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Functional Categories and Syntactic Theory

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Abstract

The distinction between lexical and functional elements plays a major role in current research in syntax and neighboring aspects of the study of language. In this article, we review the motivations of a progressive shift of emphasis from lexical to functional elements in syntactic research: the identification of the functional lexicon as the locus of the triggering of syntactic actions and of syntactic variation, and the description and analysis of the complexity of functional structures in cartographic studies. The latter point leads us to illustrate current cartographic research and to present the maps created in the study of clauses and phrases. The maps of CP, IP, and other phrasal categories all involve a richly articulated functional sequence. We then address issues of the numerosity and typology of the functional lexicon, the constraints on the featural specifications of possible functional heads, and the relations between cartographic research and minimalism.

1. INTRODUCTION

The distinction between lexical and functional words (or morphemes) has a long tradition in linguistics. It dates back at least to Aristotle's distinction between "concepts" and "grammatical meaning" (see Carlson 1983, which provides an early insightful discussion of the lexical–functional dichotomy within the generative paradigm). The distinction involves morphemes that have contentive meaning (primarily nouns, verbs, and adjectives; but see Section 4) and morphemes that have purely "grammatical" meaning (e.g., determiners, copulas, and complementizers, which have more abstract interpretive properties, such as definiteness/specificity, predication, and subordination, respectively). The contribution of grammatical morphemes to the meaning of the sentence differs in another respect as well. When a contentive morpheme is missing (in the absence of an antecedent that governs its deletion), its contribution to the meaning of the sentence is not recoverable. This is not the case for purely grammatical morphemes, which may "be omitted, under certain circumstances, without loss of meaning" (Carlson 1983, p. 71; also see Muysken 2008, p. 47f). Functional morphemes often also "display phonological properties significantly different from those of words belonging to lexical categories" (Selkirk 2003, sect. 1; also see Muysken 2008, p. 62; 2009).

However, with these criteria alone, it is not always obvious to which class one should assign a certain morpheme. To what class do demonstrative reinforcers (like the 'here' of *these here guys* of certain varieties of English or the French analogue '-ci' of *ces hommes-ci*) belong? And how should we categorize morphemes expressing personal pronouns or the notion 'other'? A more reliable kind of evidence may be membership in a closed class of elements, typical of grammatical or functional morphemes, as opposed to membership in an open class, typical of contentive morphemes; this divide is akin to that used in psycholinguistics and the study of language acquisition and pathology.¹ Additional evidence that an item has functional status may be access to derivational morphology (typically limited to contentive elements), whereas inflectional morphology may affect both types of elements (e.g., in Romance languages, agreement affects both auxiliaries and contentive verbs). The appropriate linguistic distinction must be more abstract than the identification of two classes of "words," in that the class of functional elements encompasses both independent words and inflectional affixes. For example, both the future and past markers in English, *will* and *-ed*, belong to the class of functional elements, even though the former is an independent word and the latter is not (there is crosslinguistic variation: In Jamaican Creole and many other creole languages, both are independent words, whereas in Italian and other Romance languages, both are affixes attached to the verb). Despite the different morphological statuses of these markers, what they have in common is that, under current syntactic analyses, they are syntactic heads, giving rise to independent syntactic projections and taking other phrases as complements or specifiers [but, should Kayne's (2015) suggestion that heads are invariably silent be confirmed, what they have in common would have to be stated differently].

The distinction between contentive and functional heads is typically recognized in modern syntactic theory (see, e.g., the distinction between lexical and minor categories in Chomsky 1965 and the above-mentioned divide between lexical and functional morphemes in Carlson 1983; see also Borer 1983, Fukui 1986, Abney 1987), although there has recently been a significant shift of

¹Some psycholinguists have argued that functional elements play a critical role in the acquisition of items of the contentive lexicon (Christophe et al. 2008, Bernal et al. 2010) and in the fixing of syntactic properties, such as the head–complement order (Gervain et al. 2008; see also Shi & Lepage 2008). Much work has been devoted to the role of the lexical–functional divide in normal processing and language pathology; see, for instance, Bradley & Garrett (1983) on normal and agrammatic speakers and Dotan & Friedmann (2015) on conduction aphasia. On brain imaging studies focusing on the divide, see Friederici et al. (2000), Neville et al. (1992), and Diaz & McCarthy (2009).

emphasis from contentive to functional elements, which have progressively acquired a crucial role in the study of syntactic computations. This shift has occurred for different reasons:

- Uniformity of projections. Functional heads, much like contentive heads, give rise to full-fledged phrasal projections.
- The functional lexicon and the triggering of syntactic actions. Functional heads endowed with the appropriate morphosyntactic features trigger syntactic movement, and possibly other major syntactic actions.
- The functional lexicon as the locus of syntactic variation. Parameters of syntactic variation are encoded as morphosyntactic features in the functional heads.
- The complexity of functional structures and the cartography of syntax. Contentive projections are accompanied in syntactic representations by rich zones consisting of sequences of functional projections, which are charted in cartographic studies.

In Section 2, we address these four points, illustrating the increasingly important role of functional elements in syntactic theory. The question of the size of the functional lexicon leads us to integrate research in typological linguistics on the possible targets of grammaticalization, which enables a crosslinguistic estimate of the dimension of such a lexicon. This issue is closely related to the question of how the boundaries between functional and contentive elements should be defined—whether a binary distinction is justified or whether a more articulated gradient should be assumed. We discuss these issues in Section 4, following a description in Section 3 of different maps of functional structure that have been proposed in recent work. In Section 5, we briefly discuss the role of functional elements in minimalism and cartographic studies, arguing that cartography and minimalism are fully compatible lines of research exploring the issue of functional elements from complementary angles.

2. THE CENTRAL ROLE OF FUNCTIONAL ELEMENTS IN SYNTACTIC COMPUTATIONS

2.1. Uniformity of Projections

An important starting point for the modern syntactic investigation of functional elements was the hypothesis that such elements, much like elements of the contentive lexicon, head their own phrasal projections. This hypothesis generalized X-bar theory from contentive categories to all categories, making the general conception of syntactic structures simpler and more uniform. In this conception, all phrases are headed, and elements of the functional and contentive lexicon project phrasal categories in a uniform manner (Chomsky 1986). These ideas also gave rise to the conception that all major constituents are formed by a lower structural zone built around contentive elements (verbs, nouns, adjectives, and so on) and a higher functional zone completing the contentive zone with more abstract and sometimes purely formal specifications (Grimshaw's 2000 concept of extended projections). Thus, a sentence consists of a VP embedded under an intermediate IP zone (a view credited to Kenneth Hale's groundbreaking work on American Indian and Australian languages; see, e.g., Hale 1983) and a higher CP zone; nominal expressions are in fact DPs embedding NP layers (Abney 1987), and APs and PPs may also be amenable to such a bipartite analysis. This view immediately enriched the list of head positions in syntactic representations, giving rise to syntactic approaches to inflectional morphology in which contentive elements move in the inflectional field and pick up (or check) inflectional affixes in their functional extended projections (Emonds 1978, Pollock 1989, Belletti 1990), in ways consistent with the Mirror Principle (Baker 1988). For a recent critical appraisal, see Adger (2012).

