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Against semantic features: the view from derivational affixes

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This paper builds a systematic argument against the existence of semantic features, although these would in principle conform with the understanding of features in Chomsky (1995) as instructions to the interfaces, to the Conceptual-Intentional Interface in this case. I first lay out their superfluous character as well as their redundancy in separationist / realisational approaches, and in non-lexicalist models of grammar, more generally. Under the assumption that lexical meaning in natural language is mediated by grammatical structure containing roots, (purely) semantic features would inevitably be restricted to "non-lexical" elements only, i.e. those derivational affixes that encode rich conceptual content. This makes the positing of semantic features methodologically suspect and, ultimately, redundant.

Accordingly, the rich content of derivational affixes, which can involve pretty much any nominal concept (as in Acquaviva 2009) from 'profession', 'tree', and 'place' to body parts, will be argued not to be encoded in terms of semantic features. On the contrary, this paper makes the case for derivational affixes not belonging to a unitary syntactic category, with some derivational affixes actually being roots interpreted in particular structural contexts, as has been argued already since De Belder (2011). The chapter closes by offering a taxonomy of the elements that grammar manipulates and sketches the division of labour between root structures and formal features.

1 What are we to make of derivational affixes?

It is customary to understand roots as the elements from which *stems* are constructed, i.e. of the elements that are traditionally understood to carry the descriptive content of a word. Indeed, even in the contemporary treatment of roots in grammatical theory that begins with Marantz (1996; 1997) and comes of age in Borer (2005; 2014b; 2014a), roots are (correctly) understood to either directly encode or to enable the expression of rich extra-grammatical concepts such as *justice*, *fry* or *pale* and are subsequently considered primarily as the elements around which stems and words are built – whatever words are. There are of course notable exceptions to casting roots solely in the role of the foundations of stems / words, notably De Belder (2011), Lowenstamm (2014), Acedo-Matellán and Real-Puigdollers (2014; 2019).

Hence, if stems are built on or around roots, *derivational affixes* are contentwise typically understood to be pure feature structures. In practice if not in theory, a division of labour regarding linguistic signification is assumed: rich descriptive ("lexical") content is a business of stems, while 'other' descriptive content is handled by derivational affixes and the like (see also footnote 7). In a further move, which vaguely assumes morphological realisation to be somehow isomorphic to interpretive content, stems are thought of as being built on or around roots, whereas derivational affixes are understood to be made of features only. These feature structures, i.e. derivational affixes, may attach directly to root structures or to categorised structures such as *n*Ps (nouns), *v*Ps (verbs), or adjectives (cf. Fabb 1988). As to the kinds of features derivational affixes are made of, they are in practice assumed to comprise both *formal* features and purely *semantic* features. A distinction between formal and (purely) semantic features will be properly made in the following section, for the time being let's look at what kind of semantic features derivational affixes could be argued to encode.[1]

(1) *Examples of derivational affixes that would bear semantic features:*

–eiro 'tree'	*pinheiro* 'pine tree'	*Portuguese*
–(a)tz– 'profession'	*pagot-atz-is* 'ice cream seller'	*Greek*
–ery 'place'	*fish-ery*, *bake-ry*, *nunn-ery*	*English*
–ał 'foot'	*quć-ał-ic* 'wash-foot-I.him'	*Bella Coola*
–lxs 'nose'	*kma-lxs-c* 'hurt-nose-I'	*Bella Coola*

Is it then the case that an affix like *–eiro* bears a semantic [tree] feature, that *–(a)tz–* bears a [profession] feature, *–ery* a [place] feature, *–ał* a [foot] feature and *–lxs* a [nose] feature, and so on? In this paper it will be argued that derivational affixes are not privileged as hosts of semantic features. Moreover, the stronger argument will be made that (purely) semantic features do not exist and that only formal features exist.

But some definitions are in order first.

[1] The Bella Coola examples are taken from Haspelmath and Sims (2010: 19–22), where there is some interesting discussion about them. Other affixes include *–lst* 'rock', *–lik* 'body', *–altwa* 'sky, weather', *–an* 'ear', *–uc* 'mouth'…

2 Formal vs. semantic features

Distinctive features constitute an important analytical concept in linguistic theory. Although treatments of what they are and what they do can be extrapolated from descriptive and theoretical work on a number of disparate topics, the statement that "[t]he Minimalist Program doesn't have currently a theory of features" made by Marcel den Dikken during the Abralin 'The Minimalist Program: Achievements and Challenges' online event on 6 July 2020 remains true.

