

# ***Understanding formal features***

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There are only two *ingredients* of language: **roots** and **formal features**.

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“Hjelmslev tells us that, for language theory, it is not necessary to incorporate the “sense of the content”; all that matters is the “form of the content” in interaction with the form of expression: “for calculating theory, there is no interpreted system, but only interpretable systems. There is therefore no difference on this point between pure algebra or the game of chess on the one hand and, for example, a language on the other” (Hjelmslev 1971, 141).” (Ducard 2017, 203)

## ***The primacy of formal features***

Features would be the *content* of the language faculty.

“The Minimalist Program doesn’t have currently a theory of features” (Marcel den Dikken at the Abralin ‘The Minimalist Program: Achievements and Challenges’ online event on 6 July 2020). See also the review in Svenonius (2019).

Similar observations are made in Adger and Harbour (2008). They cite Muysken and van Riemsdijk (1986), re: the fundamental desiderata of a proper Theory of Features:

- (1) “[H]ow many are there?”, “what are they?”, “how do they distribute over syntactic structures?”

Unlike extant and/or possible HPSG or CG theories of features, a minimalist theory of features will have to rest upon certain (bio)linguistic assumptions.

### *Four issues in a Theory of Features*

Revisiting (1):

- A. **What** are formal features? Is there a fixed UG inventory thereof or do features emerge during acquisition through heuristic processes?
- B. What is the correct **formalism** for them? Privative? Equipollent? [attribute: value]?
- C. Why are particular **concepts** encoded (or rather: are *encodable*) as formal features (e.g. mass / number) and others are not (e.g. colour / brightness)?
- D. How do formal features combine into **functional elements**?

#### **On A: What are formal features? No semantic features.**

Features in general will have to be conceived as “instructions to the interfaces” (Chomsky 1995). Hence,

- neither as mere diacritics (‘flags’) of structural relations,
- nor as the shorthand of structural operations; thus the likes of SLASH, Strong, EDGE, Brody’s \* Spell-Out feature, or Merchant’s E for ellipsis features are all out, unless independently motivated.

We expect formal features *both* to reflect some sort of concept (in the broadest sense) relevant to the C-I interface *and* to play a role in grammatical computation (in the narrow sense):

- (2) Formal features must be motivated as involved in grammatical operations and representations.

A thought experiment:

- ⇒ a feature [X] is an instruction to the C-I interface (e.g. animacy) *and* it plays a role in grammatical computation: [X] is a *good candidate* for a formal feature;
- ⇒ a feature [Y] plays a role in grammatical computation (e.g. motivates Internal Merge) but cannot be construed as an instruction to the C-I interface: [Y] is *not a good candidate* for a formal feature;
- ⇒ a feature [Z] can be understood as encoding instructions for the C-I systems but at the same time it is inert grammatically; should such a feature exist, [Z] is not a good candidate for a formal feature.

Summarising:

- (3) Formal features will have to be motivated *both* as C-I interface instructions *and* as playing a role in grammatical relations and operations.

Biberauer and Roberts (2015, 3):

The formal features are [...] interpretable or uninterpretable and, as such, are visible for syntactic operations such as Agree and Merge. The semantic features, on the other hand, are invisible to the core computational system (Narrow Syntax), but presumably visible at the semantic interface.

Cowper and Hall (2014, 146):

We can say that a feature is active if the grammar crucially refers to it in any way. In the case of potential morphosyntactic features, then, it is not enough to show that the semantic content of a feature is present in the encyclopedic meaning of some lexical item; rather, to be considered active it must be involved in inflectional paradigms, or trigger syntactic movement or agreement, or play some other demonstrably formal role.

Formal features as per (3) is a different set of features than those *possibly* involved in “meanings such as whatever distinguishes camels from reindeer or a joke from an insult” (Adger and Svenonius 2011, 18), i.e. so-called ‘semantic features’.

We must at least distinguish lexical semantics (feature-based or not) from formal features and our theory thereof. Example: does Turkish have *formal* gender features? *No* (following the analytical methods of Corbett 1991; Kramer 2015).

Generally speaking, are there purely *semantic* features, i.e. features like [Z] in our thought experiment above?

In separationist-realizational frameworks where formal feature structures are matched with conceptual content late (Ralli 1988; Beard 1995; Halle and Marantz 1993; Harley and Noyer 1999 and elsewhere), (purely) *semantic features should not exist*.

