

Word classes and their underlying features in minimalist syntax

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Abstract: In this article I provide an overview and discussion of how word classes are generally analyzed within (mainstream) minimalism. The starting point will be the observation that morpho-syntactic rules are not sensitive to word classes or grammatical categories, but rather to the lexical and formal morpho-syntactic features that underlie them, potentially augmented with roots. The nature, distribution and relative ordering of such features have led to a variety of theoretical proposals, of which I discuss some established representatives.

1. Introduction

The question what word classes or categories are available in a particular language has never been a central topic in formal, generative frameworks of grammar. One of the reasons for that is that such approaches generally make no reference to words or categories but rather to the morpho-syntactic features and roots that underlie them.

The question which word classes are present in a particular language thus boils down to the question as to which morpho-syntactic features there may be, and what other kinds of elements can be targeted by the morpho-syntactic component(s) in grammar. Within contemporary formal (generative) theoretical frameworks, mostly within minimalism, several types of morpho-syntactic features are distinguished. Examples are, for instance, lexical features such as [V] or [N], and formal features, like *Wh*-tense, ϕ - and case-features. Such formal features are often taken to be split into interpretable and uninterpretable features (or, more recently, into valued and unvalued features). On top of them, minimalist frameworks also make reference to acategorial, featureless roots. In what follows, I discuss these types of features and roots and assess what cross-linguistic variation in these domains is and is not possible.

In this chapter, I first briefly outline why contemporary minimalism does not make reference to words or categories, but rather to features. Then, I discuss what types of roots and morpho-syntactic features can be distinguished (focusing on lexical and formal features, in turn). After that, I discuss how existing features may be arranged in structural hierarchies or

feature geometries and discuss what their current status is within minimalist grammatical theory.

2. From words to categories, from categories to features

There are many reasons to assume that grammar does not make reference to words as such. For one, the grammaticality of sentences is not sensitive to individual words. Take the following two examples:

- (1) a. Cats love dogs
b. Children drink milk

Even though the two sentences in (1) contain different words, the reasons why both are grammatical are the same. There is no reason to assume that syntax would, for instance, treat *cats* differently from *children*. A natural step would then be that rules of grammars are sensitive to the categories that words belong to. Since *children* and *cats* belong to the same category, that of (plural count) nouns, they are grammatically treated in the same way. Consequently, *cats* and *children* are always fully interchangeable in grammatical sentences.

Such a step from words to categories is definitely a theoretical step forward, but not sufficient for a proper analysis of individual grammars. There are at least three arguments that have been provided to explain why instead of categories morpho-syntactic features should be taken to be the primitive units of syntax.

The first argument concerns the fact that categories do not behave in a uniform way. Clearly all forms *eat*, *eats*, *ate*, *eaten*, *to eat*, and *eating* belong to the category of verbs. At the same time, they are all treated differently by the grammar as witnessed by contrasts like *I eat* vs. **I aten*. Such contrasts do not follow directly from the differences in morphological shape. For instance, the past and perfect forms of *(to) sleep* are both *slept*, but *slept* in *I slept* is grammatically different from *slept* in *I have slept*. Apparently, more abstract properties must determine the grammatical differences between elements that belong to the same category. But that means that whatever constitutes a grammatical category must be reduced to these more abstract properties as well

As a second argument, such abstract properties cannot reduce to other properties of words, such as their phonological or semantic properties. There is nothing in the pronunciation of the word *table* that makes it a noun. Other nouns have completely different pronunciations.

Even if in certain languages particular phonological properties correspond to particular categorial properties this does not hold across languages and is rather epiphenomenal in nature. Alternatively, one could hypothesize that the meaning of a word reveals its category. It is a well-known fact that most nouns denote individuals or entities, whereas most verbs denote events, processes or states. Nevertheless, there are nouns that actually denote events (*war*, *dance*) and verbs that do not denote events, processes or states (this is the case, for instance, for most verbal auxiliaries). Even though nouns and verbs quite often show semantic (i.e. meaningful) differences, there is no clear-cut semantic difference between the two.

What distinguishes different categories in the grammar is thus independent of their form and meaning. Belonging to a particular category can only be distributionally determined (for instance, every common noun can be preceded by a definite article, or every verb may have finite forms), given that categorial identity between different elements guarantees full substitutionability. The consequence of this is that every lexical item must have three types of properties: phonological, semantic and abstract morpho-syntactic properties. The question is indeed what such abstract syntactic properties amount to.

This brings us to the third argument. It may be natural to assume that these abstract syntactic properties could be categorial properties themselves. Then, every verb must have the syntactic property of belonging to the category of verbs. The difference between different forms of verbs could then be cast in terms of subcategories: there is a subcategory of finite and a subcategory of non-finite verbs. The former could be further split up in two subsubcategories, present finite verb and past finite verbs. Similar subsubcategorizations could apply to non-finite verbs. A problem for such an approach is that if categorial behavior is indeed defined in terms of syntactic distribution, this behavior is not restricted to words. Take the following minimal examples:

- (2) a. Wine tastes well
- b. Red wine tastes well
- c. Wine from Italy tastes well
- d. Red wine from Italy tastes well

In the examples in (2) the subjects are fully interchangeable. This does not only apply to these sentences. Every grammatical sentence containing the noun *wine* remains grammatical if wine is replaced by *red wine*, *wine from Italy* or *red wine from Italy*. Whatever the abstract syntactic

property is that underlines nouns must also extend to phrases consisting of multiple words. Hence, this property cannot be taken to be restricted to particular word classes.