Sadly, it is hardly the case that Minimalism is unique in having no theory of features: similar observations on the lack of a *principled* theory on features are made in Adger and Harbour (2008) regarding the whole generative enterprise. More specifically, Adger and Harbour cite Muysken and van Riemsdijk (1986) on what the fundamental desiderata of a proper Theory of Features would be, desiderata that remain unfulfilled:

(2) "[H]ow many are there?", "what are they?", "how do they distribute over syntactic structures?"

True, frameworks like HPSG, which championed the importance of features back when most theoretical linguists were happy to use features as mere shorthand for all sorts of grammatical categories, come equipped with working definitions of features and feature systems. Having said that, a (remotely) minimalist theory of features will have to both answer the questions in (2) and rest upon certain (bio)linguistic assumptions on what features are.

Nevertheless, considerable vagueness still exists in how different linguistic frameworks, accounts, or even linguists understand features. Approaches range from features as descriptive specifications, as simple or complex *properties*, in the way they are pedagogically presented in Adger (2003: Section 2.3) for instance, to the actual *atoms* that morphemes and/or lexical items are made of, an approach we will commit ourselves to here. In other words, we will generally assume lexical items to be *made of* features.[2] Furthermore, in our effort to lay a minimalist foundation of what features are we can gloss over this hindering vagueness and agree on a working definition that features in general be conceived as "instructions to the interfaces" (Chomsky 1995). Such a postulate is already very restrictive: if features are instructions to the interfaces, the Conceptual-Intentional and the Articulatory-Perceptual ones, there exist whole classes of proposed features we will a priori have to reject as genuine features.

Thus, if features are instructions to the interfaces, then there is no place in minimalist theorising for features as pure diacritics ('flags') of either structural relations (e.g. an A′ dependency) or of the externalisation of structural relations (e.g. 'movement'). This entails that a number of posited features must be thoroughly re-examined, such as the likes of SLASH, which

[2] Understanding Lexical Items, i.e. the atoms that Merge manipulates, as generally *made* of features and not as independent Saussurean signs (words or morphemes) that may additionally *bear* features places the treatment here at the opposite end of accounts like Zeijlstra (2014). Zeijlstra (2014:114) argues for "a 1:1 correspondence between morphemes and semantic content", and that morphemes may *additionally* mark features as extras.

marks long-distance dependencies in HPSG, and Chomsky's (1995) Strong feature, which triggers movement, or EPP feature, which triggers Merge.[3] Similarly, Brody's (1995) *, a Spell-Out feature, or Merchant's (2001) E for ellipsis feature would also be out in principle. The only way to cast features relevant for externalisation (e.g. for ellipsis or for 'movement') as instructions to the interfaces would be to include features interpretable at the interface with the Articulatory-Perceptual (A-P) systems in the class of formal features. In other words, SLASH, Strong, *, E etc. would constitute formal features interpretable at the interface with the A-P systems, but without them being phonological features such as [rounded] or [plosive]. If anything, this move would complicate the distinction between formal and phonological features, a distinction apparently settled in Zeijlstra (2008).

Now for the definitions: like Zeijlstra (2008), Biberauer and Roberts (2015: 3) define formal features precisely as the features that are active in the syntactic derivation:

> 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.

This contrasts formal features with semantic features, which are only readable at the C-I interface. Surveying the linguistic literature one can attest that semantic features are variably understood in different ways: for some, semantic features are (still) the actual atoms into which we decompose lexical meaning or even concepts, in the Katz and Fodor (1963) tradition of BACHELOR as [+male] [–married]. Some of this content can be encyclopedic, as outlined in Adger and Svenonius (2011: 18), who describe semantic features as involved in "meanings such as whatever distinguishes camels from reindeer or a joke from an insult". Alternatively, even for those who do not advocate the decomposition of lexical concepts, semantic features include features that introduce conceptual content outside root structures and/or stems (von Fintel 1995).

Cowper and Hall (2014: 146) neatly outline the distinction between formal and semantic features:

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[3] The EPP feature was later revamped as the OCC(urrence) feature (Chomsky 2004) and later the Edge feature (Chomsky 2008). Widening our field of vision, reviewers rightly enquire what the status of uninterpretable and unvalued features would be. These by definition exist derivation-internally and only as duplicate matches for formal features (Chomsky 1995; 2001; Zeijlstra 2008; 2014). Given that uninterpretable features also by definition never reach the C-I interface, I will remain agnostic about them here, treating them as an internal affair of the combinatorial system, which it deals with via Agree or similar.

> 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.

Put otherwise, formal features are visible to grammar (i.e. the combinatorial system) whereas semantic features would only be detectable by inspecting the *proposition* instead of the *sentence*.

Building on the above considerations, we could make good on the 'instructions to the interfaces' conception of features and understand formal features as *both* encoding some sort of concept (in the broadest sense) relevant to the C-I interface *and* playing a role in grammatical computation (in the narrow sense).[4] This would make formal features a subset of semantic features: whereas all non-phonological features are readable at the C-I interface, only formal features are visible by the combinatorial system, i.e. are grammatically active. In other words, formal features must be motivated as involved in grammatical operations and representations.