2.2. The Functional Lexicon and the Triggering of Syntactic Operations

Once linguists accepted the fundamental bipartite structure of clauses and phrases, it became clear that the targets of syntactic movement were typically in the functional zone. A movement in raising, passive, and unaccusative structures targets a subject position, namely a specifier in the inflectional field; core cases of A' movement in questions, relatives, comparatives, topicalization, and so on typically target the complementizer system.

Other, apparently less straightforward, cases turned out to be amenable to the same conclusion. Romance pronominal clitics are obviously verbal clitics, in that they cannot appear in verbless small clauses. Nevertheless, the landing site of cliticization cannot be the lexical verb, as clitics typically attach to the auxiliary, not to the (contentive) past participle, in languages such as Standard Italian, French, and Spanish (e.g., *Gianni l'ha portata al cinema* 'Gianni her has taken to the movies'); cases of attachment to the participle, such as the Romanian feminine clitic, are plausibly analyzable as targeting a lower functional head in the aspectual zone of the IP. Whatever technical approach is adopted (updates of Kayne's 1975 classical movement approach, e.g., Belletti 1999; approaches in terms of clitic voice, e.g., Sportiche 1996, or in terms of Agree operations, e.g., Roberts 2010), most recent analyses of cliticization agree that cliticization involves a dedicated functional head in the inflectional space of the verb, rather than the V category itself. Moreover, the target of cliticization may be lower than the surface position of the clitic because the complex Cl + host may be pushed up by verb movement, arguably as far as the C zone, as in French inverted interrogatives (e.g., *Mas-tu vu?* 'me + have you seen?').

Thus, there appears to be a division of labor between contentive and functional projections. The former are the locus of thematic assignment (and other forms of semantic selection) in configurations created by the structure-building mechanism, whereas the latter are involved in configurations created by movement of various kinds. If this is generally true, the functional lexicon is the repository of the feature specifications that trigger the fundamental syntactic action of movement (internal merge).

In a minimalist formalization, movement proceeds in two steps. First, a head endowed with an active morphosyntactic feature acts as a Probe, launching a search for a Goal with an active matching feature in its c-domain. Second, once the Probe–Goal relation is established (e.g., between a complementizer endowed with feature Q and a *wh*-phrase), the Goal may be merged with the whole structure, a case of internal merge. So, the core case (and possibly the only case) of a Probe acting as a trigger of internal merge is a functional head, whereas contentive heads typically enter only into external merge, satisfying selection. In approaches assuming late insertion of contentive elements (Starke 2009, Marantz 2013, and much related work), external merge is also triggered by functional elements, as is ellipsis in approaches such as that of Merchant (2001). Therefore, the emerging picture is one in which the functional lexicon is the fundamental engine of syntactic operations.

2.3. The Functional Lexicon as the Locus of Syntactic Variation

If the initial conception of the Principles-and-Parameters approach (Chomsky 1981) assumed that parameters are expressed on principles of Universal Grammar (e.g., the set of bounding nodes taken into account for Subjacency can vary crosslinguistically to some extent; Rizzi 1982, chapter 2), it was soon realized that this approach needed revisions for various reasons. A prominent problem was that certain crosslinguistically variable properties were linked to the presence of a given item in the lexicon of a particular language, rather than being global properties of a grammatical system. For instance, long-distance anaphora could not be regarded as a global property of the Binding Theory of a particular language, but rather as keyed to the presence of specific items (e.g., Icelandic *sig*) in

the language's lexicon (Manzini & Wexler 1986). This and other considerations (see Rizzi 2014 for discussion) led to what is sometimes called the Borer–Chomsky conjecture (see Borer 1983):

- (1) The locus of parameters is the functional lexicon.

Another example is the Null Subject Parameter, which can be considered a property of the functional head bearing agreement features in some languages (T in many minimalist analyses, e.g., Chomsky 1995; Subj or Person in other approaches, e.g., Rizzi & Shlonsky 2007; also see Biberauer et al. 2010). Parametric properties of verb movement to T (e.g., in French) or to C (in V2 languages) can be expressed as properties of the functional heads acting as probes, and similarly for parameters involving N or NP movement in nominal structures (Cinque 2005). *wh*-in situ and *wh*-movement languages can be characterized through the properties of attracting Q heads in the complementizer systems. Also, fundamental word-order properties such as VO versus OV—whether they are expressed as a parameter on external merge, as in traditional approaches; on movement (as in Kayne 1994, 2003; Cinque 2013a); or on externalization (as in Berwick & Chomsky 2011)—can be regarded as expressed on the categorizing functional head *v*, with possible transcategorial generalizations such as those investigated under the heading of the Final-over-Final Constraint (Biberauer et al. 2008).

Conjecture 1 may seem excessively restrictive in that it precludes the possibility of expressing parametric properties on items of the contentive lexicon. A case in point may be the property permitting Exceptional Case Marking of infinitival complements with *believe/expect*-type verbs in English (*I expected John to win the race*) versus the impossibility of such structures in Romance languages. But the property in question is characteristic of certain verb classes, rather than of individual items, which suggests the possibility of a parameterization expressed on a properly “flavored” *v* (let us call it *v*_{epistemic}), rather than on individual contentive verbs (see Harley 2011 and references there, and Section 4, below, on the complexities of the functional–lexical divide in the verbal system).

