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FEATURES: VIGNETTE

1. FEATURES AS PROPERTIES

Features in minimalism are regarded in two ways: as characteristic (i.e., inherent) properties of items (atoms and constituents) of a module or as attributes that can be assigned to these items. Drawing a comparison with phonological features, the former view would describe the property [–back] of the vowel [i] and accounts for inherent features, such as gender on nouns (as opposed to gender on adjectives). So the noun *rain* has the semantic property of being a mass noun that affects in syntax (in that it does not require an article when indefinite) and we therefore assume that it has the corresponding feature distinguishing it from a count noun like *raindrop* (count). Likewise, the noun phrase *the thing*, by virtue of its internal composition, has a syntactic feature (number) responsible for triggering the -s ending on present-tense verbs that it is the subject of.

The other (attributive) way features are manifested in syntax can be compared to the behavior of the feature [–back] in Russian: it is a property that an item can acquire in virtue of being in a relation with another item. This is the way agreement is accounted for: for instance, number features on verbs are not inherent, but reflect their environment.

Like the feature [back] has two values, back and front, the number feature in English has two values, singular and plural. When this feature is found on an NP, it is interpretable: it constrains the denotation of the NP. When it is found on the verb, it is not: it merely reflects the number of the subject of the verb.¹

In the example above the number feature on NPs is both **interpretable** (correlates with the meaning of the NP) and **valued** (determined by the internal properties of the NP itself). Conversely, the value of the number feature on the verb is not determined by the meaning of the VP, but by the value of the number feature on its subject, which makes the number feature on the verb both **uninterpretable** and **unvalued**. While Chomsky's (1993, 1995) original proposal links these two properties (i.e., a feature cannot be valued without being interpretable and vice versa), there are also proposals (see Pesetsky and Torrego 2001) detailing how these two properties, having a value and being interpretable, might be independent of each other and interact.

2. INTERFACE REQUIREMENTS

The formal properties of features in minimalism should be determined by (a) their operational use in syntax and (b) interface constraints. The former amounts to AGREE (regarded as either valuation or as matching). The latter is broader and combines the needs for (some) features to be semantically interpretable, for their values to be subject to systematic syncretism and for the encoding of a lack of a feature and default values. The crucial question of whether (and which) features are multivalent (bivalency is generally the preferred choice) or privative (see, e.g., Nevins 2008) must find its answer in one of these issues.

¹ This can be viewed as a simplification, as the number feature of a verb could be interpretable and restricting its subject to singular or plural entities. Such a hypothesis, however, cannot be extended to more exotic cases of agreement, such as the agreement of certain pronominal arguments with the absolutive in Archi (Kibrik 1972 via Corbett 1991:114-115).

2.1. LF-motivated features

Semantically interpretable features are usually taken to correlate with a certain presupposition or restriction on the denotation of the appropriate constituent, as in (1). For some features, like definiteness or animacy, a binary approach is clearly appropriate. Even for multi-valued features, like number or gender, the minimalist trend has been to translate such features into a combination of binary features with their semantics stated in the terms of privative properties: [F] means *female*, yet no [M] feature is necessary, as masculine need not mean *male*, and in a three-gender system would rather mean *human* or *animate*.² Similarly, for person the bivalent features [speaker] and [addressee] have been proposed (with the latter especially needed for pronominal systems with the inclusive first-person plural, see, e.g., Noyer 1992) as well as the feature [participant] (for systems with one first-person plural pronoun, e.g., McGinnis 2005); a similar idea has been used for systems with three demonstratives (but see Diessel 2013, Gruzdeva 2020 for languages with more contrasts). Likewise, for languages with dual and trial pronouns two number sub-features have been proposed, [minimal] and [augmented], with semantics as in (1)-(2) (Noyer 1992, Harbour 2003, 2008, McGinnis 2005),³ and for Case an early attempt of decomposition has been advanced by Jakobson 1936/1971 (but see Kracht 2003 against such approaches).

- (1) a. $[[+minimal]] = \lambda x \text{ atom}(x)$
 b. $[[+augmented]] = \lambda P \lambda x \exists y [P(x) \wedge P(y) \wedge y \sqsubset x]$
- (2) a. $[+minimal -augmented] = \text{singular}$
 b. $[-minimal -augmented] = \text{dual}$
 c. $[-minimal +augmented] = \text{plural}$

While the existence of phi-features is uncontroversial, such is not the case for another class of semantically motivated features: **theta-features**, hypothesized to be responsible for theta-role assignment (Bošković 1994, Bošković and Takahashi 1998, Hornstein 1999, Lasnik 1999, Manzini and Roussou 2000, Fanselow 2001, etc.; see Bagchi 2007 for a counter-argument). Although theta-features are never marked overtly, their decomposition into clusters of two bivalent features, [c] and [m] has been proposed on semantic and syntactic grounds (Reinhart 2000, 2003, Marelj 2003, 2004, see Dimitriadis 2012 for a semantic implementation).