In order to have the above definition of a formal feature somehow clarified, we can conduct a simple thought experiment. Suppose that by observing the data in a given language we come to the conclusion that there are three candidates for formal features in this language's grammar, [X], [Y], and [Z]. We examine each candidate feature in turn and here is what we find:

- a feature [X] is both an instruction to the C-I interface (e.g. animacy) and it plays a role in grammatical computation (e.g. triggers agreement or differential object marking): [X] is a *good candidate* for a formal feature;
- a feature [Y] plays a role in grammatical computation (e.g. it motivates various scrambling operations) 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 (e.g. deference) but at the same time it is inert grammatically; should such a *purely semantic* feature exist, [Z] is nevertheless not a good candidate for a formal feature.

Summarising the above, we can conclude that:

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[4] An anonymous reviewer points out that the requirement for formal features to be interpretable at the C-I interface is consistent with the Strong Minimalist Thesis – or indeed with *any* minimalist thesis that only considers the interfaces to be genuine levels of representation, one could argue. Also responding to an anonymous reviewer, I have no story to tell in this paper on what *triggers* movement / internal Merge, if anything at all. For what it is worth, I would hope that *all* Merge, external and internal, comes for free, i.e. that it be untriggered.

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

What makes formal features active, the exact kind or role they play in grammatical derivation, is open to different interpretations. A stricter approach would be that of Zeijlstra (2008), who argues that "[c]hecking of uninterpretable features […] forms a diagnostic test to distinguish interpretable formal features from purely semantic features […]" and goes on to lay out "three properties that could be harnessed to test for the presence of a feature [*u*F]: its semantic uninterpretability, the triggering of an operation Move and the triggering of an operation Agree". A looser interpretation of this role would be that formal features are either those that "[are] involved in inflectional paradigms", as in Cowper and Hall (2014: 146) or those that come in uninterpretable and/or unvalued versions. This is the approach we will subscribe to here, as it e.g. allows English gender features to be construed as formal.

According to the outlook in (3), what distinguishes formal from (purely) semantic features is that the former are by definition grammatically active; on the other hand, semantic features are understood as instructions to the C-I interface that do not affect the grammatical derivation. Essentially, the formal-semantic distinction regarding features is homologous to the distinction between grammar, or even the Faculty of Language in the Narrow Sense, and (lexical) semantics (Adger & Svenonius 2011: 17–18).

As we will see more extensively in Section 4, Turkish data aptly illustrate this point. Although gender distinctions can of course be made in the Turkish language, do we really wish to claim that *formal* gender features such as [±feminine] exist in the grammar of Turkish? The answer is negative, given that a purported gender feature would not play any formal role: it would not be grammatically active in any way. Interestingly, this is precisely the conclusion one will independently reach by following the analytical methods of either Corbett (1991) or Kramer (2015).

3 From features to functional heads

Before scrutinising semantic features and how we can conceive derivational affixes without them, we need to make a brief and necessary excursus regarding a basic difference between derivational affixes and functional heads.

Functional heads are feature bundles or, perhaps, feature structures (Harley & Ritter 2002). A first issue is whether there can be more than one (interpretable) feature per functional head. Kayne's (2005: 212) *Principle of Decompositionality* would refute that, as according to it "UG imposes a maximum of one interpretable syntactic feature per lexical item". Nanosyntactic and cartographic approaches embrace Kayne's Principle, the former explicitly, the latter in practice. Supposing functional heads can be bundles of more than one feature (cf. Bobaljik & Thráinsson 1998), these heads could be either somehow pre-assembled (which is where nanosyntactic

objections come in) or assembled online from formal features available in the numeration (Hegarty 2005). I will here remain neutral regarding which of the above three scenarios (mono-featural functional heads, pre-assembled poly-featural functional heads, or poly-featural functional heads assembled online) is the correct one. What matters for the discussion here is the *kind* of features that make functional heads up, and I believe one would have to exclude purely semantic features in principle and posit that

(4) Functional heads are made exclusively of *formal* features (Panagiotidis 2015: 117–120, 122–124).

Functional heads of course may bear quantificational, modal, definiteness / specificity features and the like. Features like these bring in additional semantic properties to the interpretation but according to (4) such features will have to be construed as formal, in that they have an effect on the structure and not just on the proposition. Implementation matters aside, of hardly a trivial nature, a commitment to (4) goes hand-in-hand with the 'looser' definition of formal features discussed under (3), one that includes all features "involved in inflectional paradigms, or trigger syntactic movement or agreement, or play some other demonstrably formal role".