2.4. The Complexity of Functional Structures and the Cartography of Syntax

As soon as linguists began to systematically investigate the functional zones associated with phrases and clauses, it became clear that functional structures are richly articulated objects. In fact, much of the complexity of syntactic structures resides in the functional layers. The initial impulse for focusing on the fine details of functional structures came from the Split Infl hypothesis: Pollock (1989) showed that it was advantageous to separate the finer components of the node hosting verbal inflections, each of which gives rise to a full syntactic projection. This move permitted a more illuminating syntactic analysis of inflectional morphological properties and, at the same time, created more space in syntactic representations, which could be profitably used to make advances in the study of adverb syntax. This trend, initiated by the separation of Tense and Agr(eement), quickly extended to other specifications expressed by verbal inflections (modality, mood, aspect, and voice, completed by different kinds of agreement morphemes and special layers such as negation), giving rise to the fully systematic crosslinguistic approach to clause structure put forward by Cinque (1999).

In parallel, the splitting approach was adopted for the complementizer system, which also turned out to be advantageous for a proper integration of different left- (or right-)peripheral particles, while permitting a structural approach to the mechanisms for the expression of scope–discourse semantic properties, namely the scope positions of different kinds of clause-peripheral operators as well as discourse-related articulations such as Topic–Comment and

Focus–Presupposition (Rizzi 1997). If syntactic structures are richly articulated, then a natural endeavor is to draw maps of such complex objects that are as detailed as possible. This is the goal of cartography of syntactic structures, which focuses largely on functional configurations (Cinque & Rizzi 2010a, Shlonsky 2010). The resulting maps offer a new tool for comparative syntax, interact in many ways with theoretical and descriptive research on syntactic computations, and may provide a background for applied research, ranging from first- and second-language acquisition to language pathology and computational linguistics.

3. SOME MAPS OF FUNCTIONAL STRUCTURES

In this section, we illustrate some results of cartographic work on different zones of the syntactic tree.

3.1. The CP Zone

The empirical impetus for analysis of the left periphery came from studies of Italian, with extensions to Germanic and other Romance languages (Rizzi 1997). This line of research quickly proved to be generally relevant and was extended to other language families. On Romance, see Rizzi (1997; 2000; 2004a,b), Belletti (2004a,b; 2009), Poletto (2000), Cinque (2002), and Cardinaletti (2004); on Germanic, see Grewendorf (2002) and Haegeman (2004), among many others. See Roberts (2004) on Celtic; Garzonio (2005) and Krapova & Cinque (2008) on Slavic; Puskás (2000) on Finno-Ugric; Shlonsky (1997, 2014) on Semitic; Frascarelli & Puglielli (2008) on Cushitic; Aboh (2004), Biloa (2013), and Torrence (2013) on African languages; Durrleman-Tame (2008) on Creole; Tsai (2008), Badan & Del Gobbo (2011), and Paul (2014), on Chinese; Endo (2007, 2014) and Saito (2010) on Japanese; Pearce (1999) on Austronesian; Speas & Tenny (2003) on Native American languages; and Legate (2001) on Australian aboriginal languages.

Much research has also been produced in Romance and Germanic dialectology (e.g., Ledgeway 2003, Paoli 2007, Grewendorf & Poletto 2009, Cruschina 2012) and on classical languages and diachrony (Salvi 2005, Benincà 2006, Franco 2009, Danckaert 2012). Several volumes of *The Cartography of Syntactic Structures*, a subseries of the *Oxford Studies in Comparative Syntax*, are devoted entirely or in part to the cartography of the left periphery; see Rizzi & Bocci (2015) for a survey and more detailed references.

The observation that prompted initial work on the cartography of the left periphery was that different elements classically analyzed as complementizer particles occupy distinct positions, as shown by their order with respect to a third element. The research strategy was first to explore such positional properties in a language like Italian, which permits the co-occurrence of many different elements in the initial periphery, and then to explore invariant and variable properties in more constrained languages through comparative research. In Italian, the finite declarative complementizer *che* (corresponding to English *that*) and the infinitival prepositional complementizer *di* (akin to English *for*, but specialized for control structures) are, respectively, followed and preceded by a topic. This observation supports a partial map *che* . . . Top . . . *di*. Generalizing this observation led to the hypothesis that the C zone is delimited by the two heads labeled Force (expressing illocutionary force and clausal type) and Finiteness (Fin, agreeing in finiteness with the adjacent clause). Some languages indeed simultaneously lexicalize two left-peripheral heads with material sandwiched in between, arguably overtly expressing the whole Force–Fin system. Examples include the two particles *mai* and *a* in Welsh, which surround a focus and a preposed adverbial (example 2; Roberts 2004), and the *che*-like complementizer particles in Turinese, which surround a topic (example 3; Paoli 2007):

- (2) Dywedais i mai fel arfer y dynion a fuasai'n gwerthu'r ci.
Said I MAI as usual the men Prt would Asp sell-the dog
“I said that it’s as usual the men who would sell the dog.”
- (3) A chërdo **che**, col liber, **ch’** a l’ abia già lesulo.
SCL believe.3p that that book that SCL it have.SUBJ.3s already read.it
“They believe that s/he has already read that book.”

The space thus defined is used to express properties of scope–discourse semantics, specifically, different kinds of operators (interrogative, relative, exclamative, comparative, etc.), and positions used to express articulations relevant for the structuring of discourse, such as Topic–Comment and Focus–Presupposition.

A basic tenet of cartographic work on the left periphery is the criterial approach to scope–discourse semantics (Rizzi 1997). According to this view, the left periphery is populated by functional heads, such as Q, Top, and Foc, which have a double function. First, in the syntax, they act as probes attracting a phrase bearing matching features; for instance, Q attracts a *wh*-element bearing the +Q feature, and Top attracts an element bearing the +Top feature. Second, at the interfaces with sound and meaning, criterial heads guide interpretation by triggering the appropriate routines: At the interface with sound, special intonational contours are associated with scope–discourse configurations, and at the interface with meaning and discourse, the dependents of the criterial head are interpreted in terms of the appropriate notions. Example 4 shows a topic–comment structure instantiated by Romance Clitic Left Dislocation (Cinque 1990):

- (4) Il tuo libro, *Top* Gianni lo leggerà domani
Your book, *Top* Gianni [it read.will] tomorrow
“Topic” “Comment”

Here, the Top head attracts the DP *il tuo libro* to the left periphery; at the interface with sound, it triggers the intonational contour of topic structures (Bocci 2013), whereas at the interface with meaning and discourse, Top triggers the interpretation of its specifier as the topic and of its complement as the comment. In general, criterial heads give rise to Spec–head–complement configurations that guide interpretation on the basis of the inherent content of the criterial head: Topic–*Top*–Comment, Focus–*Foc*–Presupposition, *wh*-operator–*Q*–scope domain, and so on.