Matching of meaning with form, *lexical meaning* in particular, is mediated via syntactic structures built around roots, in line with non-lexicalist, neoconstructionist, and realizational approaches to grammar (separationist-realizational frameworks, including DM, the Exoskeletal Approach, and Nanosyntax).

Semantic features were originally construed in order to decompose said ‘lexical meaning’ of grammatically atomic words into primitives (Katz and Fodor 1963); famously, *bachelor* would be decomposed into [+male] [-married]. This way of doing lexical semantics has long been superseded, but grammatically inert features, i.e. semantic features, analytically persist until today.

Semantic features would

- play *no* role in the construction of functional categories (unlike English gender on pronouns);
- trigger no Agree relations (unlike Number or Question in English);
- play no “demonstrably formal role”;
- are ultimately “encyclopedic”.

In brief, purely semantic features *are not referred to by the combinatorial system in any way*. They would only be detectable by inspecting the *proposition* instead of the *sentence*.

Consider once more the status of gender in Turkish: there are female and male concepts expressed on lexical nouns, i.e. *nP* structures built around roots, but there is no evidence of a (grammatically) active gender feature: all pronouns are gender-neutral, including 3<sup>rd</sup> person *o(n)* and *kendi* (a version of a *se*-anaphor).

Do we need to posit a purely *semantic* (i.e. non-formal) gender feature in Turkish?

No: all that has to do with masculinity, femininity etc. is retrieved in the Encyclopedia once a suitable structure built around a root reaches the relevant interface.

- (4) Purely semantic features do not exist.

Clark (2020, 6) independently arrives at the same conclusion.

A fortiori, the only kind of direct *matching of signifiers to signifieds without structure* (cf. Borer 2013) – is that of formal features:

- (5) Formal features are the only unstructured Saussurean signs in natural language (cf. Adger and Svenonius 2011, 15).

Excursus: are features universal or emergent? An empirical matter (Cowper and Hall 2014; Dresher 2014; Biberauer et al. 2014; Biberauer and Roberts 2015 among others) – but consider Section 0 addressing C.

### On B: Privative? Equipollent? [attribute: value]?

The privative system is conceptually the simplest: a (monovalent) feature either is there or isn't there (Adger 2010, 187).

The equipollent system is the familiar +/- one, introduced by the linguists of Prague School for phonological representations (Jakobson, Karcevsky, and Trubetzkoy 1962; Trubetzkoy 1969; see also Nevins 2008).

Privative feature systems are problematic in defining natural classes – which are necessary e.g. for Locality and defective intervention effects (Adger and Svenonius 2011, 7).

Cowper and Hall (2014) convincingly show that it cannot be the case that privative feature systems are universal.

Harbour (2011) demonstrates the inadequacy of a privative feature system in describing intricate number systems like that of Kiowa. He also refutes a notational variant of privativity, the *pseudoprivative* alternative: using different versions of the same feature (e.g. F and F') in order to capture three-way distinctions.

If formal features do not belong to a fixed UG repertory but are arrived at by the acquirer precisely as she pays attention to contrasts (and/or distinctions) expressed by grammar (Emonds 2011; Dresher 2014; Cowper and Hall 2014; Biberauer et al. 2014; Biberauer and Roberts 2015; Biberauer 2019 and elsewhere), the availability of all three systems (privativity, equipollence, and the [attribute:value] format) cannot be excluded a priori, as long as each of these systems would optimally accommodate the grammar-specific evidence.

Although privative features do not lend themselves to cross-classification (Adger and Svenonius 2011, 7); however, cross-classification of a feature is not always necessary within a particular grammar if said feature does not have to belong to a natural class.

Suppose in a given grammar the following exist:

- two equipollent person features, [ $\pm$ author] and [ $\pm$ participant] – as in Halle (1997)
- a privative [atomic] feature: its presence will be interpreted as ‘singular’, its absence as ‘plural’, ‘mass’ etc. – unlike what happens in Kiowa (Harbour 2007; 2011).

This [atomic] feature being privative, we cannot call it a ‘Number’ feature, but it doesn’t matter iff

- a) only one functional head – call it  $\phi$  – can host these features and
- b) that head can host exactly three features: [ $\pm$ author], [ $\pm$ participant] and [Atomic].