There exist, however, multivalent semantic features for which a reanalysis in terms of binary features seems implausible: those involved in classification of various kinds (see Aikhenvald 2000, Kilarski 2013 for a typological overview). Thus Mian (Fedden and Corbett 2017) has classifying verbal prefixes agreeing with the subject in the features MASCULINE and FEMININE (not only for animates), LONG, BUNDLE, COVERING and the residue; treating these as a combination of binary features seems unmotivated on semantic grounds.

Is this problematic? In a way it is, since on the morphological side (i.e., when feature values and their combinations are spelled out), bivalent features are indeed essential.

2.2. PF-motivated features

The major difference between declension class and grammatical gender lies in their syntax: the former is not relevant anywhere beyond morphology, whereas the latter determines the realization of lexical items agreeing with the original host. Both, however, can be motivated

² This view will not account for the modern English pronouns, where *he* and *she* correspond to a known gender of the referent and the lack of gender is encoded by another pronoun (*they*).

³ Harbour 2014, 2020 uses the features $[\pm\text{additive}]$, $[\pm\text{minimal}]$ and $[\pm\text{atomic}]$ to derive richer number systems. Both positive and negative feature values are semantically encoded, with the one being the negation of the other.

by lexical properties that are not semantic. The extreme case of such features is the so-called *alliterative agreement* (Kaye 1981, Marchese 1986, 1988, n.d., Aronoff 1992, Dobrin 1995, 1998, Dimitriadis 1997, Sande 2016, 2019), where agreement markers are determined by the phonology of the noun. Like with classifiers, here the number of agreement classes can be very high and no independent motivation for binary features is present, even though such systems are also subject to syncretism (see Dobrin 1995 on Bainuk).

Evidence for the binary encoding of both semantically and morpho-phonologically motivated features comes from morphological syncretism: when two cells in the paradigm are realized by the same morpheme, they can be reasonably argued to share a feature value. So gender (distinguishing three values, feminine, masculine and neuter) has been restated in the terms of two sub-features ($[\pm F]$ and $[\pm M]$) so as to deal with syncretism in the Slavic declensional paradigm (Despić 2016 for Serbian) or in German agreement (Wiese 1999, Müller 2011, Opitz et al. 2013). Likewise, the number sub-features discussed above are also motivated by systematic cross-linguistic syncretism in the paradigms of plural and dual.

Importantly, it is not a given that all sub-features are semantically motivated. Thus Alexiadou and Müller 2008 argue that Russian morphological noun classes should be represented via a combination of two non-semantic features α and β ; assuming that both features are bivalent, four declension classes are correctly predicted. A natural question to ask in this setting would be if such sub-features (and all morpho-syntactic features in general) are emergent, as argued for phonological features by Dresher 2014 and for morpho-syntactic features by Cowper and Hall 2014.

2.3. Binary feature encoding

The trend towards binary features has raised the question of whether they are privative (in which case there is no distinction between the feature and its value) or bivalent ($\pm$ definite), and the answer does not seem to be grounded in syntax: I know of no syntactic processes that are hypothesized to be driven by the particular *value* of a feature (as opposed to its presence or absence).⁴

On the semantic side, features are generally assumed to be privative. Thus the presupposition of uniqueness can be either present or absent, which makes definiteness a privative feature, and the same is true for [feminine]. While [minimal] and [augmented] are claimed to be bivalent in (1), it is clear that the relevant *semantic* features are privative: only the plus-values in (1) bring in some semantic contribution. Motivation for treating these features as bivalent rather than privative comes from morphology: the need to encode markedness, to account for the relevant number of possibilities, or to deal with the fact that the lack of a certain semantic feature is translated into a surface form (e.g., the dual corresponds to the absence of both [minimal] and [augmented] in Nevins 2007a, 2008, 2011 and yet is not the default).

How are the two views reconciled? While the general view has been to regard properties of features as the same in semantics, morphology and syntax, these are three different modules (compare the letter *a* on a page and its Unicode value), and some mapping procedure between them is required. It is possible that the presence of a given semantic feature is mapped into its privative syntactic counterpart, which is then mapped into the plus-value of its morphological counterpart. The absence of a semantic feature (or of a privative syntactic feature) on a term

⁴ Third-person NPs sometimes behave differently from first and second person pronouns in, e.g., not triggering agreement or differential object marking. The reason could be that they (can be convincingly argued to) have no person features (Harley and Ritter 2002, Béjar and Rezac 2003, Adger and Harbour 2005, the first reference is Benveniste 1966; see Nevins 2007b for arguments against this view). Likewise, though it is often stated that wh-movement is triggered by [+wh], the only [–wh]-bearing items hypothesized to exist are complementizers, and so there are no constituents postulated in principle that could agree in the negative value.