Thus, scope–discourse properties can be traced back to a uniform syntactic configuration that is read by interface systems; the criterial approach is therefore considered part of a program of “syntacticization” (Cinque & Rizzi 2010a) of semantic, pragmatic, and prosodic properties in which syntax offers transparent and uniform hierarchical configurations that are interpreted by simple interpretive routines in the interface systems. The fact that criterial heads are overtly expressed in some languages offers straightforward evidence supporting this structural approach to scope–discourse properties. For instance, many languages have overt topic and focus particles (such as *yà* and *wè* in Gungbe; Aboh 2004); overt Q particles (such as Japanese *ka*; Endo 2007, Saito 2010); or overt relativizing complementizers, possibly distinct from declarative complementizers (e.g., in dialectal Germanic varieties; Bayer 1984). Under the usual assumptions of uniformity, the natural hypothesis is that languages generally use such structural mechanisms, except that the dedicated criterial heads may be overt or null, a familiar kind of low-level parameterization.

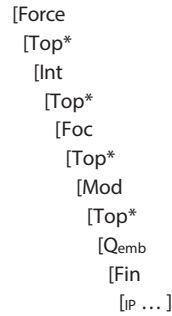


Figure 1

How are the different criterial positions arranged within the complementizer zone? Detailed descriptive research on Italian has led to the functional sequence depicted in **Figure 1** (Rizzi & Bocci 2015). Let us comment on the individual heads in **Figure 1**:

- Int. Int is the position of the interrogative yes/no complementizer *se* ‘if’; it also hosts the *wh*-element *perché* ‘why’ in its Spec; it can be surrounded by topics; and it necessarily precedes the focus position (Rizzi 2001). Both Force and Int may be simultaneously lexicalized in special constructions, such as reported questions in Spanish, giving rise to the *que . . . si* sequence (see Saito 2010 and Rizzi 2013 for recent discussions).
- Foc. In the left periphery, Foc is used in standard Italian to express corrective focus and mirative focus (Bianchi et al. 2015), whereas in other systems, such as Sicilian (Cruschina 2012), it may also express new information focus. Foc can occur only once in the left periphery, presumably for the principled reasons explored by Rizzi (1997, 2013).
- Mod. Adverbials can be highlighted by being preposed to the left periphery without being properly topical or focal (e.g., *Rapidly, John left the room*). Rizzi (2004a) assumes that this movement is triggered by a dedicated Mod(ification) head, lower than Foc.
- Q. In main *wh*-interrogatives, the Q feature appears to be associated with Foc, as Q and Foc are in complementary distribution; in embedded interrogatives, *wh*-elements may be attracted by an independent Q head, compatible with Foc and following it (Rizzi 1997). This head, presumably licensed by the main predicate, is labeled Q_{emb} in **Figure 1**.²
- Top. Topic heads can be reiterated and may freely occur in the complementizer space in Romance languages; finer analyses postulate distinct topic positions with distinct interpretive properties (Benincà & Poletto 2004, Frascarelli & Hinterhölzl 2007, Bianchi & Frascarelli 2010). “Hanging topics” (Benincà & Poletto 2004) have topic-like properties, but are attached to a higher position and differ in syntactic and interface properties from regular topics.

This comparative analysis underscores a robust crosslinguistic uniformity, as well as the necessity of postulating certain parameters of variation:

- One set of parametric properties deals with the overt lexicalization of the different heads involved in the C zone, the Force–Fin heads, and the criterial heads, which may be overtly expressed or null in different languages, as discussed above.

²“Special questions” (Obenauer 2006), such as rhetorical questions, “surprise-disapproval questions,” and so on, may also involve special Q markers that are distinct in syntactic and interpretive properties from ordinary Q markers, possibly in association with discourse particles, as proposed by Bayer & Obenauer (2011).

- Certain properties of Top are parameterized. Some languages (e.g., Gungbe) permit a single topic position, whereas other languages (e.g., Romance languages) permit an indefinite number of topics.
- Moreover, in addition to the Top position higher than Foc, certain languages (e.g., Italian) also permit a Top position lower than Foc, thus permitting the sequence Top–Foc–Top, whereas other languages do not. For example, Abidji permits a proliferation of topics (each one marked by an overt Top head) higher than focus, but no lower Top position (Hager-M’Boua 2014). The low topic position, with interpretive properties of the “familiarity topic” (Bianchi & Frascarelli 2010), can also occur in embedded contexts (adjunct clauses) that are normally inconsistent with higher topics (Haegeman 2012).
- Left-peripheral focus positions also have parameterized properties. In some languages the position is used only for “special” focal interpretations, whereas in other languages it can be used for new information focus as well (see above). Cruschina (2012) argues that distinct specialized Foc heads are involved; such heads can never co-occur, though, presumably for principled reasons (Rizzi 1997, 2013). Other languages (e.g., French, Japanese) may use the cleft construction (preferentially or uniquely; Belletti 2009, 2013) to express left-peripheral focalization.

Other parameters interact with the possible expansion of the left periphery in particular languages. In V2 languages, a parameterized constraint permits movement of a single element (focal, topical, preposed adverbial, or expletive) to the left periphery of the clause (see Haegeman 1996, Roberts 2004, and much subsequent work). Certain languages may permit or require phrases carrying criterial features to remain IP internal, giving rise to various in situ constructions.

A low clausal periphery has been proposed to express properties akin to those expressed by the left-peripheral positions, such as focus and topicality of different kinds (Belletti 2004a). The low periphery may be thought of as associated with the *v*P, so that the two peripheries are presumably associated with the two nodes, CP and *v*P, which define phases (Chomsky 2001). The issue of the “further explanation” of properties of the functional hierarchy (i.e., Why do functional elements appear in particular orders?) arises for the CP, much as for other categories. Principles of locality and principles operating at the interface with meaning may be involved (see Abels 2012 on the role of locality, Cinque & Krapova 2014 for discussion, and Rizzi 2013 for a general assessment and discussion of the relevant literature).

3.2. The IP Zone

The functional projections of the IP seem to be even more complex. Cinque (1999, 2006) presented some crosslinguistic evidence concerning invariant ordering of clausal functional projections below the CP zone. It consisted of two steps. The first rested on the observation that the grammatical morphemes for the distinct moods, tenses, and aspects enter a syntactic hierarchy to which languages appear to conform.