The above leave us with a fundamental difference between functional heads and derivational affixes hinted at above: while functional heads are made exclusively of formal features (possibly just the one each), derivational affixes seem at first glance to (also) contain semantic features, as illustrated in (1). In the next section however we will see that semantic features have no place in contemporary generative approaches, let alone minimalist ones: that semantic features do not exist. We will therefore have to rethink the distinction between functional heads and derivational affixes, and the *content* of derivational affixes more generally.

4 Formal features only: semantic features are superfluous

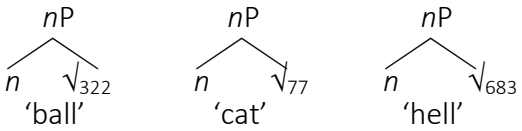
It was established in (3) that formal features must both be readable at the C-I interface and play a role in grammatical relations and operations: formal features must be both interface *instructions* and grammatically *active*. The question is whether there exist purely semantic features at all, i.e. features that are readable at the C-I interface but are grammatically inert – just like the ones we would have to posit for the affixes in (1). The answer I wish to argue for here is in the negative: (purely) *semantic features do not exist*, especially in a grammatical framework where formal structures are matched with conceptual content late.

In separationist-realisational frameworks of grammar (Ralli 1988; Halle & Marantz 1993; Beard 1995; Harley & Noyer 1999 and elsewhere), all semantic interpretation takes place at the interface between the combinatorial system, i.e. the grammar, and C-I systems. More specifically, all matching of meaning with form is mediated via syntactic structures built around roots (Borer 2013a; 2013b; Panagiotidis 2020): not even a simplex noun *cat* is an unstructured Saussurean

sign (Marantz 1996; 1997). Of course, structures built around roots typically encode the kind of rich conceptual meaning that e.g. “distinguishes camels from reindeer or a joke from an insult” (Adger & Svenonius 2011: 18), what can perhaps still be loosely called ‘lexical meaning’, even after Bruening (2018).

Roots themselves can be understood as contentful but polysemous (Levinson 2007; Marantz 2013) or as radically empty differential indices, i.e. as the only grammar-internal criteria of lexical identity (Acquaviva 2009; Borer 2014a; 2014b; Harley 2014; Panagiotidis 2014; 2020). Following this second thesis, roots as lexical items are completely contentless but the insertion of different roots in the same syntactic structure – say an idealised *n*P consisting of nothing but a root and a categoriser *n* – enables it to be associated with different rich concepts, from *ball* to *cat* to *hell* and so on. Hence, by inserting different roots in otherwise identical structures, these structures become distinguishable at the interface with the Conceptual-Intentional systems and thus can be matched with different concepts (Acquaviva & Panagiotidis 2012; Panagiotidis & Nóbrega to appear). It is such structures that carry the conceptual content (the “denoting part”) of language, what we call ‘lexical meaning’ (Marantz 1996; 1997; Borer 2005; 2013a; Panagiotidis 2015: Chapter 3; Panagiotidis & Nóbrega to appear).

(5) Same structure, different roots



As already mentioned, semantic features that are nevertheless grammatically inert, i.e. purely semantic features, were posited in older frameworks as primitives into which said lexical meaning would be decomposed: originating in Katz and Fodor (1963), such features were invoked upon in order to do decompositional lexical semantics. This way of doing lexical semantics has long been superseded (famously after J. D. Fodor & Fodor & Garrett 1975), but the idea that particular concepts are expressible in terms of grammatically inert features, i.e. semantic features, has persisted until today. As we will see below, those purely semantic features are nothing but a notational variant of meaning postulates; methodologically they are a remnant of a classic but obsolete way of doing lexical semantics.

Summarising, (purely) semantic features, in contrast to what was claimed about formal features in (3), would

a. play *no* role in the construction of functional categories (unlike e.g. English gender on pronouns);
b. trigger no Agree relations (unlike e.g. Number or Q(uestion) in English);
c. generally play no “demonstrably formal role”.

In brief, purely semantic features are not referred to by the combinatorial system in any way.

Let us again turn to the state of gender in Turkish: female and male concepts are expressed on lexical nouns, a state of affairs that is brought about by the existence in the language of stems encoding female and male concepts. Given that these stems are overwhelmingly nominal, the existence of such stems encoding gendered concepts can be readily captured as involving *n*P structures built around roots, as in (5). Crucially, there is no evidence in Turkish of a gender feature outside the lexical domain. There is definitely no *grammatical* gender whatsoever: neither chairs are feminine, as in Italian, nor pain is masculine, as in Greek. Furthermore, *semantic* gender is not manifested on any functional element, with all Turkish pronouns being gender-neutral, including *o*(*n*) ('she / he') and *kendi* (a version of a *se*-anaphor). By any definition in (3) there are no formal gender features in Turkish.