No reference to an attribute [number] is necessary here, provided that ‘person’ (i.e. [ $\pm$ author], [ $\pm$ participant]) and ‘number’ (i.e. [atomic]) features are only present on this very  $\phi$  head, a pronominal one presumably.

This hypothetical scenario is reminiscent of ‘natural’ gender in English: it does not have to be expressed as [animate:male], [animate:female], and nothing are not necessary: [male], [female] and nothing, would be fine, given that they are marked only on 3<sup>rd</sup> person pronouns in English; the presence of a privative [male] or [female] feature would by default also entail animacy.

Going back to the  $\phi$  head of our hypothetical grammar, the privative [Atomic] feature would have to be construed as [number:atomic] iff it is probed by an unvalued Probe somewhere in the grammar; otherwise privativity of [atomic] is fine. Therefore:

(6) *On the availability of privative features*

Privative features can only be posited by the acquirer iff i) they do not cross-classify and ii) they never function as Goals for unvalued Probes.

**On C: Which concepts can be encoded as features?**

Formal features encode conceptual categories such as Person, Animacy, Individuation, Definiteness, Quantification, Transitivity, Aspect, Tense, Mood, Finiteness, Illocutionary Force and so on. Why these? Why not others? Cinque (2013, 50–52) notes (*ibid.*, 50):

Verbal projections in clauses grammatically encode (through affixes, particles, auxiliaries, etc.) distinctions relating to the external and internal temporal constituency of events (tense and aspect) and the speaker's attitude toward the truth of the proposition (mood), but they are never found to grammatically encode such human cognitive universals as "shame", "mourning", "sexual taboos", etc., nor otherwise cognitively significant concepts like "worry", "peril", "fear", "hunger", "love", "death", "awe of god", etc.

"Cognitively salient"? "useful in an evolutionary sense"? – come on!

This issue becomes even more pressing if feature systems are not UG-given but assembled on the basis of linguistic data during the course of acquisition.

Hence:

- ⇒ How come acquirers never attempt to assemble noun classification systems on, say, the basis of a very salient bright vs. dark (and, even, red) contrast? Why do noun classificatory feature systems may be based on animacy and sex / size and shape?
- ⇒ Why has the quasi-systematic wealth of manner-of-motion types (Talmy 1985) expressed among English verbs never yielded a grammatical taxonomy thereof? Can't speakers *generalise* accordingly?
- ⇒ What privileges the concept of surprise (in miratives) over that of worry, of desire or volition (in optatives) over that of fear, of failure (in frustratives) over that of shame (Cinque 2013, 51), those of honorification and deference over a range of diverse attitudes towards other humans? What about the crucial concept of 'poisonous' (Leivada and Barceló-Coblijn 2020)?

Roberts and Roussou (2003, 221): functional categories are purely *logical*, i.e. "invariant under isomorphic structures" (their (45)).

If functional categories are composed exclusively of formal features, the zero hypothesis, then formal features would exclusively express "the logical content [which is] independent of the external factors, or in von Stechow's (1995) words, "insensitive to facts about the world".

This claim doesn't cover Person, demonstratives (as already admitted by R&R), as well as miratives, frustratives, honorifics etc. etc. etc.

- (7) Not all formal features encode ‘logical’ (‘narrow semantic’) concepts.

Ideas?

Golston (2018; 2019b; 2019a): concepts encoded as formal features *predate* the emergence of the human species.

Emonds (2011): only concepts that predate the emergence of *Homo sapiens* (apparently the ‘languaged’ mutant of the genus *Homo*) are encodable as formal features.

These observations already preclude the existence of features about *all* artefact and exclusively *human* social organisation concepts, but also about the successor function (ibid., 56-7).

Having said that, Emonds (2011, 58):

many other categories that are almost certainly part of primate cognition are not used in any system of syntactic computation: those of brightness, loudness, perceptions of speed and non-speaker centred motion, awareness of emotion (sadness, fear, anger, anticipation, sexual arousal, illness), and essentially all categories of feeling, taste and smell.

Also, Emonds (2011, 51): featureable concepts must be *discrete*; his *Lexical Labelling* (2011, 59):

- (8) “Lexical items are associated with (“syntactic”) labels or categories drawn from the store of the mutant primates’ discrete visual concepts (their only conceptually discrete system).”