For example, when they are overtly realized, epistemic mood morphemes appear further away from the verb than does tense, regardless of whether both precede (example 5*a*) or follow (example 5*b*) the verb:

- Thai
 (5a) lom **khong** cà? kamlang phát
 wind **EPIST** **FUT** PROG blow
 ‘The wind must be blowing’
 (Cinque 1999, p. 159)

- Garó (Sino-Tibetan)
- (5b) Anti-ci re'an-**aha-kon**
 market-to go-**PAST-EPIST**
 'He must have gone to the market'
 (Cinque 1999, p. 72)

Aspect morphemes are closer to the verb than are tense morphemes, whether both precede (example 6a) or follow (example 6b) the verb:

- Ponapean (Micronesian)
- (6a) i **pahn kin** kangkang rais
 I **FUT HAB** eat.PROG rice
 'I will habitually be eating rice'
 (Cinque 1999, p. 160)

- Evenki (Altaic)
- (6b) Nunqan ulle-ve tulile lo:van-d'e-**ngne-re-n**
 she meat-ACC outdoors hang-**IMPF-HAB-PAST-3sg**
 'She used to hang meat outdoors for some time (for drying)'
 (Cinque 1999, p. 154)

Similarly rigid orderings are found with the different types of modals, causative and perception verbs, voice, and so on. Despite the pre- or postverbal positioning of the various grammatical morphemes, their relative order remains constant. This situation requires recognizing and undoing the effects of a number of factors that come to obscure the unique universal structure of sentences, such as the displacement of VPs or of larger portions of the sentence (also see Cinque 2013a,b for some principled exceptions). Once these effects are undone, an articulate order (hierarchy) of functional morphemes emerges, a fragment of which is given in **Figure 2**.³

The second step consisted of the recognition that the various classes of adverbs (more accurately, AdvPs) are also ordered among one another in a syntactic hierarchy. This hierarchy turns out to match exactly the hierarchy of mood, tense, modality, aspect, and voice morphemes, as shown by a juxtaposition of the two hierarchies in **Figure 3**.

Examples 7–11 show the fixed order of pairs of adverbs:

- (7a) Whenever I meet him, John has *always just* returned from abroad
 (7b) *Whenever I meet him, John has *just always* returned from abroad
- (8a) John can *normally* be *briefly* seen in his office on Mondays
 (8b) *John can *briefly* be *normally* seen in his office on Mondays
- (9a) John *fortunately no longer* smokes
 (9b) *John *no longer fortunately* smokes

³For our purposes, it is immaterial whether some such grammatical notions turn out to be further decomposable into more elementary notions.

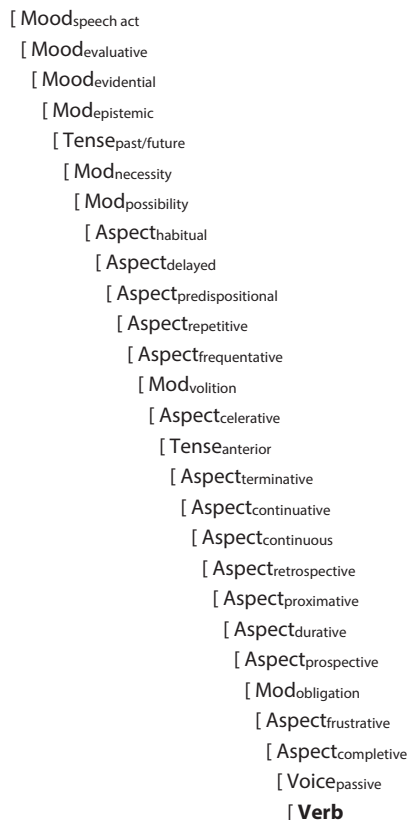


Figure 2

- (10a) John *no longer always* wins his games
 (10b) *John *always no longer* wins his games
- (11a) John *frequently completely* forgets his duties
 (11b) *John *completely frequently* forgets his duties

The rigid ordering in examples 10a and 10b is also found in the following languages:

- Italian
- (12a) Gianni non vince *più sempre* le sue partite
 John doesn't *any longer always* win his games
 (12b) *Gianni non vince *sempre più* le sue partite
 *John doesn't *always any longer* win his games
- Norwegian
- (13a) Jon aksepterer *ikke lenger alltid* var invitasjon
 'John accepts no longer always our invitation'

<p>a Mood_{speech act} Mood_{evaluative} Mood_{evidential} Mod_{epistemic} Tense_{past/future} Mod_{necessity} Mod_{possibility} Aspect_{habitual} Aspect_{delayed} Aspect_{prepositional} Aspect_{repetitive} Aspect_{frequentative} Mod_{volition} Aspect_{celerative} Tense_{anterior} Aspect_{terminative} Aspect_{continuative} Aspect_{continuous} Aspect_{retrospective} Aspect_{proximative} Aspect_{durative} Aspect_{prospective} Mod_{obligation} Aspect_{frustrative} Aspect_{completive} Voice_{passive} Verb</p>	<p>b AdvP_{speech act (frankly,...)} AdvP_{evaluative (oddly,...)} AdvP_{evidential (allegedly,...)} AdvP_{epistemic (probably,...)} AdvP_{past/future (then,...)} AdvP_{necessity (necessarily,...)} AdvP_{possibility (possibly,...)} AdvP_{habitual (usually,...)} AdvP_{delayed (finally,...)} Aspect_{prepositional (tendentially,...)} AdvP_{repetitive (again,...)} AdvP_{frequentative (frequently,...)} AdvP_{volition (willingly,...)} AdvP_{celerative (quickly,...)} AdvP_{anterior (already)} AdvP_{terminative (no longer,...)} AdvP_{continuative (still,...)} AdvP_{continuous (always,...)} AdvP_{retrospective (just,...)} Aspect_{proximative (soon,...)} AdvP_{durative (briefly,...)} AdvP_{prospective (imminently,...)} AdvP_{obligation (obligatorily,...)} AdvP_{frustrative (in vain,...)} AdvP_{completive (partially,...)} AdvP_{manner (well,...)} Verb</p>
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Figure 3

- (13b) *Jon aksepterer *alltid ikke lenger* var invitasjon
*‘John accepts always no longer our invitation’
(Cinque 1999, p. 35)

- Bosnian/Croatian/Serbian
(14a) on *vise uvijek* ne pobjedjuje
‘he no longer always wins’
(14b) *on *uvijek vise* ne pobjedjuje
*‘he always no longer wins’
(Cinque 1999, p. 37)

- Hebrew
(15a) hu *kvar lo tamid* yodea ’et ha-tsuva
‘He no longer always knows the answer’
(15b) *hu *tamid kvar lo* yodea ’et ha-tsuva
*‘He always no longer knows the answer’
(Cinque 1999, p. 39)