Is it then the case that we need to posit purely semantic (i.e. non-formal) gender features in Turkish? Such features would be borne by nominals encoding gendered concepts. I think that informal descriptions of Turkish might acknowledge that a noun like *erkek* ('man') would bear a masculine gender feature, whereas a noun like *kadın* ('woman') would bear a feminine gender feature. Crucially the features [masculine] and [feminine] informally posited here only describe a particular *aspect* of the lexical meaning encoded by the nouns (i.e. *n*Ps) *erkek* ('man') and *kadın* ('woman').

Still, other aspects of the lexical meaning for words like *erkek* ('man') and *kadın* ('woman') could be [+adult] or [–familiar], if we choose to have them *notated* as features. However, what we are dealing with when we are isolating particular aspects of the denotation of *erkek* ('man') and *kadın* ('woman') is simply meaning postulates. Unless we would subscribe to semantic decomposition as the way in which *the Language Faculty* would (somehow) encode concepts, expressing meaning postulates as semantic features 'travelling' through the derivation is unnecessary and ultimately fallacious. In any case, regarding *erkek* ('man'), at least the following meaning postulates can be claimed to hold:

(6) $\forall x,\ \text{ERKEK}(x) \rightarrow \text{MALE}(x)$
$\forall x,\ \text{ERKEK}(x) \rightarrow \text{ADULT}(x)$
$\forall x,\ \text{ERKEK}(x) \rightarrow \neg\text{FAMILIAR}(x)$

The fact that sixty years after Katz and Fodor (1963) we are still inclined to think of the first meaning postulate in (6), MALE, as the interpretation of a 'semantic' feature, although this is not what we would customarily think of the ADULT and FAMILIAR, is simply a notational preference. In the context of (6), and of Turkish grammar more generally, positing a [±feminine] or [±masculine] feature would make as much as sense as positing a [±adult] or a [±familiar] feature: all three would simply notate meaning postulates *qua* semantic features, translating particular but arguably prominent aspects of *erkek*'s lexical meaning. Of course, for someone

coming from the study of a language with formal gender features – semantic, grammatical, or both – the gender category is easier to pass as encoded by a feature than are adulthood or familiarity. Nevertheless, such preference does not necessarily reflect the realities of Turkish grammar.

Picking particular meaning postulates to notate as semantic features, just because formal features with the same interpretation exist in other grammars, is therefore superfluous or even methodologically flawed: in the case of (6) for instance, all that has to do with masculinity etc. is retrieved in the Encyclopaedia once a nominal structure built around an ERKEK root reaches the C-I interface.[5]

Reiterating: purely semantic linguistic features should not exist, especially in frameworks where structures are matched with their exponents and their conceptual content late, as in the separationist-realisational frameworks mentioned at the beginning of this section. This is a fortiori true if we are adopting approaches in which the matching of meaning with form is mediated via syntactic structures built around roots.

(7) Lexical meaning in natural language is mediated by grammatical structure containing roots, structures that are matched with concepts at the C-I interface.

In contrast to the structure-mediated state of affairs in (7), a semantic feature would actually be used in order to directly encode a concept like masculinity in (6) or tree, profession, place etc. in (1), irrespective of the grammatical structure in which they would appear and, generally, in a fashion orthogonal to the combinatorics of natural language. In other words, semantic features would *duplicate* the signification job of structures containing roots while at the same time not making any reference to the combinatorial system, and indeed being invisible to the combinatorial system. The above considerations lead us to think that semantic features in general, grammatically inert instructions to lexical semantics, are superfluous; they are therefore inexistent:

(8) Purely semantic features do not exist.

Clark (2020: 6) independently arrived at the same conclusion. Departing from language design considerations, he argues that the crucial distinction to be made is not between semantic and encyclopedic knowledge, but rather "between semantic properties that have systematic morphosyntactic effects and semantic properties that do not"; he further goes on to argue that

[5] How concepts are actually represented *beyond* the C-I interface with the Language Faculty is a matter of vivid speculation. Despite a prevalent Fodorian understanding that concepts should be monadic (J. Fodor 1970; J. Fodor & Lepore 1996), it could be the case that at least some of them be decomposed into non-linguistic logical primitives, cf. Larson and Jaspers (2011).

only the former should be encoded as (essentially formal) features, whereas the latter are aspects of atomic concepts "that LIs interface with through pointers" (Clark 2020: 12).[6]

5 Derivational affixes without semantic features

It could be argued that we are being too hasty in our wholesale rejection of semantic features in (8). Once more recalling (1), the Portuguese affix *–eiro* does mean 'tree', productively deriving words such as *pinheiro* 'pine tree' and the like, the Greek affix *–(a)tz–* does mean 'profession', productively yielding professional names like *pagot-atz-is* 'ice cream seller', *–ery* carries a meaning of place in such derived nouns as *cattery*, *nunnery* etc.; finally, Bella Coola contains affixes encoding concepts such as *–lst* ('rock'), *–lik* ('body'), *–altwa* ('sky, weather'), *–an* ('ear'), *–uc* ('mouth'), that are used to derive complex expressions like "I will wash his feet" and "my nose hurts" in (1).

