contrast in gender and those involving a contrast in number. While the attributive:predicate link is only one in the chain (15), it is where the effect is most pronounced.

It is not uncommon in Slavic for a noun to exhibit different gender values for Concord and Predicate Agreement. This is most frequent for masculine nouns denoting females, for which, per Corbett's Agreement

Hierarchy, nouns exhibit grammatical gender in Concord, but semantic gender in the predicate form:

- (16) Naš        vrač        prišla.  
our<sub>SG MASC</sub> doctor<sub>SG MASC</sub> arrived<sub>SG FEM</sub>  
'Our doctor arrived.'

Pereltsvaig 2005 cites the converse case: a feminine noun denoting a male:

- (17) Filipinskaja   kinozvezda ...   zajavil,        čto ...'  
Filipino<sub>SG FEM</sub>   movie-star<sub>SG FEM</sub> announced<sub>SG MASC</sub> that  
'The Filipino movie star ... announced that ...'

The plural in Polish distinguishes personal and non-personal subgenres within the masculine. Emotive epithets for males can be treated as non-personal for Concord, but the sex of the referent reappears in the predicate (Corbett 1983: 21-2)

- (18) Te                   łajdaki  
'Those<sub>MASC NON-PERS PL</sub> scoundrels<sub>MASC NON-PERS PL</sub>  
mówili               nieładnie.  
were talking<sub>MASC PERS PL</sub> crudely.'  
'Those scoundrels were talking crudely.'

And numerous honorific forms in Polish and Russian, cited by (Corbett 1983: 23-5), exhibit semantic agreement in the predicate, but some other gender for Concord, determined by the derivation of the honorific form and seen in the Russian example cited by Corbett in the direct object:

- (19) ... ego vysokobladorodie prikazal        vaše bladorodie  
... his Worship<sub>SG NEUT</sub>   ordered<sub>SG MASC</sub> your<sub>SG NEUT</sub> Honor ...  
otvesti v ostrog ...  
to-take to jail  
'His Worship ordered your Honor be taken to jail.'

It has been widely noted that Bosnian-Croatian-Serbian (BCS, also called Serbo-Croatian) boasts words which differ in both gender and number for the purposes of Concord and Predicate Agreement.<sup>5</sup> For example, the singular word *dete* 'child' is neuter; instead of a standard

<sup>5</sup>It is a well-known difference between American and British English that the latter exhibits semantic agreement in number in a predicate applying to a collective noun, while admitting the indefinite article characteristic of singular nouns:

(i) A band are enjoying themselves. (Wechsler and Zlatić 2003:76)

plural form, plurality is expressed by the collective noun *deca*, grammatically singular and feminine in gender, as reflected in Concord. And yet a predicate agreeing with *deca* takes the neuter plural form. Similarly, the collective nouns *unučad* ‘grandchildren’, *dugmad* ‘buttons’, *telad* ‘calves’ function as feminine singular for Concord, but neuter plural for Predicate Agreement (examples from Wechsler and Zlatić 2003):

- (20) a. Ta            dobra        deca            su  
 these<sub>FEM SG</sub> good<sub>FEM SG</sub> children<sub>FEM SG</sub> have<sub>3RD PL</sub>  
 došla            /dolaze  
 arrived<sub>NEUT PL</sub>/are arriving<sub>3RD PL</sub>  
 ‘These good children have arrived/are arriving.’
- b. Moja    plava    dugmad        su        nestala  
 my<sub>FEM SG</sub> blue<sub>FEM SG</sub> buttons<sub>FEM SG</sub> have<sub>3RD PL</sub> disappeared<sub>NEUT PL</sub>  
 ‘My blue buttons have disappeared.’
- c. Moja    unučad            lepo uče  
 my<sub>FEM SG</sub> grandchildren<sub>FEM SG</sub> well studying<sub>3RD PL</sub>  
 ‘My grandchildren are studying well.’