Instead, such syntactic properties can be very well defined in term of *morpho-syntactic features* (sometimes also referred to as *grammatical feature* or just *feature*). Nouns carry a morpho-syntactic feature [N] that can project through entire phrases and the same holds for verbs that carry a feature [V]. Furthermore there is no restriction to there being one feature per word or lexical element. *Took*, for instance, carries features [V], [finite] and [past]. With this in mind, we can now explore what types of features there are, what their grammatical behavior amounts to and how they are furthermore constrained.

3. Lexical features and featureless roots

3.1 Reducing lexical features

The first attempt to categorize the formal features underlying lexical categories is by Chomsky (1970), who defines the categories of nouns, verbs, and adjectives in terms of binary features. For Chomsky, lexical categories contain both a feature [$\pm V$] and a feature [$\pm N$]. Nouns then are underlyingly [+N, -V], verbs [-N, +V] and adjectives [+N, +V].

One of the advantages of such a binary feature system is that it can account for the somewhat hybrid nature of adjectives. Whereas the syntactic behavior of nouns and verbs is complementary, adjectives can sometimes behave both nominally and verbally. For instance, the verbal participle *destroyed* in ((3)a) is used as adjectively in ((3)b).

- (3) a. Caesar destroyed the city
b. The destroyed city

Another advantage of such a system is that it makes predictions about the number of lexical categories. A binary system like the one sketched above also allows a fourth category of the type [-N, -V]. Jackendoff (1977) took elements carrying [-N, -V] to be adpositions. This has led to a dominant view in generative grammar that the four lexical categories are nouns, verbs adjectives and adpositions to the exclusion of adverbs, an aspect in which generative grammar differs from more functional paradigms.

Naturally, the question arises as to whether features [$\pm V$] and [$\pm N$] are lexical primitives or whether they can be reduced to some more fundamental properties. One attempt to do so is

Stowell (1981) who argues that nominality and verbality can be defined in terms of the (in)ability to license case. Déchaine (1993), by contrast, has argued that the noun-verb distinction reduces to the interplay of [nominal] and [referential] features. For her, nouns carry a feature [referential] and a feature [nominal], while adjectives only carry [nominal] and verbs only [referential].

The most advanced grammatical theory that aims at explaining the differences between verbs, nouns and adjectives is Baker (2003). For Baker, verbs are the only lexical category that always project a specifier, a 'subject'. By contrast, nouns carry referential indexes. Adjectives, finally, are negatively defined as the lexical category that lacks referential indexes and cannot project a specifier either. One of the core tenets of Baker's work is that he clearly takes lexical items to carry particular formal features. That is, being a noun, verb or category is a property already encoded in the lexicon.

3.2 *Roots in syntax*

Such a perspective runs against more recent ideas by Halle & Marantz (1993), Marantz (1997) and Harley & Noyer (1998), who argue that the grammatical properties that lexical categories like verbs, nouns and adjectives exhibit are not lexically encoded but result from the functional structure above category-less roots. In terms of Marantz (1997) such roots become 'nouns' and 'verbs' as a result of where they are inserted in the syntactic structure (see also Don, this volume). *Destruction* and *destroy* are not different lexical elements but different syntactic structures that share the same categoryless, and thus featureless, root $\sqrt{\text{DESTROY}}$. In *destruction*, $\sqrt{\text{DESTROY}}$ is the head of a nominal extended projection; in *destroy*, the head of a verbal one. As pointed out by Acquaviva (2008), the notion of a morphological root is ultimately based on the intuition that complete words may share a minimal 'core', which remains invariant when all other morphological formatives have been abstracted away. Within Distributed Morphology (DM), consensus has emerged that roots correspond to this non-grammatically definable part of a word (Marantz 1997). This leads to the hypothesis that all lexical categories are made up of category-less roots combined with category-assigning heads (Marantz 2001, Embick and Marantz 2006, Embick and Noyer 2007). For example, nouns and verbs are not syntactic atoms, but are derived from a structure $[\text{n} + \sqrt{\quad}]$ and $[\text{v} + \sqrt{\quad}]$, respectively, where n and v are syntactic functional heads carrying nominal / verbal features. The noun *cat*, for instance, has $[\text{n} \text{ n } \sqrt{\text{CAT}}]$ as its underlying structure.

An advantage of dismissing lexical categories/features in narrow syntax lies in the fact that roots differ from other functional elements in at least three respects (Halle and Marantz 1993, Harley & Noyer 1999, Embick 2000, Alexiadou 2001, Borer 2005a, 2005b, 2013, De Belder & Van Craenenbroeck 2014). First, following the examples in De Belder & Van Craenenbroeck, who base themselves on Borer (2005a), open class lexical items can generally be modified both nominally and verbally. As they show, a lexical item such as English *stone* can be used in a wide variety of ways, some nominal ((4)a-b) and some verbal ((4)c-d):

- (4) a. I've got a stone in my hand.
b. There's too much stone and metal in this room.
c. They want to stone this man.
d. Billy-Bob should lay off the weed; he's always stoned.