that is lexically specified to be marked for that feature, is mapped into the minus-value (so, for instance, the lack of specified number on a noun is mapped into [–plural]). This privative-to-bivalent mapping is no more complicated than a bivalent-to-bivalent mapping.⁵

2.4. Feature geometries

One way of dealing with syncretism is assuming intrinsic entailment relations between formal features. So the (first-person) (sub-)feature [author] entails the (sub-)feature [participant] and [feminine] entails [animate] in Harley and Ritter 2002. While these relations are clearly rooted in semantics, it is not clear whether they translate into hierarchical structures in syntax when several features are present on a single node; both answers have their proponents. So free variation in predicate case in Polish has been argued to result from the free choice of which feature to value first, number or gender (Witkoś 2008, Matushansky and Ionin 2018) – a view that relies on the absence of hierarchy in the phi-feature bundle. Conversely, Béjar 2003 argues that since the phi-feature bundle can only be assembled via merge, it must have hierarchical structure.

3. SYNTACTIC CONSTRAINTS ON FEATURES

The only syntactic operation involving features in mainstream minimalism is agreement, which can be viewed as **valuation** (the agreement host, a.k.a. *probe*, has a feature that lacks a value, and this value is obtained from another instance of the same feature under certain locality constraints) or as checking or **matching** (the relevant feature on the probe starts out as valued and its value must match that on the appropriate *goal*). Both views have their proponents, yet obviously, only the matching approach is compatible with privative features.

Unlike other feature clusters, Reinhart’s theta-feature clusters ([±c], [±m]) have been argued to be subject to such operations as **deletion** (decausativization removes the [+c] feature, Reinhart 2003), **insertion** (causativization inserts the [–c, +m] cluster, Reinhart 2003) and **expansion** (the Goal theta-role [–c] is expanded as [–c, +m], Marelj 2003) in syntax. (The two directions of research on theta-features, agreement (checking) and decomposition, have been developing independently of each other.)

In addition, the literature on phases hypothesizes **feature inheritance**, where uninterpretable features are passed down from the phase head to the head of its complement (Richards 2007a, Chomsky 2008, Obata, Epstein and Baptista 2015, among others).

3.1. Agreement and privative features

The hypothesis that movement requires Agree as a necessary step (Chomsky 1995) raises the question of how wh-movement (or more precisely, wh-agreement) can be formalized. Indeed, the wh-feature, as well as the focus and topic features, would not seem to have more than one value on either semantic or morphological grounds: wh-items have it and nothing else does, with the potential exception of wh-complementizers. For such wh-complementizers as *if* the wh-feature is interpretable and raises no problems. Problems arise for the probe-goal scenario: if the probing complementizer has a wh-feature, then this wh-feature cannot be unvalued, as there can be no concept of an unvalued privative feature. One way of resolving this issue, as noted more generally by Adger and Svenonius 2011, is that the probe has a

⁵ Cases like fake mass nouns (*furniture*) or group nouns (*committee*) where the formal value of a given feature (number) and its semantic value do not coincide give rise to mixed or semantic agreement. The topic is very well researched (see Smith 2015 and Puskar 2017 for recent discussions and references). In these cases there is arguably no direct mapping, since both formal and semantic values are specified.

formal feature that specifies that it enters into an agreement relation with a wh-feature, yet this would make an interpretable feature a principally different item from its interpretable counterpart, placing the connection between the two into the features themselves.

The same issue arises with categorial features. It has often been suggested (Svenonius 1994, Emonds 2000, Julien 2002, Adger 2003, Matushansky 2006, etc.) that c-selection and/or the notion of extended projection (Grimshaw 1991) can be formalized in the terms of probing for a categorial feature (but see Chomsky 2004, Surányi 2006 against this view and Adger and Svenonius 2011 for a discussion of the category-feature distinction). Whether the categorial feature is multi-valued (although there is evidence that adjectives and nouns share a formal feature, as do adjectives and verbs) or privative ([A], [N] or [V]), the question arises what the unvalued counterpart of such features is and how it is not, in essence, simply another value (see Corbett 2012:31 for a discussion).

If, however, agreement involves matching rather than valuation, this problem disappears.

3.2. Syntactically motivated features: Case

In the mainstream view Case is regarded as a purely syntactic feature needed to license an NP and valued (as free-rider) in the course of an agreement relation established between an NP and another functional head (but see Pesetsky 2013 and following him, Sheehan and Van Der Wal 2018 for the hypothesis that NPs are licensed by a different mechanism). For the matching approach to agreement to work, functional heads would have to be specified for a given value of the Case feature, with neither instance interpretable at either of the interfaces.