Other collective plurals (*gospoda* ‘gentleman’ and *braća* ‘brothers’) are feminine singular for the purposes of Concord, but masculine plural for the purposes of predicate agreement

These examples are presented here in order to show that the numeral phrase constructions we have been considering can be shown to be analogous in their behavior to a wider range of data, all of which exemplify Corbett’s Agreement Hierarchy (15). That is, (21) represents semantic agreement, what we will call *referential agreement*, and (22) represents *formal agreement* (including default agreement, if that is what formal principles dictate); (21a) is to (22a) as (21b) is to (22b):

- (21) *Referential agreement*:
- a. V fil’me igrali    pjat’ aktërov.  
 in film played<sub>3RD PL</sub> five actors<sub>GEN PL</sub>  
 ‘Five actors played in the film.’
- b. V komnatu vošla        molodoj        vrač  
 into room entered<sub>FEM SG</sub> young<sub>MASC SG</sub> doctor<sub>MASC SG</sub>  
 ‘A young doctor entered the room.’

(22) *Formal agreement:*

- a. V fil'me igralo pjat' aktërov.  
in film played<sub>NEUT SG</sub> five actors<sub>GEN PL</sub>  
'Five actors played in the film.'
- b. V komnatu vošel vrač.  
into room entered young doctor  
'A young doctor entered the room.'

Such cases of mismatch between Concord and Predicate Agreement might suggest that it is a mistake to unify these two processes by using the same operation Agree to implement them. We argue that it is not. When alternate forms are observed in Predicate Agreement, one (formal agreement) corresponds to Concord in feature values and thus presents no problem; we need to provide an account for the other form, referential agreement. To do so, we need to elaborate on what feature sets are available to the syntactic processes of Concord and Predicate Agreement.

Consider a lexeme denoting an inanimate object, such as *karandaš* 'pencil'. Its declension class (call it 'I') and gender (masculine) are equally arbitrary and must be lexically specified; in this respect these features are parallel, even as their effect differs (the former is morphological, the latter is morphosyntactic).<sup>6</sup> Number is a *facultative* category, not inherent to the lexeme's form or meaning, and both morphological and morphosyntactic in effect. So the lexicon would associate the stem *karandaš-* with the features [declension class: I; gender: masculine; number: ], with an appropriate mechanism identifying the last to be valued by the speaker at will, much as the lexeme itself is selected.

The animacy feature in Russian is also a formal feature, with both morphological and morphosyntactic consequences. However, its value is more predictable than is the gender of inanimate nouns. To treat the animacy feature value of *karandaš* 'pencil' as arbitrary in the same way that its declension class and gender are would be to miss an obvious generalization of the language: the default is for grammatical animacy of

<sup>6</sup>We err on the side of redundancy here, for in fact we would follow Halle 1990 in assuming that the default situation is for declension class to be assigned in the lexicon by rule from gender, with exceptions lexically specified and impervious to the application of the rule. It would be a digression to develop this here.

a lexeme corresponds to the animacy of its referent. We assume, then, that the semantic representation of the word, that information which is LF-interpretable and irrelevant to PF-interpretation, includes *referential* features which are legible at the lexical level to the formal features, but independent of them.<sup>7</sup> In the absence of better terms, we call the former *r-animacy* and the latter – *f-animacy*. The value of f-animacy need not be specified in the lexicon as an inherent property of the stem; a redundancy rule can assign it in accordance with the value of the r-animacy feature. By postulating two sets of features, we are gain generality, not lose it. Referential features are simply distilled parameters of lexical meaning. As such, they come ‘for free’. And they are justified at the lexical level to identify predictable values of the formal features.

The gender of animate nouns in Russian is more predictable than that of inanimate nouns. It is in fact analogous to the status of animacy itself in typically being predictable from the meaning of the lexeme. It is clear that the default is for grammatical gender to be correlated with the sex reference: a word necessarily denoting an animate male, *brat* ‘brother’ or *xolostjak* ‘bachelor’, for example, is in the overwhelming majority of cases of masculine grammatical gender. To treat the grammatical gender of such words as arbitrary in the same way as the gender of *karandaš* would again be to miss an obvious generalization of the language. We assume lexical redundancy rules which value the formal gender feature on the basis of the referential feature set: [r-animacy: +; sex: male] entails [gender: masculine] and [r-animacy: +; sex: female] entails [gender: feminine].

