PROMINENCE IN MORPHOLOGY: THE NOTION OF HEAD

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ABSTRACT: In this paper we will discuss the notion of prominence in morphology by reviewing how morphological heads are defined through their prominence at different levels. After outlining the main issues and, specially, the problems posed by heads in morphology, we consider how prominence and headedness are dealt with in two different influential contemporary theories: Minimalism and Construction Morphology. Despite being very different in many respects, the two models agree that there is no need for a structural notion of head, because interpretability is guaranteed by the interplay of features within complex constituents.

KEYWORDS: Construction Morphology, features, head, Minimalism, morphology.

1. PROMINENCE IN MORPHOLOGY

What are we referring to when we talk about PROMINENCE in a domain such as morphology, and especially word-formation? Or, to take a concrete example, what's PROMINENT in compounds like those in (1a) or derived words like those in (1b)?

(1)   a.   Compounds
             blackboard
             mercato nero (lit. market black) 'black market' (Italian)
        b.   Derived words
             exploration
             amministrazione 'administration' (Italian)

Usually, what we are referring to is what is known as the HEAD of a complex word, namely a structural constituent that is dominant with respect to other constituents in the same domain. What the word "dominant" exactly implies has been and still is a matter of debate.

The notion of head has its roots in syntactic research (see Corbett, Fraser & McGlashan 1993 for an overview). Both old (Sanskrit, Latin, Greek, Arabic)

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and modern dependency grammars (e.g. Tesnière 1959, Hudson 1976) built their theory about combinations of elements on the idea that in any (syntactic) construction there is governor and a dependent. The following quote from American Structuralism, taken from Bloomfield (1933: 195; bold added), is representative of the traditional notion of structural head:

> In subordinative endocentric constructions, **the resultant phrase belongs to the same form-class as one of the constituents**, which we call the *head*: thus, *poor John* belongs to the same form-class as *John*, which we accordingly call the head; the other member, in our example *poor*, is the *attribute*.

The notion head was then borrowed by lexical morphologists and used to identify the "prominent" constituent in both compounding and derivation, i.e. the word subconstituent that passes certain properties to the whole structure (cf. Allen 1978; Lieber 1980; Williams 1981; Selkirk 1982; Kiparsky 1982; Zwicky 1985; Scalise 1988).

In this paper we will explore the notion of prominence in morphology through a review of the way in which morphological heads are defined through their prominence at different levels. We start from outlining the main questions posed by heads in morphology (Section 2). Then we consider prominence and headedness in two different influential contemporary theories, Minimalism (Section 3) and Construction Morphology (Section 4). The chapter is wrapped up by focusing in the points of agreement between these two very different theories (Section 5).

2. ISSUES IN HEADEDNESS

One of the basic tenets of dependency grammars is the idea that in any combination of items there is one single element that has higher prominence than the others. Hoeksema (1992: 121) stated this in the form of an Omniheadedness Principle:[1]

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[1] In the same paper Hoeksema (1992: 120) notes, however, that heads can be defined in a variety of ways, that is, that what counts as prominent can vary depending on the parameters used to evaluate the structure. He notes that there are at least four different notions of head:

    a. **Semantic**: *pie* is the head of *apple pie* because it is a hypernym of *apple pie* and, conversely, *apple pie* is a hyponym of *pie.*

    b. **Distributional**: *pie* is the head of *apple pie* because it has the same distribution of *apple pie* (they are interchangeable).

    c. **Morphosyntactic**: *pie* is the head of *apple pie* because it is the locus of inflection (*apple pies* vs. *apples pie*).

    d. **Technical** (also known as "**categorial**"): *school* is the head of *high school* because it

(2)   Omniheadedness: every complex structure has a head (overtly or covertly)

However, this general goal faces several difficulties, that we will review in turn. Next to the questions that we will discuss here, there is one that, despite its importance, has not received a lot of attention in the literature up to now: should the prominent element be defined as a constituent in the structure or could the head be just (a set of) features contained in one or several constituents? Overwhlemingly, the vast majority of approaches have assumed that a head has to be a constituent, but another logical possibility would be that what counts as the prominent element is just one of the features of a single head, or even a feature shared by two separate constituents. This problem is left outside from the general discussion presented in this section, but will be mentioned in Section 3, in the context of the discussion about labeling in the last version of Minimalism, and also in Section 4, where we discuss headedness within Construction Morphology.