Second, as De Belder & Van Craenenbroeck point out, many properties, traditionally assigned to verbs or nouns in (for instance, agreement or case assignment), are nowadays performed by functional heads (see Marantz 1997, Borer 2005a,b, Adger 2011). What roots do is adding conceptual meanings to the structures built by syntax, but for this it does not need to have a specific syntactic category.

A third reason to assume that roots are categoryless is that it removes redundancy from the grammatical architecture. If it already follows that elements that merge with a determiner must be nominal (as determiners only select nominal elements) and that elements that merge with complementizers must be verbal (as complementizers only select verbal elements), it already follows that the complements of D/T are nominal/verbal and there is no need to reduplicate that in the grammatical architecture.

Despite the great conceptual advantages of assuming that morphemes become categorial in the context of a syntactic structure, the assumption that, therefore, roots are feature- and categoryless is problematic in one important respect: it substantially complicates the notion of what constitutes the set of syntactic objects. If roots are categoryless and lack any morpho-syntactic features, then the question arises what all syntactic objects, roots and morpho-syntactic features alike, have in common. For instance, the structure-building operation Merge should now be said to apply to both elements carrying morpho-syntactic features and to featureless roots instead of elements carrying morpho-syntactic features only. Of course, one can try to motivate why Merge can apply to two different types of objects, as is standardly done in approaches like Distributed Morphology, or even provide arguments why the lowest element

in a derivational domain must be featureless (see Fortuny 2008, Zwart 2009, 2010, De Belder & Van Craenenbroeck 2014, Biberauer 2017 for notable attempts). However, the question is whether such additional steps are actually necessary. The crucial argument in approaches that take roots to be categoryless is that problems emerge once it is assumed that roots must be either nominal or verbal. The crucial underlying assumption is thus that roots must be underspecified with respect to being nominal or verbal; they cannot just be lexical categories nouns or verbs. But, taking roots to be acategorial is not the only way to explain this underspecification. Assuming that there is a supercategory / superfeature above nouns and verbs (and, arguably, predicatively used adjectives as well) exactly derives that as well. All conceptual arguments outlined above in favour of roots being featureless/acategorial are also compatible with roots carrying a formal superfeature, which could be dubbed [PRED(ICATE)] or [CONTENTIVE] that can get valued for being either verbal, nominal or (predicatively) adjectival (see Zeijlstra 2020 for discussion).

3.3 *The universality of nominal and verbal lexical categories*

The question whether the noun-verb distinction is lexically encoded or not is closely related to the question whether every language in the world exhibits a noun-verb distinction. Traditionally it has been assumed that languages minimally distinguish nouns and verbs (cf. Baker 2003, 2008, Borer 2003, Croft 2003, 2005, 2009, Greenberg 1986, Halle & Marantz 1993, Pinker & Bloom 1990, Whaley 1997, a.o.). For some of these scholars (e.g. Baker), this universal noun-verb distinction is directly given by Universal Grammar. However, there are a number of languages that display a behaviour that may make one cast doubt on this assumption as such languages do not show any morpho-syntactic noun-verb distinction at all.

For instance, in Samoan, all content words can systematically be used both verbally and nominally. Samoan *alu* in (5) may either mean ‘to go’ or ‘(the) going’, depending on the grammatical context: combined with a tense marker it obtains a verbal reading ‘to go’; combined with an article, it yields a nominal reading ‘(the) going’ (cf. Mosel & Hovdhaugen 1992; Don & Van Lier 2013), as is illustrated below.

- (5) a. E alu le pasi I Apia. Samoan
 PRES go the bus to Apia (Don & Van Lier 2013)
 'The bus goes to Apia.'
- b. Le alu o le pasi I Apia

The go of the bus to Apia
 'The going of the bus to Apia'

Similar claims have been made for Mundari (Hengeveld and Rijkhoff 2005), Kharia (Peterson 2006) and Riau Indonesian (Gil 2013a,b). In Mundari and Kharia, just as in Samoan, content verbs can be used both nominally and verbally. For instance, in Mundari nominally used *buru* means 'mountain' and verbally used *buru* means 'to heap up' (6); in Kharia nominally used *lebu* means 'man' and verbally used *lebu* 'to become a man' (7).

- (6) a. Buru=ko bai-ke-d-a Mundari
 Mountain=3PL.S make-COMPL-TR-IND (Evans & Osada 2005)
 'They made the mountain.'
- b. Saan=ko buru-ke-d-a
 Firewood=3PL.S mountain-COMPL-TR-IND
 'The heaped up the firewood.'
- (7) a. Lebu del=ki Kharia
 Man came.MV.PST (Peterson 2006)
 'The man came'
- b. Baghwan lebu=ki
 God man.MV.PST
 'God became a man'

And for Riau Indonesian, Gil (2013a,b) has claimed that the syntactic distribution of any thing-denoting or action-denoting word is the same. E.g., both *abang* ('(elder) brother') and *kencing* ('to pee') can be modified by a demonstrative (as shown in (8) below), and may also appear in existential constructions, form the complements of adpositions, or combine with topic markers.