There are Russian words denoting animate beings whose referential meaning is noncommittal with respect to sex and whose gender conforms to the generalization of mirroring sex by gender. Such words treat the

<sup>7</sup>Wechsler and Zlatić 2003 develop a Head-Driven Phrase Structure Grammar (HPSG) approach to BSC. They distinguish two sets of features: Index: for NP-internal modifiers and Concord: for predicate agreement. There is a default constraint identifying the two, but lexical specifications can override it. Despite the difference in framework, their analysis has greatly influenced the present study. We will attempt, however, to provide a more explanatory and integrated account of the relation between the two sets of features, rather than establishing by fiat that different feature sets control different syntactic processes. Pereltsvaig (2005) makes a differentiation more like that in the text; we will return to her analysis in passing below.

referential feature [sex: ] as facultative. Once that referential feature was valued by speaker choice, the lexical rule valuing the formal feature [gender: ] to conform would apply. Such words, called ‘common gender’ in the Russian grammatical tradition, would seem to be a logical default, but in fact they are quite limited (the paradigmatic Russian example is *sirota* ‘orphan’). This hardly seems optimal, but what Corbett calls ‘strict semantic gender systems’, found in the Dravidian language Tamil, for example, in which every noun is like Russian *sirota*, are apparently quite rare among the world’s languages (Corbett 1991). In the same way, number would entail a facultative referential feature [cardinality: ] and a formal feature [number: ]. The former is facultative, and the latter is assigned to conform to the former.

We need a mechanism to account for the numerous instances in which the formal features of a lexeme are not determined by referential features. In these instances the distinction of the two sets of features is essential. Consider first words such as the masculine *vrač* ‘doctor’ or the feminine *kinozvezda* ‘film star’, both discussed above. The referential feature [sex: ] in both cases is facultative, but their genders are fixed. It is sufficient to say simply that the formal feature [gender: ] of these two words, masculine and feminine, respectively, is lexically specified as an inherent property of the stem. The lexical redundancy rule we propose is what Halle 1990 calls a *Structure Building* rule, which functions only to value unvalued features. The property that a redundancy rule has no effect on a feature already valued is the mechanism for identifying exceptions to the rule. In the realm of animacy, contemporary Polish is particularly rich in such exceptions: games, dances, and units of currency, among other semantic classes, are regularly treated as animate in that the Accusative is syncretic with the Genitive case, not the Nominative (e.g., *skradziono laptopa* ‘There was stolen a laptopa<sub>ACC=GEN</sub>’). Similarly, while a referential feature for [cardinality] would serve to value the formal feature [number: ], collective nouns (e.g., BSC *deca* ‘children’ discussed above, would lexically specify the number feature as singular, a value which the redundancy rule applying to the referential feature for cardinality could not change. Conversely, Polish abounds in place names which are plural, without semantic differentiation from singular place names; e.g., the city *Katowice*. Again, this noun has a referential feature identifying singular cardinality, but the associated formal feature is [number: plural].

We have, then, proposed a fair amount of structure and process within the lexicon, before a lexeme is even Merged in syntactic structure. Lexemes are associated with formal features, which are potentially (when valued) PF-interpretable at some point in the derivation. We leave the question of their LF-interpretability open; in our view, it is not important. Lexemes are also associated with referential features. Some are facultative (e.g., cardinality); others are distilled, as it were, from the semantic definition of the lexeme (by definition, LF-interpretable), so as to be accessible to lexical processes which value formal features when those values are readily predictable. Important to this discussion is that formal features need not always be licensed by referential features; instead, they may be lexically valued as inherent properties of the lexeme, and thus impervious to the valuation rules.