2.1 Are heads predictable?

A crucial question is whether what counts as prominent in a morphological structure is predictable – derivable from general principles – or has to be stipulated on a case-by-base basis.
One of the first predictive proposals relied on semantic information: if you know what a word means, and what the morphemes that it contains mean, you can identify the head. In the words of Otto Jespersen (1924: 96; bold added):

> In any composite denomination of a thing or person […] we always find that **there is one word of supreme importance to which the others are joined as subordinates**. This chief word is defined (qualified, modified) by another word, which in turn may be defined (qualified, modified) by a third word, etc. We are thus led to **establish different 'ranks' of words according to their mutual relations as defined or defining**. In the combination *extremely hot weather* the last word *weather,* which is evidently the chief idea, may be called primary; *hot,* which defines *weather,* secondary, and *extremely,* which defines *hot,* tertiary.

Allen (1978), already within the model of Lexical Morphology, also uses semantics to define prominence inside the word; her "**IS A Condition**" (1978: 105, 108) is clearly a mechanism to identify the head in productive compounds:

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determines its category.

As we will see in this section, different theories have proposed that the head in morphology has to be defined according to one or several of these parameters. Some accounts also propose that a structure can have multiple heads, each one relevant for a different grammatical level.

> In the compound [[…]$_X$ […]$_Y$]$_Z$, Z 'IS A' Y
> […] a semantic subset relationship holds between the compound Z and
> the compound constituent Y

So, a *steam-boat* IS A *boat* (not a *steam*), a *night-club* IS A *club* (not a *night*), a *silk-worm* IS A *worm* (not a *silk*), etc. (Allen 1978: 108).

Obviously, this criterion would fail whenever the complex word has a meaning that is not directly expressed by any of the two components: e.g., *see-saw*, or *one-eyed* (cf. Section 2.2).

If Allen's proposal can be interpreted as a purely semantic criterion, but also as a syntactic-structural approach,[2] Edwin Williams' (1981) influential proposal attempted to define the head, predictively also, through structural and distributional properties that do not make reference to the semantics of the word (Williams 1981: 247-248):

> In morphology, we define the head of a morphologically complex word
> to be the righthand member of that word.

This was formulated as the Righthand Head Rule (RHR), which claims that the head of a complex word (in English) is invariably the rightmost element, i.e., the second member in a compound, the affix in a suffixed word and the base in a prefixed word:

(3) a. *black <u>bird</u>*
     b. *class-<u>ify</u>*
     c. *re-<u>read</u>*

However, the rule is known to have massive exceptions in other languages (like Italian, where the prominent member of compounds is to the left: *cassa-forte* lit. box-strong 'safe'), and even in English. Indeed, some prefixes in the Germanic languages behave like heads at least in the sense that they change the grammatical category of the base (see (4)), thus, from a grammatical perspective, the prefix must be more prominent than the base (cf. Scalise 1984; Corbin 1987).

(4) a. [<u>en</u>- [*rage*]$_N$]$_V$
     b. [<u>ver</u>- [*bleek*]$_A$]$_V$ (Dutch)
         'to bleach'

The situation is so complex that it does not even seem possible to propose that the position of a head in a word can be parametrized in a fixed value for a single language (as emerges already from the examples in (4)). Inside the same

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[2] "[T]he IS A Condition is purposefully ambiguous between syntactic and semantic interpretations" (Allen 1978: 105).

language, the position of an element is not predictive of morphological headedness. In Chinese and Japanese compounds, for instance, the position of the prominent element depends, among other things, on the output lexical category. VN compounds are right-headed when they are nominal, but left-headed when they are verbal (cf. Packard 2000; Ceccagno & Scalise 2006; Kageyama 2009).

(5)   a. *shípǐn*   (eat+<u>product</u>)   'food'   (Chinese)
        b. *kāidāo*   (<u>open</u>+knife)   'to operate'
        c. *yude-tamago*   (boil+<u>egg</u>)   'boiled egg'   (Japanese)
        d. *soo-kin*   (<u>send</u>+money)   'to remit'

Even the semantics of the compound seems to play a role on the linear ordering between the head and its dependents. In Nizaa (a Niger-Congo language from Cameroon) right-headed compounds denote part/whole and kinship relations, whereas left-headed compounds are employed to convey attributive relations of different sorts (Pepper 2010).