- (8) a. Abang in-i Riau Indonesian
 Elder.brother DEM-PROX (Gil 2013b)
 'that brother/man'
- b. Ter-kencing in-i
 Non_AG.pee DEM-PROX
 'to pee'

The question is thus whether the examples in Mundari, Kharia, Samoan and Riau Indonesian (and any other language that exhibits the same pattern) form counterexamples to the claimed universal noun-verb distinction, or whether these languages nevertheless underlyingly exhibit distinct nouns and verbs.

Within the functional paradigm, Hengeveld (1992, 2005) and Hengeveld & Rijkhof (2005) have argued that languages that lack a morpho-syntactic noun-verb distinction exhibit a supercategory dubbed *contentives*. The same conclusion has been reached by Mosel and Hovdhaugen (1992), who have also argued that languages such as Samoan lack distinct nouns and verbs, and exhibit a single lexical supercategory instead. By contrast, Croft (2005), among others, has argued that in this type of languages such nouns and verbs are actually homophonous: in (5) there are two instances of *alu*, a noun *alu* ‘(the) going’ and a verb *alu* ‘to go’. The central argument for postulating a noun-verb distinction in languages where there are no visible morpho-syntactic differences between nouns and verbs, and thus for denying the existence of contentives, is that the meanings of the verbal and nominal usages of such alleged contentives do not follow compositionally. For instance, Samoan *tusi* means ‘to write’, ‘letter’ and ‘book’. Similarly, Samoan *fana* means ‘to shoot’ and ‘gun’, *gaoi* ‘to steal’ and ‘thief’, and *eklaesia* ‘to go to church’ and ‘church member’. It would be very hard to come up with a fully compositional analysis purely on the basis of the linguistic environment that can derive these meanings (and these meanings only) from a single semantic core. Evans & Osafa (2005) for this and other reasons assume that languages that seem to exhibit contentives (Mundari is their example) actually involve zero-derivation and do not exhibit a lexical supercategory ‘contentives’. In order to address these problems, Hengeveld and Rijkhoff (2005) have argued that in such flexible languages interpretation does not have to proceed in a strictly compositional fashion. For them, the underlying semantics is vague, so that both readings can come about, even though it is not predictable which meanings must be yielded. Contentives only have some flexible core, and the more specific meaning has to come about contextually.

Within minimalism, there are different ways to approach this question, depending on whether the categorial status of nominals, verbals and adjectivals is lexically encoded or not. For Baker (2003), such lexical categories are indeed universally available. To strengthen his case, he presents data as well from languages that are generally taken to lack a noun-verb distinction, such as Makah. In Makah, what both look like verb and nouns can function as an argument when followed by a determiner. But Baker points out that closer scrutiny still reveals differences between real verbs and nouns. For instance, real nouns can also be used as a bare

arguments (i.e. without the determiner), but real verbs and adjectives cannot, suggesting that in these cases obligatory nominalization is going on.

For non-lexical approaches, there is no such thing as a noun-verb distinction as what look like nouns and verbs are roots that are embedded in different syntactic structures. Hence, the question here boils down to whether universally roots can be embedded by both functional heads of an extended nominal and an extended verbal projection.

Most scholars working in Distributed Morphology, following up on Marantz' notion of featureless roots, would tend to assume so, but primarily because such frameworks tend to take the set of formal features active in language to be universal in the first place. Hence, in order to assess the validity of these underpinnings of Distributed Morphology, the question needs to be addressed what the nature of formal features is, and in particular, whether the set of formal features is pre-given by Universal Grammar or not.

4. The nature of formal features

4.1 Universal vs. emergentist views on formal features

Over the past two decades, several proposals have been formulated that aim at accounting for the presence of the set of formal features in natural language grammars. For one, it has been argued that Universal Grammar provides this set of formal features, and that every language has the same set of formal features at its disposal – a view much in line with the so-called cartographic approach, which, in its most radical version, assigns a universal syntactic structure to all natural languages with variation lying solely in the way that (parts of) this structure are phonologically realised (cf. Pollock 1989, Beghelli & Stowell 1997, Rizzi 1997, 2004, Cinque 1999, 2002, 2006, Starke 2001, 2004, Caha 2009; Miyagawa 2009; Baunaz et al. 2018).

More recently, an alternative view arose which states that the set of formal features is as minimal as possible in every language. Under this view, sometimes referred to as *emergentist* or *WYSIWYG* (*What You See Is What You Get*) approaches, formal features and, consequently, functional projections should only be assumed to be present if there is overt evidence for it (cf. Iatridou 1990; Grimshaw 1997; Bobaljik & Thrainsson 1998; Koenen 2000; Nilsen 2003; Zeijlstra 2008, 2014; Biberauer & Roberts 2015).

The main difference between these building block grammar / WYSIWYG approaches and the cartographic approach (in its most radical sense) is that the visible presence of a particular formal feature in a particular language (for instance, if it overtly heads a functional

projection) does not, under the former approach, imply its presence in all languages, whereas this is the basic line of reasoning under the latter approach (cf. Chomsky 2001; Cinque 1999; Kayne 2000; Starke 2004; Miyagawa 2009). This reduces the question as to what constitutes the set of formal features to a question about the nature of Universal Grammar. Is Universal Grammar a rich body of knowledge that contains the set of all formal features that a language may be sensitive to, or is Universal Grammar, as has been proposed in more recent minimalist views (cf. Chomsky 2005), much poorer in nature, and are the relevant formal features to be acquired in the course of first language acquisition?