When a lexeme is inserted in syntactic structure, only the formal features are visible to the operation Agree. Consequently, as a noun is combined with attributive modifiers, Concord sees not only default values for formal features which mirror corresponding referential feature values, but also any exceptions. So that a female doctor in Russian (*vrač*) takes masculine modifiers, a male film star in Russian takes a female modifiers (*kinozvezda*), children (*deca*) and brothers (*braća*) in BSC take feminine singular modifiers, ‘scoundrels’ in Polish take inanimate modifiers, ‘your excellency’ in Russian takes a neuter singular modifier, etc. etc.

Now let us turn to Predicate Agreement. We will assume here that nominal phrases in Russian are associated with a Determiner, a functional head which takes as its complement a phrase consisting of the nominal head and its satellites: its complements and modifiers.<sup>8</sup> If Predicate Agreement were determined by N, rather than D, then there would be no difference between it and Concord: the two processes would refer to the same set of formal features. But T will Agree with the closer

<sup>8</sup>The DP hypothesis as it applies to Slavic is a controversial issue. See for example Rappaport 2000b for a survey with a summary of the range of views with references. The present paper only assumes that nominal phrases in subject position are included in DPs. Rappaport 2000a provides evidence from extraction in Polish in support of the view that only nominal phrases in argument positions must be included in DPs (Longobardi 1994). In contrast, Pereltsvaig 2005 argues that a nominal phrase in any position can be included in a DP or not.

category D and be rendered inactive; D's complement, including N, will be inaccessible. Therefore, the features for Predicate Agreement will have to be hosted by D, not N, and in this distinction will lie the contrast with Concord.

Consider the patterns we have observed. When formal features must be inherently specified because referential features do not predict them (e.g., the gender of an inanimate noun like *karandaš* 'pencil'), there is no difference between Concord and Predicate Agreement. When formal features are unspecified as inherent features but valued in the lexicon by redundancy rule to correspond to the appropriate referential features (e.g., the gender and animacy of *brat* 'brother', the number of a typical count noun, the gender of a common gender noun), there is likewise no such difference. The issue arises when referential features predict a particular value of a corresponding formal feature, but that feature is inherently specified and thus overrides the redundancy rule. It is as though in such cases Predicate Agreement refers to the referential features, while Concord refers to the formal features. The result is one link in Corbett's Agreement hierarchy. How can this result be implemented?

We will assume that the formal morphosyntactic and referential features associated with N are shared by the functional category D, as is the lexical process whereby referential features value the formal features.<sup>9,10</sup> To the extent, then, that formal features are determined by

<sup>9</sup>Morphological features associated with the nominal lexeme (e.g., declension class) are irrelevant to the form of D and not part of its lexical representation. The referential features of the two categories must match. We assume that a failure to match will invoke derivation crash in Logical Form as a result of an inherent contradiction.

<sup>10</sup>Pereltsvaig 2005 develops an analysis of nominal phrases in Russian (and other languages) which has influenced our analysis, along with Wechsler and Zlatić 2003. However, there are important differences of both detail, conception, and empirical coverage. We cannot pursue a detailed comparison of approaches here, limiting ourselves to two observations. First, Pereltsvaig assumes two sets of features (her  $\phi$ -features, more like our referential features, and grammatical features, more like our formal features), such that one governs Concord and the other Predicate Agreement, without explanation or explication of the interdependencies between the two. Second, she sees 'small nominals' (nominal phrases without a D) as bearing unvalued  $\phi$ -features. This reflects a very different notion of feature; for us, a derivation would crash if such features were never valued.

the corresponding referential features, the formal features of D are filled in without complication before Merger. To take the example of *brat* ‘brother’, D acquires the formal features [animacy: +; gender: masculine; number: singular], as well as an unvalued case feature. Agree applies between D and N, and the case features are marked as shared, to be valued by a clause-level operation of Agree yet to be invoked. A word for which the formal features are underdetermined by the referential features (e.g., *karandaš* ‘pencil’) will have to await the application of Agree to acquire such features from N. The D associated with the word *karandaš*, then, is Merged with formal features [animacy: -; number: singular; gender: ; case: ]. Agree will apply between D and N, invoking feature sharing for any matching features. These include the gender feature, which has the value “masculine” on the N, and the case feature, which is no value (yet) on either D or N.