### On D: From features to functional heads

Functional heads are

- feature bundles or, perhaps,
- feature structures (Harley and Ritter 2002) or even
- structural manifestations of single features: Kayne’s (2005, 212) *Principle of Decompositionability*: “UG imposes a maximum of one interpretable syntactic feature per lexical item”.

In any case,

- (9) Functional heads are made exclusively of formal features.

Having said that, do we *need* to posit a given formal feature [X]?

We must distinguish at least between necessary formal features and interpretations emerging as (long-distance) syntactic relations; e.g. do we need [Focus] *features* (cf. Irurtzun

2008)? If Tense is about the correlation between time intervals, then [past] features and the like are superfluous (Von Stechow 1995; Demirdache and Uribe-Etxebarria 2000; Stowell 2007).

Hence, there exists a true tension between competing *feature-based* and *structure-based* explanations of phenomena (Marcel Den Dikken, p.c.). This tension should be resolved following the tenet below, what Adger (2021) calls *Pylyshyn's Razor*:

- (10) Minimise representation, maximise architecture.

Second, *we need to (re-)examine formal features* on functional heads and other elements.

Wiltschko (2008; 2014) aptly distinguishes between *functional heads* and *modifiers*.

Whereas functional heads consist exclusively of formal features, modifiers might (also) encode concepts that are not necessarily encodable as features – especially if modifiers are syntactically complex themselves and contain roots structures.

## **Beginning to sketch the Theory**

### **Signs? Yes: formal features**

Formal features are the only “Saussurean” signs in natural language, as in (5): they *directly* connect concepts with some *abstract formal realisation*.

Unlike everything else in language, signification in the case of formal features is not mediated by grammatical *structure*.

Formal features are the elements that syntactic processes manipulate.

Examples:

- A [neg] feature has a *signified*, the logical operator  $\neg$ , and an abstract *signifier*, the realisation of which is some morphological exponent.
- A [Q] feature has a *signified*, the illocutionary Force of question, the signifier of which is the external Merge this feature might force, or the Agree relation it will establish, or similar.

Crucially, a formal feature will *have* to be realised *somehow*, the vagaries of morphological Impoverishment, syncretism, and feature deletion notwithstanding (Halle 1997; Calabrese 2008; Harley 2008 among others).

- (11) The signifier of formal features is realised i) as (part of) an exponence or ii) via a grammatical relation and/or operation.

Purely semantic features do not exist, as in (4). If a feature with a signified has no abstract signifier, it simply is not there. There is nothing making manifest a feature [-married] on words such as *bachelor*; therefore there exists no feature [ $\pm$ married].

The semantic interpretation of contentful ('lexical') *structures* in language is a matter of lexical semantics, and, as noted earlier, contentful structures are built around a root.

The division of labour regarding signification in natural language falls out like this:

- (12) A limited number of concepts are featurable; these concepts can be *directly* signified as formal features, whereas every other concept will have to be signified by a structure involving (a) root(s).

Recall that concepts serving as signifieds of formal features must definitely *predate the emergence of language* in our ancestors (Emonds 2011; Nóbrega and Miyagawa 2015; Nóbrega 2018; Golston 2018; 2019b; 2019a).

No alternative to this particular constraint on the concepts formal features may encode, unless FL is still evolving.

### How to compile a formal feature inventory

We need to carry out in-depth typological work that will pursue at least the following:

- (13) *How to compile an inventory of formal features*
- a. List *all and only* the concepts that look like they are encoded as formal features.
  - b. With (10) as a criterion, decide on *feature-based* and *structure-based* interpretations.
  - c. Let the grammar do the explaining: follow a *theoretically informed* algorithm.

Regarding a.: we work under the restrictive definition of formal features in (3), listing only those features in a particular language that are “involved in inflectional paradigms, or trigger syntactic movement or agreement, or play some other demonstrably formal role” (Cowper and Hall 2014, 146).

In the light of (4), i.e. the inexistence of purely semantic features, one should for instance count in [animacy] in Spanish but count [number] out in Mandarin Chinese, and so on.