Two types of arguments have been provided why the set of formal features should be part of Universal Grammar. The first one comes from observed structural and featural hierarchies. The starting point for cartography has been Cinque (1999), who has famously shown that the relative order between adverbials is uniform across languages. For instance, speaker-oriented adverbs like *allegedly* must always be in a structurally higher position than aspectual adverbs such as *completely*, and the same holds for epistemic modal adverbs like *probably* and temporal adverbs like *always*, as illustrated for English below:

- (9) a. Allegedly, Mary completely finished his painting.
 b. *Completely, Mary allegedly finished his painting.
- (10) a. Suzanne probably always went to her classes.
 b. *Suzanne always probably went to her classes.

Cinque observed that adverbials in all languages in the world appear to be subject to the following structural hierarchy.

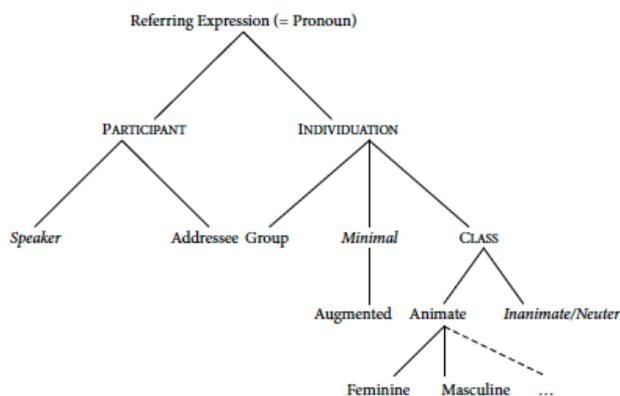
- (11) [*frankly* Mood_{speech act}] [*fortunately* Mood_{evaluative}] [*allegedly* Mood_{evidential}] [*probably* Mod_{epistemic}] [*once* T(Past)] [*then* T(Future)] [*perhaps* Mood_{irrealis}] [*necessarily* Mod_{necessity}] [*possibly* Mod_{possibility}] [*usually* Asp_{habitual}] [*again* Asp_{repetitive(I)}] [*often* Asp_{frequentative(I)}] [*intentionally* Mod_{volitional}] [*quickly* Asp_{celerative(I)}] [*already* T(Anterior)] [*no longer* Asp_{terminative}] [*still* Asp_{continuative}] [*always* Asp_{perfect(?)}] [*just* Asp_{retrospective}] [*soon* Asp_{proximative}] [*briefly* Asp_{durative}] [*characteristically(?)* Asp_{generic/progressive}] [*almost* Asp_{prospective}] [*completely* Asp_{SgCompletive(I)}] [*tutto* Asp_{PICompletive}] [*well* Voice] [*fast/early* Asp_{celerative(II)}] [*again* Asp_{repetitive(II)}] [*often* Asp_{frequentative(II)}] [*completely* Asp_{SgCompletive(II)}]

For Cinque, each of these adverbial categories involve a formal feature of their own. For him, these features head different phrases that must stand in this particular hierarchical order.

Cinque's hierarchy is not the only in its kind. Rizzi (1997) made similar observations about the relative order between structural positions in the left-periphery (involving formal features like topic and focus) and Ramchand (1997) has argued that within verbal phrases similar hierarchical relations can be observed.

Whereas Cinque essentially proposes a syntactic hierarchy, his proposal boils down to the existence of a hierarchy between different formal features in combination with the conjecture that each of these features heads a phrase of its own. Such featural hierarchies have also been proposed in other domains, albeit it without such syntactic ramifications, for instance when it comes to the various formal (ϕ -)features that constitutes pronouns. Harley & Ritter (2002) propose that these features stand in a hierarchical relation as depicted in (12):

(12)



Such featural hierarchies do not only determine which formal features constitute pronominal paradigms, but also which features are dependent on others. For instance, the features [Feminine] and [Masculine] can only be grammatically active in a particular language if its grammar also exploits a feature [Animate]. Harley & Ritter (2002) claim that such feature hierarches must also be acquisitionally reflected. The acquisition of [Feminine] and [Masculine] can only take place of [Animate] has been acquired before.

An important aspect of this featural hierarchy is that it can also account for markedness effects. It is often observed that one feature or more marked than another. For instance, the feature underlying the 2nd person, [Addressee], is generally considered more marked than the feature underlying the 1st person. And 3rd person is even considered the most unmarked form. Outside, pronominal domains, past tense morphology is considered more marked than present tense morphology. Rather just postulating that certain features happen to be more marked,

within a feature hierarchy like (12), markedness can be seen as a reflection of the distance to the highest node. A third person then, reflects the absence of a feature [Speaker] or [Addressee]; it simply lacks specific person features not (see Forschheimer 1953, Benveniste 1971, Heim 2008, Sauerland 2008, Kratzer 2009, Zeijlstra 2015). Unmarkedness follows from featural underspecification.