We now consider the trickier case, represented by, say, *vrač* ‘doctor’. The key is the fact that N appears to assign its  $\phi$ -feature values to its attributives, but not to D. It will be necessary for D, then, to fill in its own  $\phi$ -feature values, giving semantic agreement. This follows automatically from the assumption that D has the same features and redundancy rules than N does, without the option of inherently-specified feature values associated with a particular lexeme. The inherently-specified gender value “masculine” associated with *vrač* is visible to Agree as attributive modifiers are added to it. In contrast, D is merged with the default gender value “feminine” assigned in the lexicon on the basis of the referential feature [sex: feminine], and this is the value that Predicate Agreement sees: D is closer to T and when the two undergo Agree, T is rendered inactive and N effectively inaccessible. The architecture of the grammar, then, not only permits mismatch between Concord and Predicate Agreement, but predicts it. There is no mismatch for an inanimate word like *karandaš* because there is no redundancy rule to assign a gender value to D. Agree applies to invoke feature sharing, so that the inherently-specified value associated with the corresponding lexeme applies to D as well. As for the optional variants for the predicate of agreement (14) and default values for  $\phi$ -features (13), the application of the redundancy rules for D result in agreement. It is the unmarked assumption to assume that an operation is optional; the failure of the redundancy rules to apply result in default values being assigned in the morphology. The mechanism is simple and familiar: there is a Structure

Building rule which assigns these values (singular number and either neuter gender or third person) in any context, but of course if values have been assigned in the syntax by Agree, those values cannot be overridden. Again, an inanimate noun will not offer the default agreement option associated with the failure of the redundancy rule because it will not invoke the redundancy rule at all: Predicate Agreement sees the gender features of D which are necessarily assigned by feature sharing with N, which in turn will be the result of inherent feature valuation in the lexicon.

## **5. Conclusions**

The primary claim of this paper has been that Concord and Predicate agreement be unified as contextual variants of the operation Agree. To make this work, we adopted ‘feature sharing’ as a way of simulating derivational memory and resolving apparent ordering paradoxes. We have also argued that differentiating among formal features according to their LF-interpretability is not a useful concept: the criteria for it are ill-defined. The real operative principle that we take from Minimalism is the contrast of valued and unvalued features: operations are driven by the need to assign values to unvalued features and render them ‘legible’ at PF. Both morphological and morphosyntactic features need to be valued in order for them to acquire phonological form (be “spelled out”). Which features are inherently valued is an empirical matter, not to be resolved by fiat, including appeals to an unreliable notion of LF-interpretability.

An account was proposed here for the traditional distinction between formal and referential agreement. This distinction appears in two contrasts: Concord versus Predicate Agreement (per Corbett’s Agreement Hierarchy) and variant morphological forms of the Predicate. The account presupposes an independently-motivated distinction between formal and referential features in lexical representations. Only formal features, by definition, are accessible to syntactic operations. Referential features are present in the lexicon by necessity, associated with the reference of the host lexeme, and do not constitute stipulated artifacts. To some extent formal features can be predicted from the referential features of the host lexeme. One could imagine either extreme: 100% predictability or none. The Slavic languages occupy an intermediate position. Part of an explicit formal grammar is determining

and stating the predictability that exists in the form of redundancy rules. When these rules are absent because predictability is incomplete, the corresponding formal feature must be inherently valued. This same mechanism of inherent specification results in exceptions: valuations in contradiction to the redundancy rule which cannot be overridden. Both D and N have both types of features. The logic of locality makes Concord see the formal features of N, while Predicate Agreement sees the formal features of D. The categories D and N share the same redundancy rules, but only N can exhibit lexeme-specific values for formal features. It follows that when the redundancy rules give a value contracted by the inherent specification of the lexeme, Predicate Agreement will see the former (a clause level process which “sees” D, while Concord (a DP-internal process which “sees” N) will see the latter.

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