- Mandarin
(16a) ta *bu-zai zongshi* gen da-ge zhengcao
‘He no longer always quarrels with Big Brother’

- (16b) *ta *zongsbi bu-zai* gen da-ge zhengcao
 *‘He always no longer quarrels with Big Brother’
 (Cinque 1999, p.41)

This hierarchy of clausal functional projections (initially presented as an incomplete proposal in need of refinement) has since been largely confirmed, enriched, and refined on the basis of other languages (see Chao & Mui 2000 on Cantonese; Rackowski & Travis 2000 on Malagasy; Legate 2001 on Warlpiri; Beijer 2001 on Swedish; Haddican 2001, 2004 on Basque; Bannister 2004 and Oxford 2007 on Innu-aimûn; Bhatia 2006 on Hindi; Durrleman-Tame 2008 on Jamaican Creole; Adger et al. 2009 on Kiowa; Kiss 2009 on Hungarian; Biloa 2013 on Tuki; Smit 2013 on Afrikaans). However, much work remains to be done to incorporate further functional heads and corresponding classes of adverbs.

Schweikert’s (2004, 2005) and Takamine’s (2010) studies of clausal argument and circumstantial PPs in German and Japanese, respectively, propose an interesting enrichment of this hierarchy. These authors show that, despite their apparent free order, these PPs enter a rigid hierarchy once special focus options are factored out.⁴ The hierarchies developed by these authors are strikingly similar. See hierarchies 20 and 21, which are consistent with and integrate the hierarchy in **Figure 3**.

- (20) TEMPORAL > LOCATIVE > COMITATIVE > BENEFACTIVE > REASON > SOURCE >
 GOAL > MALEFACTIVE > INSTRUMENTAL > MATTER > MANNER
 (Schweikert 2005, p. 132)
- (21) TEMPORAL > LOCATIVE > COMITATIVE > REASON > SOURCE > GOAL >
 INSTRUMENTAL/MEANS > MATERIAL > MANNER
 (Takamine 2010, p.94)

The highly structured IP zone described above sits on top of a VP that may also involve a richly articulated structure, possibly expressed by a sequence of functional verbs associated with the lexical verb (see Pylkkänen 2008, Ramchand 2008, Harley 2011). We do not address this important aspect of clausal maps here.

3.3. The Extended Projection of DP

The first signs of a similar complexity in nominal phrases were the recognition of separate determiner, number, and agreement projections (Szabolcsi 1983/1984; Abney 1987; Ritter 1991, 1992) and the realization that (direct modification) adjectives enter a specific ordering (Sproat & Shi 1988, 1990), which Cinque (1994) ascribed to separate layers within the extended projection of the noun. Subsequent research expanded the adjective-related functional projections to encompass at least the following classes: subjective comment > evidential > size > length > height > speed > depth > width > weight > temperature > wetness > age > shape > color > nationality/origin > material > compound element > NP (Scott 2002).⁵ Adjectives appear to be closer to the noun

⁴So, for example, the apparently free word order of *I talked to Bill about Mary* and *I talked about Mary to Bill* proves to be deceptive, as the two sentences differ in syntactic properties (P-stranding, Principle A, etc.). These differences indicate that the first order/hierarchy is the canonical one (see Cinque 2006, chapter 6, sect. 2).

⁵Apparent reversals of this order with regard to the noun, in English and other languages, are arguably only apparent as they involve two distinct sources of adjectives, namely direct modification adjectives, ordered as above, and predicative adjectives in

than are reduced relative clauses, which are lower than cardinal numerals and numeral classifiers. These are lower than restrictive relative clauses and ordinal numerals, which in turn are lower than determiners and demonstratives (Cinque 2005, sect. 3; 2010; and references cited there). Above demonstratives are nondistributive universal quantifiers and the integrated kind of nonrestrictive relative clauses (Cinque 2008). Augmentative, pejorative, diminutive, and endearing morphemes also appear to enter a specific hierarchy, below size adjectives and above all lower ones (Cinque 2015), and classificatory adjectives also seem to enter a specific hierarchy (TIME > LOCATION > AGENT > INSTRUMENT > THEME /MATTER > N°; see Bortolotto 2015). This hierarchy bears a striking resemblance to the hierarchy of noun modifiers in English complex nominals studied by Rae (2009) (e.g., *November London fog* versus **London November fog*) and, even more impressively, to the hierarchies of clausal argumental and circumstantial PPs (mentioned above) put forward by Schweikert (2004, 2005) and Takamine (2010). Finally, there also appears to be a specific hierarchy in the lowest part of the nominal extended projection between proper noun (phrase) and common noun (phrase), with the former higher than the latter (see Cinque 2011, as well as Giusti 2002 on complex proper noun phrases). Also see Borer (2005), Alexiadou et al. (2007), and Ihsane (2008).

Putting together these various partial orders, one arrives at the overall hierarchy shown in **Figure 4** (which omits a number of adjectival projections).⁶ This hierarchy is still incomplete, as a number of further modifiers have to find a place relative to the others. These modifiers include multal, paucal, and distributive quantifiers; pronominal adjectives (e.g., ‘other,’ ‘same,’ and ‘next’); and number, gender, and case morphemes.

3.4. The Extended Projections of PP and AP

Prepositional phrases have also been the object of in-depth studies in both the generative and nongenerative literature. See Jackendoff’s (1973) seminal work and other works cited in Cinque & Rizzi (2010b). The contributors to the latter volume attempted to draw an initial map of the internal structure of spatial PPs. These are the most complex prepositional constructions because they combine simple prepositions like ‘from,’ ‘at,’ and ‘to’ with so-called axial prepositions like ‘under,’ ‘above,’ and ‘next to.’ The functional status of both types of prepositions is attested by their closed-class nature (Cinque & Rizzi 2010b, p. 11, and references cited there) and by certain special (almost idiomatic) properties [e.g., *in front of the house* versus *of *(the) front of the house*]. The overall structure can be quite complex (e.g., *from two inches diagonally down in/out there under the table*), involving a rich hierarchy (see **Figure 4**) (Cinque & Rizzi 2010b, p. 10). This hierarchy need not be spelled out in its entirety but may surface in reduced form (e.g., *from under the table, there, down, out there*), and it is arguably the extended projection of a silent NP “place” (**Figure 5**). The Ground DP (here, *the table*) may actually be merged in a genitive-like high position, as shown by rigid head-final languages like Korean (example 19) and Kannada (example 20). The same DP ends up on the right like genitives in head-initial/medial languages like Italian (see Cinque 2013a):

reduced relative clauses, which are higher than the position of direct modification adjectives (see Cinque 2010 for discussion and evidence).