Maybe a compromise could be struck; as already mentioned, this would be a compromise that actually already constitutes an operating procedure for many researchers looking into morphology, although not necessarily one informed by a principle. Such a compromise would look like this: whereas (7) is true for stems and similar root-derived structures, maybe semantic features like [tree], [profession], [place], [foot], [nose] etc. would actually encode meaning *in rootless affixes*.

It is now time to see how such a compromise would stand up to scrutiny. We begin with a simple observation: the interpretations of the derivational affixes in (1) look a lot like those of *nouns*; more precisely, all the listed affixes actually encode nominal concepts (Acquaviva 2014). Informally, we can think of most interpretations for purported purely semantic features as the encoding of nominal concepts. If this generalisation is a valid one, which is of course an empirical matter, it would be an eminently interesting one: why would semantic features not encode more verb-like concepts, such as dynamic concepts typically functioning as events?

Second, even setting aside whether semantic features exist, the orthogonal issue of the *syntactic* status of derivational affixes is a crucial one here, should we insist on drawing a dichotomy between root-derived stems on the one hand and those derivational affixes that host semantic features on the other. "Affix" is definitely a morphological analytical category that describes how a morpheme combines with other morphemes, whereas "derivational" describes

[6] "Work on lexical semantics suggests that semantic features should be limited to features that affect the morphosyntactic distribution of the corresponding LIs. Distinguishing between descriptive semantic and foundational semantic questions, and anti-individualist and individualist answers, provides a way of thinking about what questions we might ask about the nature of those features (e.g., CAUSE) within the context of language evolution. The pointers and packaging approach to the lexicon suggests how we might couple semantic features with a mechanism that accounts for the distinctive content of individual LIs and the observation that lexical meaning is an interface phenomenon […]" (Clark 2020: 12)

its morphological function, i.e. 'word making' (see Fábregas & Krämer 2020 for the similar case of 'prefixes'). Therefore, there can exist no *a priori* commitment about the *content* of particular morphemes just because they will end up to morphologically behave as affixes. Simply put, it is implausible to posit that a mechanism will decide that i) root-based structures will end up as stems and ii) structures composed of semantic features will end up as affixes; this sort of look-ahead would make no sense, at least in realisational-separationist models.

Third, we should factor in an empirical consideration: the derivational affixes at (1), at least from the more familiar languages, haven't got a fixed interpretation, for instance:

(9) *Polysemy of derivational affixes*

brasil-eiro	'Brazilian'	*origin*	Portuguese *–eiro*
cinz-eiro	'ashtray'	*container*	
paok-tzis	'PAOK fan'	*member*	Greek *–(a)tzis*
slav-ery		*state*	English *–ery*
mock-ery		*quality / activity*	

This brings these 'rich' derivational affixes closer to structures built around roots, which are well-known for their polysemy. If anything, the suffixes in (1) and (9) are hardly characterised by the rigid and unambiguous interpretation of formal features. To wit, an [imperfective] feature is systematically unambiguous, however it be manipulated within grammatical structures, something that cannot be said for the suffixes in question and for the vast majority of root structures, which display an array of polysemy. This observation is due to Nóbrega (2018: Chapter 3) and has been previously called *Nóbrega's Generalization*.

Evidently, there are already well-articulated accounts casting *all* derivational affixes as roots or as built around roots (e.g. De Belder 2011; Acedo-Matellán & Real-Puigdollers 2014; 2019; Lowenstamm 2014). If anything, this means that the dichotomy between root structures as *stems* and semantic feature structures as *affixes* is hardly to be taken for granted. Let us then entertain the hypothesis that all derivational morphemes are root structures, which would bear at least two consequences: First, all derivational affixation would be a subcase of compounding. For instance, if *–ness*, *bird*, *–ful*, *maiden*, *–proof* and *bottle* are all root structures, then *blackness* is a compound like *blackbird*, *handful* as much of a compound as *handmaiden*, *waterproof* akin to *water bottle* – and so on, morphophonological minutiae notwithstanding. I am not sure this is a desirable state of affairs or even one that would be easy to explain away. Second, there do exist derivational affixes like *–ness / –ity*, *–ise,* and the like, which clearly have no substantive content: are these also root structures? Again, their unambiguity would suggest otherwise under Nóbrega's Generalization. Similar concerns are reported by Panagiotidis (2014: 297–298), who cites Pullum (2010). Pullum claims that the root vs. "suffix" status of "the endings of the words [such as] *–like*, *–esque*, *–ward*,

–proof, – (*a*)*thon*, […] *–ism*, […] –(*o*)*phile*, –(*i*)*licious*, and *–gasm*" must be decided on the basis of firm theoretical considerations.[7] No pretheoretical decisions made on stress patterns or other morphophonological considerations will help us reverse-engineer the content of morphemes, be they stems or affixes.