Supporting evidence for the view that certain pronouns, like 3rd person pronouns, are featurally underspecified comes from the fact that 3rd person subjects like *he* or *she* are known to be able to make reference to a speaker or hearer too. As Heim (2008) has shown, a sentence like (13) cannot only be used to talk about a set of girls that does not include the speaker or hearer. (13) can also be uttered by, or addressed to, a member of the same set of the girls that are being talked about. This is evidenced by the fact that adding a continuation to (13) like ‘including me (and you)’ is not infelicitous.

(13) Every girl invited herself.

Similar assumptions that are standardly made in this respect is that singular is nothing but the absence of a number feature [Plural] (though see Sauerland et al. 2003) and present tense the absence of a tense feature [Past] (cf. Sauerland 2002).

The reason why scholars like Cinque, Rizzi, Ramchand and Harley & Ritter take these features and the way they are structurally related to be part of Universal Grammar, as otherwise the cross-linguistic uniformity would be left unexplained. However, it is not a priori the case that this uniformity cannot receive a syntax-external, or even a grammar-external explanation.

Focusing on Cinque’s Hierarchy, Ernst (2002) argues instead that that adverb ordering is (mostly) determined by semantic principles in terms of semantic selectional requirements. He argues that the order in (11) should be replaced by the semantic hierarchy in (14).

(14) Speech-Act > Fact > Proposition > Event > Specified event

Another attempt to reduce Cinque’s hierarchy to semantic scope relations is Nilsen (2002) who provides a semantic account for the relative order of adverbs *always*, *completely* and *not*. Ramchand & Svenonius (2013) propose a UG-based tripartition of the clause into a V-domain, a T-domain and a C-domain, which for them reflects a conceptual hierarchy Proposition > Situation > Event. Further articulation within these domains can then be language-specific. Also featural hierarchies like the one proposed by Harley & Ritter, have received semantic explanations (see, for instance, Heim 2008, Sauerland 2008, Kratzer 2009).

A second type of argument in favour of a universal pool of formal features comes from so-called *ABA effects. As Caha & Vandenwyngaerd 2017 put it: “Morphological paradigms can be ordered so as to observe the *ABA restriction, i.e. such that only contiguous cells in a paradigm are syncretic. Syncretisms thus reveal a hierarchy in paradigms, which is in turn accounted for in terms of a hierarchy of underlying features. Consequently, syncretisms can be used as a tool for the diagnosis of feature structures.”

Foundational discussions of *ABA patterns are found in Caha (2009) on case and Bobaljik (2012) on suppletion for comparative and superlative forms of adjectives. Concerning the latter, as the table below shows, positive, comparative and superlative adjectives may have one shared base or employ two or even three different bases. However, what is impossible is that the positive and the superlative form of an adjective employ the same base to the exclusion of the comparative.

(15)

Suppletion for comparative vs. superlative adjective-forms:

	PATTERN	POSITIVE	COMPARATIVE	SUPERLATIVE	LANGUAGE
a.	AAA	small	small-er	small-est	English
b.	ABB	good	bett-er	be-st	English
c.	ABC	bon-us	mel-ior	opt-imus	Latin
d.	*ABA	good	bett-er	good-est	English'

*ABA patterns have been used to motivate proposals that paradigmatic orderings reflect structural containment hierarchies. For example, Bobaljik (2012) argues that the structure of the superlative contains the structure of the comparative, which in turn contains that of the positive. The restrictions on possible syncretisms are then derived from the workings of spell-out, whereby (underspecified) vocabulary items expone contiguous regions or spans of featural hierarchies. If such *ABA effects hold universally, as is claimed by Bobaljik (2012), these featural hierarchies should be universal as well.

By contrast, others have argued against a universal set of formal features. For instance, Iatridou (1990) provides several arguments that the formal features that are active in the inflectional domain vary from one language to another and should not be taken to be universally present. Zeijlstra (2004) has argued that negation is a formal feature only in some, but crucially not all languages. These authors argue that formal features are not universal but rather language-specific.

Such emergentist/WYSIWYG views of grammar assume that a language-learning child presupposes the existence of certain syntactic features only if there is overt morpho-syntactic

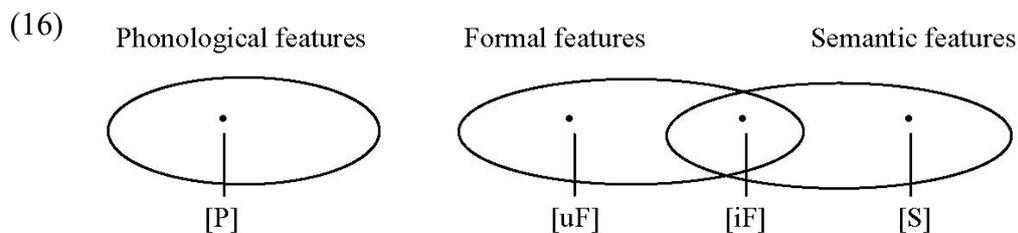
evidence for them in the language input. In other words, only those syntactic features of which there is a grammatical reflex — for instance, different parts of speech, involvement in agreement relations, triggers of movement—can be considered part of the formal feature inventory of the target language. Other potential syntactic features must be taken to be absent, irrespective of whether they are active in other languages.