⁶One should also bear in mind that certain combinatorial restrictions exist such that complex event nominals, but not result or object nominals, are compatible with adverbial adjectives like ‘probable,’ ‘frequent,’ and ‘complete’ (ordered like the corresponding adverbs; Cinque 1994, Valois 1991), but they are hardly compatible with adjectives modifying object nominals, like those discussed by Scott (2002).

[PP_{direction} (from)
 [PP_{stative} (at)
 [DegreeP (two inches)
 [Mode_{direction}P (diagonally)
 [AbsoluteViewP (south)
 [RelativeView_{vertical}P (down)
 [RelativeView_{in/out}P (in)
 [DecticP (there)
 [AxPartP X° (under)
 [NP_{place} DP (the table)
 [PLACE]

Figure 5

type has a projection above DegP that hosts raised pronominalized complements of the adjective and a higher AgrP hosting the PRO subject. Fults (2006), by contrast, considers the order, and relative hierarchy, that complements and different adjuncts of the adjective enter in the adjective extended projection. On the basis of ordering data, Fults concludes that comparative *than*-phrases are higher than *compared-to*-phrases, which in turn are higher than complements, which are higher than *for*-phrases (e.g., *He is more patient for a boy his age with his peers compared to you than his brother ever was*; Fults 2006, sect. 2.4). Judging from the order between *for*-phrases and *as*-phrases (e.g., *He is very good as a diagnostician for someone with so little experience*; Siegel 1976), one may reach the overall hierarchy depicted in Figure 6.

4. ON THE LOCUS, SOURCE, NUMBER, AND CLASSES OF FUNCTIONAL CATEGORIES: SOME SPECULATIVE REMARKS

Other important questions are: (a) What is the specific grammatical locus of different classes of functional morphemes in the clause? (In other words, which grammatical features are specialized to occur in the functional space of the clause?) (b) What is the specific grammatical locus of different classes of functional morphemes? (c) Which cognitively salient features are encoded grammatically in the functional lexicon, and which are not? (d) How many functional heads/projections are there? And how many and which morphosyntactic features can be assigned to a functional head? (e) How should the boundary between functional and contentive elements be defined? Is it a binary distinction or a more articulated one? We address these questions, at least tentatively, in the rest of this section.

Concerning question *a*, there appears to be a specialization in the loci where functional morphemes are found across languages. For example, auxiliary verbs are typically the locus of functional

[AgrP PRO
 [DegP [measure phrase] -er [than XP]
 [compared to WP
 [complement PP
 ['for' YP
 ['as' ZP
 [AP]

Figure 6

elements, such as mood, tense, negation, aspect, and voice, but not of, for example, diminution (which can be expressed on lexical verbs), derogation (which, like diminution, is more characteristically expressed on nouns), or many other possible functional notions (such as nominal classification of a verbal argument, which can be expressed on lexical verbs, or quantification). On the small range of domains that functional morphemes can express, see Steele (1981), Carlson (1983), and Heine (1993, sect. 1.7).

Nominal inflectional affixes are typically the locus of gender (or class), number, definiteness, case, diminution, and endearment. They do not encode voice (despite the existence of passive nominals), mirative mood, or habitual aspect, among others. This property, which remains to be elucidated, raises the question of precisely what functional notions make up the extended projections of nouns, verbs, adjectives, and so on. Addressing this problem is the central goal of cartography (Cinque & Rizzi 2010a).

An even more fundamental issue about grammatical versus functional morphemes concerns question *b*. Why do only certain notions find a grammatical encoding within the verbal or nominal domains in the languages of the world? Cinque & Rizzi (2010a, p. 65), Cinque (2013c), and the authors of the references cited there observe that only a few of the concepts and distinctions that populate our cognition are grammatically encoded through bona fide functional exponents like affixes and other closed-class categories (e.g., auxiliaries, particles, clitics). One could expect many more cognitive notions to be grammatically encoded on some category than what we actually find—for example, the notion of ‘anger’ or ‘worry’ encoded as an affix on common nouns or verbs, the notion ‘sexual attractiveness’ encoded in proper human nouns, or the notion of ‘advantage’ encoded in nouns or spatial prepositions. One can easily imagine many other such cases.

Related to this issue is question *c* concerning how many functional heads there are in Universal Grammar. As a first approximation to that number, Cinque & Rizzi (2010a) mention the number of targets of grammaticalization discussed by Heine & Kuteva (2002), who identify 150 “targets” (which they also refer to as functional categories or grams; Heine & Kuteva 2002, p. 2, footnote 1). This number can easily be tripled or quadrupled when we consider that many of these targets conflate separate grammatical categories; for instance, these authors’ term “complementizer” covers a number of distinct heads (Rizzi 1997, Rizzi & Bocci 2015), as do their notions of locative (Maierborn 2001), negation (Zanutini 1997), relative (Cinque 2005, 2010), classifier, demonstrative, and so forth. And many more functional categories or grams appear to exist (e.g., augmentative, pejorative, celerative, predispositional, retrospective, delayed, conative, and frustrative aspects; approximate numerals; associative plurals; demonstrative reinforcers; multal, paucal, and distributive quantifiers; polarity items, etc.).

A related question (the second part of question *c*) is whether functional heads can conflate more functional features, or whether each should be assumed to express only one feature. Kayne (2005) and Cinque & Rizzi (2010a) tentatively take the latter position. This question needs to be further investigated.

Much cartographic work adopts the dictum “one property, one feature, one head” as a working hypothesis, which severely constrains the class of possible primitive functional heads. This guideline has an important heuristic and explanatory role, as it implies a restrictive view of lexical specifications and enforces a syntactic analysis of featural conglomerates. Nevertheless, if understood as a substantive principle, the guideline requires qualifications. What is the minimal specification of a functional head in the lexicon? At least five kinds of featural specifications seem to be needed:

- The syntactic label, which may also directly provide interpretive instructions at the interface between syntax and semantics (e.g., Tense is interpreted differently from Aspect, Voice, etc.; the dependents of Top are interpreted differently from the dependents of Foc, etc.).