I believe that in tackling this matter we should take (7) very seriously: whatever element has substantive content, i.e. a concept not encoded by formal features, is a structure built *around* a root or *containing* a root (see Alexiadou & Lohndal 2017 for a review of the subtle but crucial distinction between the two), no matter whether it surfaces as a stem or as a affix. I therefore agree with De Belder (2011), Lowenstamm (2014), and Acedo-Matellán and Real-Puigdollers (2014; 2019) that *all truly contentful* derivational affixes involve roots; incidentally, these would include all our examples in (1) and (9). This stand would also contribute to answering the question of why so many derivational affixes encode nominal concepts. If these affixes are built around (categorised?) roots, they can be readily matched with simplex sortal concepts (and also states, perhaps); anything more, say a dynamic event, would require a more complex syntactic structure (cf. Hale & Keyser 2002; Harley 2005; Ramchand 2008).

Summarising, the whole issue actually boils down to a choice between

a. elements in (1) being roots (or structures containing roots) and
b. positing that, in the absence of a root structure, semantic features may fetch a wealth of elaborate (primarily nominal) concepts, such as 'tree', 'profession', 'place', body part concepts, whatever the meaning(s) of *–ism* would be, or a complex notion of 'loving something' as in *franco-phile*, *biblio-phile* etc.

Given that some of these concepts (e.g. 'profession') clearly postdate the emergence of the Language Faculty in the species, I think that we can confidently go for the first option.[8]

Still, pure *formal* feature structures that surface as the 'light' derivational affixes should also exist. While vouching for (4), namely that functional heads are made of formal features, it is not necessarily the case that formal feature structures surface exclusively as functional heads: they may also surface as 'light' derivational affixes.

If something along the lines of Panagiotidis (2015: Chapter 5) is on the right track, formal feature structures bearing uninterpretable categorial features will surface as functional heads,

[7] For the record, Pullum considers *–like*, *–esque*, *–ward*, and *–ism* to be "suffixes", and the rest to be roots. A descriptively rich discussion of affixoids and combining forms, elements that appear to bring together properties of both stems and affixes, can be found in Amiot and Dugas (2020).

[8] Emonds (2011: 56–59) and Nóbrega (2018) on why a concept post-dating the emergence of the Language Faculty is not encodable as a feature.

otherwise they can function as derivational affixes. Two examples of such 'light' derivational affixes, made of formal features only, would include English *–ness / –ity*, along with *–th* and, perhaps, the likes of *–ment*: all these are category-changing affixes yielding nouns, they therefore look like they are exponents of the nominaliser *n*. A more complex case would be English *–ise*: this would realise a special verbaliser *v,* i.e. an element that bears a [causation] formal feature, one that is independently motivated for English, next to a categorial feature [V]. If the 'menagerie' in (10), adapted from Panagiotidis (2011: 381), is anything to go by, derivational affixes could either

- be complex syntactic structures containing roots or
- belong to *any* of the four elements predicted below, ***except*** *functional heads*.

(10) The elements of grammar

	made of	***categorial status***	***includes***	***examples***
categorisers	formal features	[N] or [V]	*n*, *v*	*–ness*, *–th*
functional heads	formal features	uninterpretable [N] or [V]	Voice, Asp, T, C, D, Num…	*–ing*, *to*, *will*, *if*, *the*, *–s*
subcategorial elements / "inner morphemes"	formal features	categoryless	particles, low applicatives, low causatives…	*–ee*, *de–*; verbal particles *up*, *in*
roots	?	categoryless	roots	CAT, WORK, KTB, -EIRO

According to the picture in (10), roots and root structures, categorising elements, and subcategorial "inner morphemes" can all surface as derivational affixes.[9] Returning to the English examples used earlier, *–ise* would be a categorising derivational affix made of formal features only, *–ness* a pure categoriser also consisting of just formal features, whereas *–ful* and *–proof* would be roots or root structures.[10] A critical discussion of the 'menagerie' in (10) can be found in Panagiotidis (2023), where the issue of affixoids and combing forms is also discussed (see also footnote 7).