On a practical level, one could use Cinque (1999; 2006; 2013), Cinque and Rizzi (2010), and similar kinds of work as a starting point, even if one does not necessarily subscribe to cartographic approaches.<sup>1</sup>

Second, now with reference to point b. in (13), one should remain mindful of the inevitable analytical tensions between competing feature-based and structure-based explanations of grammatical phenomena. As per (10), all other things being equal, structure-based explanations of phenomena trump feature-based ones:

(14) Formal features are not to be posited *praeter necessitatem*.

For instance, do we really need (at least one) [Focus] feature in all languages? Even when we narrow down our investigation of focus to a sample of languages that unambiguously express it grammatically, like Hungarian, is it always the case that we need to posit [Focus] features in them?

Would it not be the case that in at least some languages a focus interpretation is the result of an A'-movement operation that might be otherwise triggered, i.e. not as a result of a purported [Focus] feature?

Perhaps similarly for Verb Second (V2): its simplest analysis “requires the acquirer to postulate only a single left-peripheral head which is not specifically associated with formal features like [topic] or [focus]” (Biberauer and Roberts 2015, 16).

Third, and related to invoking V2 above, “letting the grammar do the explaining” (Marcel Den Dikken, p.c.) involves not only being consistent with the Theory of Features sketched here (or similar), but also both making theoretical and methodological commitments and keeping them. This is more than just a possibly vapid call for consistency or even for avoiding eclecticism:

### Letting the grammar do the explaining: auxiliaries

Consider Ramchand and Svenonius' (2014) method of investigating the order of English auxiliaries and the interactions among them:

(15) *The Ramchand and Svenonius (2014) analytical steps:*

- a. A Cartographic contribution—the ordering of syntactic nodes in the (conceptually grounded) functional sequence, for example giving us the order of  $T_{\text{perf}}$  over  $V_{\text{evt}}$  (Perf over Prog).

<sup>1</sup> We will however have to be very careful when admitting evidence exclusively from adverbs as making manifest a formal feature in a particular grammar. The cartographic heuristic procession ‘adverb → functional specifier → dedicated functional head → distinctive formal feature’ in Cinque (1999; 2006; 2013), Cinque and Rizzi (2010), and elsewhere *cannot always be taken at face value*. See Larson (2021) for a review and criticism.

- b. A selectional contribution—for example the selection of  $\text{Asp}^*_{en}$  by  $T_{perf}$ , rather than some other featural instantiation of  $\text{Asp}^*$ .
- c. A default rule for the spell out of heads in the eventive domain when those heads cannot be filled by raising. This gives us the illusion of *be* ‘selecting’ for the passive phrase and the progressive phrase.
- d. A featural stipulation on English modals that they exist only in a morphological form that includes a  $\text{Fin}^*$  feature, like the other tensed morphological forms. This needs to be a stipulation because it is an idiosyncratic fact about English (we give this real semantic content via world anchoring).

One might not agree with the details of the account sketched in (15), or even with the examples supplied. Still, it must definitely be noted that the “featural stipulation” comes last, once other factors at play have been considered.

### Letting the grammar do the explaining: Case

Baker (2023), see also Alok & Baker (2022) and Calabrese (2008), proposes studying syncretic patterns in order to define the repertory of formal features available – their target being Case. Baker (2023, 2) elaborates:

The intuition is that two cases for which neutralization or syncretism happens commonly/systematically/regularly have something in common that underlies this: those two cases “share a feature.”

Interestingly, this shared feature will eventually turn out to be more abstract than the usual ‘nominative’ or ‘accusative’ monikers; to wit, analysing syncretism patterns Baker (2023, 6) comes up with the following ‘alphabet of case’:

	<i>C phase</i>	<i>v phase</i>	<i>D domain</i>
[high]	ergative	dative	genitive <sub>1</sub>
[low]	accusative	oblique	–
∅	nominative	partitive	genitive <sub>2</sub>

Once this is accomplished, then family relations among families of abstract features themselves could be traced, which would hopefully identify and establish general feature patterns in different domains, e.g.  $\phi$ , spatial, quantification, event, categorial, degree / scalar etc. For instance:

	<i>Num</i>	<i>Event</i>	<i>Spatial</i>
[point]	atomic	point	point
[stretch]	group	process	path
$\emptyset$	mass	state	?

If this works out, tough questions like “what would be the counterpart of the gender system in other domains?” could then be asked. See the discussion in Svenonius (2019, 18), who reports these steps having been taken by Hale (1986) and Harbour (2011).

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