- The PF label, expressing whether and how the element is pronounced.
- A selectional instruction that determines (external) merge properties with a complement (Tense selects AspP, etc.).
- A selectional instruction that determines (external) merge properties with a specifier (*v* selects the external DP argument, Aspect may select an aspectual adverbial, etc.).
- A morphosyntactic instruction that expresses the capacity of the head to launch a search operation, eventually giving rise to internal merge (e.g., a Q-head launching a search for a *wh*-element, a prerequisite for *wh*-movement, etc.). This specification is sometimes called an EPP feature. Perhaps it should also encode the distinction between phrasal and head movement.

Whereas the complement is necessarily unique under binary branching (Kayne 1984), the question of whether the specifier is unique or whether multiple specifiers are allowed remains open. On the grounds of restrictiveness, cartographic studies usually assume that specifiers are unique, a conclusion also enforced by antisymmetry (Kayne 1994). Under the “uniqueness of specifiers” view, the fourth and fifth specifications listed above are mutually exclusive. If so, a functional head has unique specifications for the syntactic and PF labels and for the selection of a complement and a specifier (selection in a broad sense, encompassing satisfaction by external or internal merge).

A more difficult question is whether one should distinguish different kinds of functional categories, perhaps with the notion of functional element organized along a gradient. As mentioned above, some functional categories (e.g., complementizers, determiners, and copular verbs) have a purely grammatical meaning and can even be omitted under certain conditions without compromising the overall meaning of the sentence. However, this does not seem to be the case for other types of bona fide functional categories, including functional prepositions like ‘to,’ ‘at,’ ‘from,’ demonstratives, quantifiers, and tense and aspect morphemes, all of which contribute substantial meaning and cannot be omitted *salvo sensu*. The majority of functional categories may be of the latter kind. If belonging to a closed class of items is the hallmark of functional categories, then nouns may turn out to be the only genuine lexical class—there are Niger-Congo, Austronesian, Papuan, and Tibeto-Burman languages that have a limited number of adjectives (Hagège 1974; Dixon 1982, pp. 3ff; Cinque 2010; sect. 3.5, 4.1) and others that have a limited number of adverbs (see Dixon 1982, p. 40; Schachter 1985, pp. 21ff; Stutzman 1997, p. 75; Cinque 2006, p. 9, footnote 22, and references cited there). This situation is even encountered with verbs, as there are languages that have only a limited class of them (see Dixon 1982, p. 225; Foley 1986, sect. 5.2; Karimi-Doostan 2005; Pawley 2006; and Liljégren 2010 for examples from Australian, Trans New Guinea, and Indo-Aryan languages). The fact that some languages appear to have large (seemingly open) classes of adjectives, adverbs, and verbs may prove illusory. Processes that derive adjectives from nouns or other categories, adverbs from adjectives or nouns, or verbs from nouns and so-called light verbs may give the impression that in such languages adjectives, adverbs, and verbs are open classes. A somewhat similar case is provided by numerals, a closed-class category that, however, yields infinite derived numerals.

These considerations seem to indicate that finer distinctions need to be made within the class of functional categories. Even core properties of extensively studied languages suggest that subtler distinctions are needed. For instance, if one takes (obligatory) clitic climbing as a diagnostic for functional verbs in French, then the causative verb *faire* ‘make’ is classified as functional, along with the auxiliaries *être* ‘be’ and *avoir* ‘have.’ This hypothesis is supported by the observation that in many languages the causative construction is expressed by a causative affix attached to a lexical verb (Zubizarreta 1985). If one takes the possibility of raising to T past the negative marker *pas* ‘not’ in infinitives as a diagnostic environment (Pollock 1989), then *faire* patterns with lexical

verbs and contrasts with auxiliaries (*n'être pas* 'to be not,' *n'avoir pas* 'to have not,' *ne pas faire* 'to not'). Therefore, the verb *faire* and the auxiliaries *être* and *avoir* may occupy distinct positions in a gradient from lexical to functional elements (the fact that *faire* assigns a thematic role of causer is presumably crucial in order to differentiate it from auxiliaries).

5. CONCLUSION: CARTOGRAPHY AND MINIMALISM ON THE FUNCTIONAL LEXICON

Sometimes there appears to be a tension between the rich cartographic representations reviewed in Section 3 and the austere representations of clausal structures in much minimalist literature, which often expresses the functional structure of clauses as a C-T-*v* system (and where the functional structure associated with other phrases is also reduced to a minimum). We believe that there is no contradiction between these two strands of current research (on this topic, see also Belletti 2004b, introduction; Rizzi 2004b, introduction; and Cinque & Rizzi 2010a). On the one hand, cartographic studies are fully consistent with and typically assume the elements of syntactic computations introduced by minimalist research [the fundamental structure-building operation is merge; movement is feature driven and is decomposed as a Probe–Goal search operation seeking a matching featural specification, followed by (internal) merge, etc.]. On the other hand, such labels as C, T, and *v* are sometimes explicitly considered abbreviations of richer cartographic structures in the minimalist literature (e.g., Chomsky 2001, footnote 8). Apart from matters concerning the style of presentation, there are some genuine empirical issues that are the subject of current syntactic research in both cartography and minimalism. One question concerns the size of the functional lexicon: How large is it? The evidence reviewed in Sections 3 and 4 suggests that, in the structure of both clauses and the major phrases, a rich inventory of functional heads is well justified and distinct functional elements may co-occur, giving rise to structured functional sequences. Therefore, syntactic configurations involve a rich functional articulation, even though it is fully legitimate to use abbreviated structures when the argument does not depend on that functional richness. Perhaps one may consider simplified structures as fractally related to rich cartographic representations: The cartographic magnifier reveals a finer structure that shows the same inner geometric constitution of structures “visible with the naked eye”—hierarchically organized head-dependent relations created by merge.

A related question concerns the possible morphosyntactic constitution of a functional head: Can a primitive syntactic head, an element drawn from the lexicon, be a conglomerate of morphosyntactic features of an arbitrary complexity? Or are there simplicity principles constraining the possible featural makeup of primitive heads? What should be clear from the discussion in Section 4 is that cartographic research is inspired by core guidelines of simplicity on this point. One functional head typically expresses a single morphosyntactic property of each given kind (label, selection of complement, selection of specifier); complex conglomerates of properties (e.g., a verb inflected for voice, aspect, tense) may arise through syntactic movement, but “primitive” heads entering syntax from the functional lexicon are simple entities. Such guidelines are fully compatible with a minimalist perspective, in that they are grounded on assumptions about simplicity that are consistent with the letter and congenial to the spirit of minimalism.

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Errata

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