Even though the latter view should be taken to be the default hypothesis (given that one should only postulate grammatical knowledge to be part of Universal Grammar that knowledge cannot otherwise be accounted for), its correctness can only be evaluated against a concrete proposal of how these formal features can be acquired in the first place. Not many proposals for this have been developed, though (see Zeijlstra 2014, Biberauer & Roberts 2015 for some examples), so it remains to be seen what such emergentist perspective should really amount to.

4.2 *The nature of formal features*

Irrespective of the question whether formal features are part of Universal Grammar or not, the question arises to what exact properties formal features have. The central question in this respect concerns the relation between formal and semantic features.

For Chomsky (1995), the set of formal features, i.e., the set of features that may participate in syntactic operations, is a set that intersects with the set of semantic features (the architecture of grammatical features is depicted in (16)). Consequently, formal features come about in two kinds: interpretable and uninterpretable formal features. Interpretable formal features ([iF]s) are features that are part of the intersection of the sets of formal and semantics features; therefore, both participate in syntactic operations and receive an interpretation. Uninterpretable features, by contrast, are features that are only formal, and not semantic in nature, and therefore cannot receive a semantic interpretation.



Examples of interpretable features are for instance ϕ -features on nominals. The 1st person plural feature on *we* is what gives rise to its reference to a plurality including the speaker. By contrast,

ϕ -features finite verbs are void of semantics. There is nothing in the meaning of a finite verb like *sleeps* that makes reference to a 3rd person singular.

Chomsky (1995, 2001) furthermore argues that every feature that reaches the interfaces must be interpretable, which refers to as the Principle of Full Interpretation:

- (17) Full Interpretation (FI): Every element of an output representation should provide a meaningful input to the relevant other parts of the cognitive system.

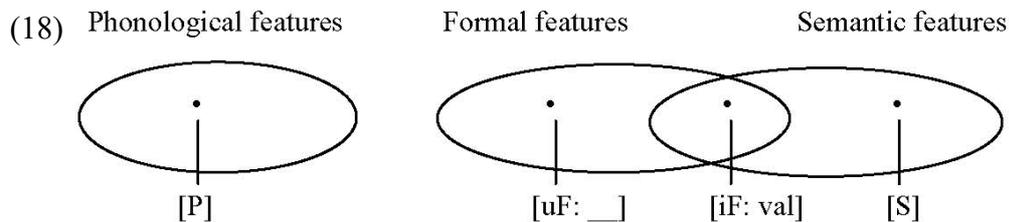
To satisfy Full Interpretation, all uninterpretable formal features must be deleted in the course of a syntactic derivation, as those, by definition, do not provide any meaningful input. For Chomsky (1995, 2001), Agree is the only available operation that is capable of deleting uninterpretable formal features: If a matching interpretable and an uninterpretable formal feature stand in a particular (c-command) configuration, the uninterpretable feature can be checked off against the interpretable one and, as a consequence, be deleted. Once every uninterpretable feature has been deleted, the derivation can be fully interpreted at the interfaces; after the deletion of those features that are only formal in nature, all features left over are either phonological or semantic features, which are interpretable at the relevant interfaces.

The core motivation behind alluding to (17) is that it reduces two understood issues in grammar to one, namely the existence of semantically redundant material and the triggering of movement operations. If movement takes place to check off uninterpretable formal features, it remains only mysterious why there would be uninterpretable features in the first place.

At the same time, the idea that semantic redundancy triggers movement is problematic in at least in one sense. Since it can only be determined within the semantic component of grammar whether a particular feature is interpretable, the (un)interpretability of a feature is not visible in narrow syntax (which precedes semantic interpretation). Hence, deletion of uninterpretable features as such cannot be a trigger for syntactic operations, as it would yield a *look ahead problem*, as was pointed out by Epstein et al. (1998) and Epstein & Seely (2000). For this reason, in later work, Chomsky argues that deletion of uninterpretable features is not the trigger of syntactic operations, but that, rather, feature valuation is.

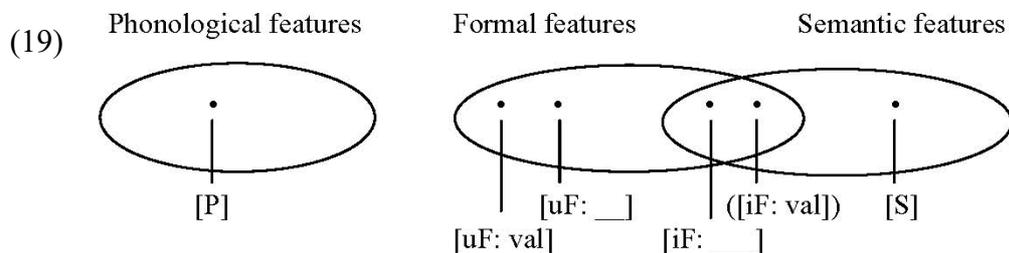
Chomsky (2002) proposes to enrich the feature taxonomy by including a second parameter, feature (un)valuedness. For him, all formal features that are interpretable are already valued within the lexicon, and formal features that are uninterpretable are also lexically unvalued. In other words, for him, interpretability and valuedness always go hand in hand, and the number of different types of formal features remains identical (interpretable valued formal

features and uninterpretable unvalued formal features). The 1st person plural feature on *we* is thus not only semantically active, but also already part of the lexical representation of *we*. A ϕ -feature on a finite verbs is then, apart from being meaningless, a feature whose ϕ -values are determined by the grammatical context (i.e., they come from the subject). This architecture is shown in (18), where “_” means *unvalued* and “val” means *valued*.