[9] Subcategorial 'inner morphemes' (Marantz 2000; 2005; 2006; Pylkkänen 2008) consist of formal features only and typically contribute to idiosyncratic interpretations due to their close affinity to roots before the categorisation of the constituent containing the root (Panagiotidis 2011; 2015: 67–70 and elsewhere). The Japanese causative *–(s)ase* in its subcategorial realisation, of Marantz (1997) fame, is an example of such a lexical item.

[10] Non-category changing derivational affixes would also be pure formal feature structures (Fábregas 2024). A task for future work to also engage with is the question of whether *handful* and *waterproof* are to be treated as compounds.

6 Formal features as signs

Ridding our grammatical descriptions from semantic features eminently highlights the role of formal features as elements that syntactic processes manipulate: formal features must by definition play a role in the grammatical computation, as per (3).

The dual role of formal features as reflected in (3) eventually renders them as the only "Saussurean" signs in natural language because they *directly* connect concepts with some *abstract formal realisation*. Once (purely) semantic features as an analytical concept are out of the picture, and acknowledging that signification is a job for root structures, we can conclude that signification in the case of formal features is unique in not being mediated by grammatical *structure*.

Two relatively uncontroversial illustrations of this generalisation would be [neg] and [Q](uestion) features: a [neg] feature has a *signified*, say the logical operator ¬ (NOT), and an abstract *signifier*, the realisation of which is some morphological exponent; a [Q](uestion) 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 an actual morphological exponent. Crucially, a formal feature will *have* to be realised somehow in all cases, the vagaries of morphological impoverishment, syncretism, and feature deletion notwithstanding (Halle 1997; Calabrese 2008; Harley 2008 among others): ultimately, this is what we mean by the grammatical activity or visibility to the grammar of formal features. In this vein, semantic features cannot exist precisely because a feature without an abstract signifier is simply not there. Thus, there is nothing making grammatically manifest a feature [–married] on words such as *bachelor*, *maiden* etc.; therefore there exists no feature [± married].

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

Features have a signifier in the sense of that they must be *somehow* expressed, indirectly most of the time; this is eventually the rationale behind the definition of formal features in (3). As mentioned above, this abstract signifier is combined with a signified which comes from a limited number of *featurable* concepts (Emonds 2011; Cinque 2013; Nóbrega & Miyagawa 2015; Golston 2018; 2019a; 2019b; Nóbrega 2018; Panagiotidis 2022).

Understanding formal features as unstructured pairings of a signifier and a signified, we can perhaps make a case for properties of theirs resulting from the concepts they signify as opposed to properties resulting from the way signification takes place. To wit, if, as Sauerland (2008) argues, semantic markedness of features distinct from morphological markedness exists, such semantic markedness would be exactly a property of features as signifieds; at the same time, morphological markedness would be a characteristic of features as signifiers. Once more, such a signifier should be understood in the most abstract way possible, as it is rarely the case that features are *directly* expressed via phonological representations. In the case of formal features, a

signifier must be conceived not as a form but as the *potential for form*. In any case, signification in natural language is a task shared between unstructured formal features (for a limited number of concepts) and root structures (for all other concepts):

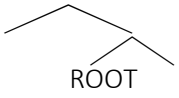
(12) A limited number of concepts can be encoded as formal features; every other concept will have to be signified via root structures.

The purpose of the above framing of the signification problem is to highlight that *features*, not 'words' or similar, *are the actual symbolic atoms of language*; all meaning not encoded as formal features is the result of matching root structures of varying complexity to Encyclopedia entries.

Summarising, the division of labour regarding signification in natural language falls out like this:

(13) Formal features are the only unstructured signs in natural language.[11]

The table below distils the proposed overview.

SYMBOLIC FUNCTION		***COMBINATORIAL FUNCTION***	
formal features	*structures with roots*	*roots*	*formal features*
unstructured signification	structured ('lexical') signification	N/A	driving the combinatorial function
[NEG], [Q], [N], [±state], [±plural]		N/A	Labelling, [*u*X] … [X]

7 Conclusion

Even if one does not subscribe to Minimalist commitments, it is a truism that methodological parsimony should drive all scientific research. In this respect, semantic features' only purpose is to encode concepts without them having any effect on the grammatical computation, thus duplicating the role of root structures, whose purpose is par excellence to encode rich 'lexical' concepts. Additionally, if the semantic features posited abide by no grammar-internal principles, these must be superfluous and unnecessary: all signification in language not involving formal features such as [imperfective] is therefore mediated by root structures.

[11] Adger and Svenonius (2011: 15) are the first (to my knowledge) to conceive features as Saussurean signs: "A given feature might consistently spell out in one way or another […]. This simply reflects the usual Saussurean arbitrary pairing of phonological content with syntactic and/or semantic content."

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Competing interests

The author has no competing interests to declare.

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