Two alternatives have been proposed. One is to regard Case features as the uninterpretable counterparts of categorial features: there is no nominative but only the uninterpretable feature [T] (Pesetsky and Torrego 2001, see also Williams 1994, Haerberli 1999); no accusative, but only the uninterpretable feature [v] (Pesetsky and Torrego 2004, see also Kratzer 1996, Torrego 2002, Travis 2010); no genitive, but only [Q] (Bailyn 2004) or [N] (Pesetsky 2013), etc. A possible notational variant of this view is the hypothesis that Case assignment is a requirement on Case-assigners themselves (Bošković 1997, Lasnik 1999, Martin 1999, Rezac 2004, Duguine 2013, etc.). The other route has been taken in nanosyntax (Caha 2007, 2010 and further work): Case is formalized as a series of functional heads on top of the NP, which also makes Case features into a type of categorial features. In both of these approaches different Case features are not in complementary distribution and can be stacked (see Béjar and Massam 1999, Merchant 2006, Caha 2007, Richards 2007b, Brattico 2011, Matushansky 2008, 2010, 2012 and Pesetsky 2013 for various ways of spelling out a complex of case features).

3.3. Feature inheritance and double-marking

Feature inheritance is assumed without argument (Chomsky 2008) to involve something like copying of (ϕ -)features from phase heads C^0 and v^0 , where they are generated *ex hypothesi*, to the head of their complement (i.e., T^0 and V^0).

Research of feature inheritance lacks the discussion of which features are inherited and how (or whether) they relate to each other. Whereas Chomsky 2008 suggests that complementizer agreement in West Flemish (Bennis and Haegeman 1984) arises from feature inheritance, van Koppen 2017 shows that C^0 and T^0 can probe for different targets. Wh-agreement in Ojibwe has been claimed to result from the inheritance of δ (discourse)-features on T (Lochbihler and Mathieu 2016a, b), which raises the question of which features are inherited when. A broader study of wh-agreement produces further issues. First of all, wh-agreement can, contrary to the generalization in Reintges, LeSourd and Chung 2006, cross-reference ϕ -features of the extracted wh-phrase (see, e.g., Schneider-Zioga 2009 and Zentz 2015:296 for wh-agreement in noun class). Second, it can appear higher than v^0 : e.g., as a verbal prefix preceding the

subject agreement prefix in Bemba (Cheng 2006) or on a separate complementizer in Kinande (Schneider-Zioga 2009); see Zentz 2015 for the full spectrum of the Bantu wh-agreement data). The fact that C^0 and T^0 agree with different targets necessarily entails that if T^0 inherits features from C^0 , it does not inherit them all – an algorithm of inheritance is still missing. The fact that two prefixes (wh-agreement and subject-agreement) both surface on the Shona verb in the presence of an overt complementizer (Zentz 2015:296) suggests the presence of either two ϕ -feature bundles on T^0 or two separate ϕ -bearing heads below C^0 distinct from v^0 , which exacerbates the problem of inheritance.

All in all, however, research on feature inheritance has not yet produced any constraints on features.

3.4. Features of features

Being interpretable or uninterpretable is clearly a property of features themselves. Two views on this are possible: one, that (un)interpretability is an inherent property of a given instance of a feature and two, that (un)interpretability is determined by the head hosting the feature, so $[\pm F]$, for instance, is interpretable on N and uninterpretable on T. While the latter approach is clearly more parsimonious, it seems that nouns can be specified for uninterpretable person or number features (e.g., in Tundra Nenets, Corbett 2006:141, where a noun agrees with its possessor); ϕ -features of certain pronouns may result from agreement (Kratzer 1998, 2009, von Stechow 2003, Heim 2008, Wurmbrand 2017, etc., see Bassi 2019 for an alternative) and verbs can bear uninterpretable tense (in sequence-of-tense phenomena, cf. Ogihara 1995, von Stechow 2003, Zagana 2014; Bjorkman 2015 argues against this view and for agreement for tense in counterfactuals). If these descriptions are correct, interpretability of features may be an inherent property for at least some instances.

The hypothesis that movement requires agreement gives rise to another property of features: whether or not overt movement follows. This has been encoded as the juxtaposition of strong and weak features (Chomsky 1993), as a separate EPP feature (Chomsky 1995) or as the EPP property of a feature (Chomsky 2000).

4. OUTLOOK

A minimalist view of features as syntactic atoms is constrained by both interfaces and by the properties of syntactic operations (agreement). Having studied these constraints we conclude that features must be allowed to have more than two values, that these values may themselves share features and that these sub-features motivated by the SM and CI modules are likely to be emergent. This (partially) hierarchical structure has moreover been argued to be reflected in syntactic hierarchies, which can be taken as support for the hypothesis (Wiltschko 2014) that functional categories are themselves non-innate.

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