Now, Chomsky postulates that, during syntax, all lexically unvalued features must be valued under Agree and subsequently deleted before reaching the semantics interface. Since, every uninterpretable feature is taken to be lexically unvalued, only those formal features that are interpretable will thus feed semantics.

Note, that it is by pure stipulation, though, that (un)valuedness and (un)interpretability should always coincide. If that stipulation is given up, formal features should actually come about in four kinds: (i) interpretable and unvalued features; (ii) interpretable and valued features; (iii) uninterpretable and unvalued features; and (iv) uninterpretable and valued features. This is what has been proposed by Pesetsky & Torrego (2007), who argue that valuedness and interpretability are disentangled notions. Then, both types of interpretable features form a subset of the set of semantic features, and both types of uninterpretable features do not. Pesetsky & Torrego’s (2007) taxonomy thus looks as follows:



Again, lexically unvalued uninterpretable formal features are for instance ϕ -features on finite verbs, just as ϕ -features on nominals are valued interpretable formal features. An example of lexically valued but uninterpretable formal features would be tense features on finite verbs. Even though tense is only marked a finite verb (and must therefore enter a syntactic derivation

from the lexicon with its tense value already present), tense is not interpreted on the verb itself but higher up in the structure. A sentence like *Mary studied syntax* does not mean that in the past a study event took place, but that a study event took place of which Mary is the agent and syntax the patient. The tense value on the finite verbs is thus uninterpretable but it may value a higher tense operator (see Abusch 1997, Ogihara 1995, Kratzer 2009 and much subsequent work). Finally, an example of lexically unvalued but uninterpretable formal features may be the ϕ -features on an anaphor (like *herself*). Since, anaphors must have exactly the same set of ϕ -features as their antecedents, one could argue that anaphors enter the sentence unvalued and only receive their ϕ -features from their antecedents; at the same time, being a nominal, such ϕ -features on an anaphor must still be interpretable (see Kratzer 2009, Tucker 2011, Sundaresan 2012 a.o.).

The idea that the sets of formal and semantic features overlap has received a fair amount of criticism as well, both empirically and theoretically. Empirically, mismatches between the two types of features are often attested. For instance, an element may have a formal plural feature, but receive a singular semantic interpretation, such as *scissors* or *pants* in English. Examples in the other direction can also be attested; *furniture*, *family* are semantically plural, but syntactically singular. Likewise, certain nouns can be formally neutral but semantically feminine, such as German *Mädchen* ('girl'). Similar mismatches can also be attested in the verbal domain. Deponent verbs, like Latin *loqui* ('talk'), are formally passive but semantically active.

Theoretically, the evidence against the model in which (18)/(19) faces certain problems as well. The central idea behind this model is, as said, Chomsky's Principle of Full Interpretation. For Chomsky, any uninterpretable feature must be deleted/erased in syntax. However, it is unclear why particular formal features should be able to disappear from the structure just by appearing in particular configuration with a matching interpretable feature. Moreover, one may even wonder why features need to be deleted in order for the derivation to survive semantically. Why could the zero meaning contribution of an uninterpretable feature not simply be ignored by semantics? In fact, not ignoring the vacuous meaning contribution of an uninterpretable feature even yields a logical contradiction. Semantic features are defined as features that can constitute a distinction between two different semantic representations (cf. Svenonius 2006). Now, if all other things being equal, the presence of an uninterpretable feature in a structure that is otherwise fully interpretable can make a sentence crash within the semantic component, then this uninterpretable feature should by definition be taken to be a semantic feature. But if it is a semantic feature, Full Interpretation should not mind its presence.

For these and other reasons, various scholars have stepped away from semantically motivated feature checking. Preminger (2014) has argued that, at least in the domain of ϕ -agreement, valuation is the only relevant notion and that feature checking should be dismissed with altogether. Zeijlstra (2014, 2020), instead, has argued that the set of formal features should be fully disentangled from the set of semantic features (see also Smith 2015). Other scholars (e.g., Richards 2010, 2016) have argued that formal features should not be alluded to in the first place to account for particular syntactic operations, such as movement. The theoretical status of formal features in grammar, despite their empirical motivation and heuristic power, is thus still not settled upon.

5. By means of conclusion

In this article I have provided an overview of how word classes are generally analyzed within (mainstream) minimalist grammar. The starting point has been the observation that morpho-syntactic rules are not sensitive to word classes or grammatical categories, but rather to the lexical and formal morpho-syntactic features that may underlie them, potentially augmented with roots. The nature, distribution and relative ordering of such features have led to a variety of theoretical proposals. In this article I have outlined what I think are the most important approaches in this respect. Needless to say, what I have captured is only a small selection of what has been discussed and described in the literature on formal features. Such a selection is always subjective and other authors most likely would have made different choices. Nevertheless, I hope that this selection has provided readers with a representative impression of what has been, and can be said about the morpho-syntactic features underlying word classes and grammatical categories.

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