(6)   a. *cam ɓʉʉ*   (finger <u>top</u>)   'fingertip'   (Nizaa)
        b. *leemú sàŋw*   (<u>orange</u> sour)   'lemon'

Another non-semantic criterion that has been proposed defines the head as the element that imposes its internal properties to the whole structure (the output word). This is what Lieber's (1980: 85ff.) Feature Percolation does: in any structure, the most prominent element is the one that lends its features to the whole word, which inherits its basic properties from it. There is no implication about which position that element must occupy, or about (conceptual) semantic properties having to be also transmitted to the whole word. Therefore, in a semantically unpredictable compound like (7), for instance, the head would be the noun *rostro* 'face', because it imposes its properties to the whole construction: noun, masculine and singular.

(7)   *rostro   pálido*   (Spanish)
        face   pale
        'white person'

2.2 Is there always one and only one head?

The difficulty of finding a single predictive set of criteria to univocally identify the head has raised the question of whether Omniheadedness really applies to morphological structures.

One first possibility is that any structure may have a head, but what counts as the head of the structure is not the same across grammatical domains: one constituent can be the semantic head, another one the syntactic head, a third one the morphological head, etc. The idea has some initial plausibility because

the head in morphology, in a prototypical case, would carry different kinds of information:

i) CATEGORIAL FEATURES: if the word belongs to the class of nouns, verbs or adjectives is generally determined by one of its internal constituents, that also belongs to this class. For instance, in Spanish *canción* 'song', the head would be the suffix *-ción*, not the base *can-* (related to *cantar* 'to sing'), because the whole word is a noun, not a verb.

ii) SEMANTIC FEATURES associated with a certain lexical category, such as "ontological" categories/features: *apple* and *pie* are both nouns, but are nouns beloging to different classes (the first is a natural kind, the former an artifact), and the resulting compound *apple pie* belongs to the same kind as *pie* (artifact); again, in the compound *swordfish* we recognize a [-animate] element and a [+animate,-human] element, the whole compound belonging to the latter type.

iii) MORPHOLOGICAL FEATURES proper, such as gender or irregularity: the Italian coordinate compound *nave traghetto* (lit. boat.F ferry.M) 'ferry boat' inherits feminine gender from *nave*, which is also the locus of inflection (see the plural *navi traghetto* vs. **nave traghetti* vs. **navi traghetti*) but cannot be taken to be the semantic head, since a *nave traghetto* is both a boat AND a ferry.

In some cases, all these different aspects are contained in the same constituent. In Italian *pesce palla* (lit. fish.M ball.F) 'blowfish', the constituent *pesce* 'fish' can be identified as the head because it carries the word's semantic information (a *pesce palla* IS A *pesce*), it defines its lexical category and subcategory (a blowfish, just like fish, is an animate noun), and it also defines the gender of the whole word (masculine). Moreover, the same constituent can be claimed to be the distributional head of the word, because *pesce palla* and *pesce* have the same distribution, and also the locus of inflection, because it is the constituent where number is morphologically spelled out (*pesci palla*).

The problem is that in the general case none of these aspects seems to be, by itself, a sufficient and necessary condition to identify one element as the head. Sometimes, in fact, the three different sets of information presented above are not contained in the same internal constituent (Scalise & Fábregas 2010). The semantic criterion fails to identify a head at least in two cases:

(8)   Lexicalized compounds: a *hot-dog* is not a dog, a *buttercup* (flower) is not a cup, etc.

(9)   Exocentric compounds: a *loud-mouth* is not a mouth, a *red-coat* is not a coat, a *kill-joy* is not a joy, etc.

In some compounds we get the opposite problem: both constituents equally

contribute to the semantics of the whole and it is not possible to identify one single semantically defining head, as in coordinative compounds (10). Are there two heads in such cases?

(10)   a. a *ferry boat* IS A ferry **and** IS A boat
         b. an *actor-manager* IS AN actor **and** IS A manager

Similar problems emerge with lexical categories and categorial features, which sometimes do not seem to percolate from the internal constituents. Note that in *hot-dog* (8) the category N cannot percolate from *dog* because *dog* is an animate noun, whereas *hot-dog* is clearly non animate. The problem is even more acute in the case of some nominal compounds composed of two verbs:

(11)   a. $[[subi]_V[baja]_V]_N$ (Spanish)
            ascend+descend
            'lift'
      b. $[[cai]_V[feng]_V]_N$ (Chinese)
            cut+sew
            'tailor'

In some cases not even morphology helps to define the morphological head. It makes sense to suppose that, for morphosyntactic purposes, the most prominent element will be the one that carries the inflection of the word as a whole, but the criterion fails because some compounds inflect both elements:

(12)   a. *uno*   *student-**e**-lavorator-**e***   (Italian)
           one   student-SG-worker-SG
           'a/one student-worker'
      b. *due*   *student-**i**-lavorator-**i***
           two   student-PL-worker-PL
           'two student-workers'

Further, the identification of the locus of inflection – i.e., the constituent that serves as the base for a particular inflectional process – can get complex and tricky in some languages (due to lexicalization effects, internal inflection of constituents, etc.). Consider, for instance, the Italian situation (Masini & Scalise 2012:86), and note how much number inflection varies across different constructions (the underlined constituent in each case is the element that could be identified as the head following semantic/categorial criteria).

(13)   a. [[[<u>X</u>] **PL**] [Y]]   *cap**i**stazione* 'stationmasters'   (Italian)
      b. [[[<u>X</u>] **PL**] [[Y] **PL**]] *cass**e** fort**i*** 'safes'
      c. [[<u>X</u>] [[Y] **PL**]]   *acquarag(**i**)e* 'turpentines'
      d. [[<u>X</u>] [Y]]   *trasporto latte* 'milk transportation'

e. [[X] [[Y] **PL**]]   *gentildonne* 'gentlewomen'
f. [[[X] **PL**] [[Y] **PL**]]   *studenti lavoratori* 'students who also work'
g. [[[X] **PL**] [[Y]]]   *navi traghetto* 'ferry boats'
h. [[[X] **PL**] [[Y] **PL**]]   *visi pallidi* 'palefaces'
i. [[X] [Y **PL**]]   *portabagagli* 'car trunks'

In other cases, the situation is even more critical: not only the identification of the head is not consistent or varies across constructions according to one or several principles, but serious doubts are raised that a structural constituent can be postulated as a plausible head. This situation is known as exocentricity (absence of a head internal to the word), and it was identified in so many languages and situations that it is no longer believed to be – and can no longer be dismissed as – an exceptional pattern (cf. Bauer 2008; Scalise, Fabregas & Forza 2009).

Consider the case in (14), which exemplifies the highly productive and well-known class of VN compounds with agentive meaning in Romance languages.

(14) *porta-lettere*   (Italian)
      carry-letters
      'postman'

Here there is no clear semantic head: the semantics has something to do with carrying and with letters but the IS A Condition does not apply to these cases. There is no distributional head, because the distribution of the compound does not correspond exactly to that of any of its two members. There is no morphosyntactic head, because *lettere* is plural, but the compound is not necessarily plural. There is no categorial head, because the compound is an animate noun, and *lettere* is a non animate noun. There is, finally, no morphological head, because *lettere* is a feminine word, but the compound is not necessarily feminine: it can be used in the masculine.[3]

2.3 Are heads defined relationally?

In phonology, it is quite clear that prominence is a relational notion, in the sense that elements are not defined as prominent in isolation, but become prominent

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[3] But see Bisetto (1999) for an analysis where the head inside the compound is proposed to be a null element equivalent to the agentive nominaliser *-tore* '*-er*'; this proposal would rescue the endocentricity of the compound, and furthermore would confirm a distinction between what counts as prominent in different levels of the grammar –with the unit that counts as prominent in semantics, morphology and syntax being null in phonology–. We, however, restrict this overview to analysis where no covert elements are postulated.

when they are inserted in a bigger structure, by comparison with a second element. In morphology, the answer to this question is only partially clear.

Prominence (or headedness) is patently relational in compounding and in derivation. A single item, like *-(t)ion* or *dog*, is not inherently defined as prominent – namely, as a head –, but will become prominent if it is part of a structure where the right relations are defined. Consider, for instance, the examples in (15) and (16).

(15) a. *composit-ion*
      b. *composit-ion-al*
(16) a. *police dog*
      b. *police dog center*

In (15a), our suffix can be claimed to be the head: it defines, at least, the lexical category and the distribution of the word. However, it does not need to be, always, the head of a word: in (15b) there is an additional affix, *-al*, which defines the word as an adjective, and thus *-ion* is not the head there. The same applies to the next example: *dog* is a good candidate to be the semantic head in (16a), but not in (16b), because this compound denotes a particular kind of center.

In inflection, however, it is easier to argue that prominence is not defined relationally, because inflectional affixes – at least in a strong lexicalist view (cf. Halle 1973) – never alter the grammatical category of the word, so they are defined as inherently non-prominent.

(17) a. *classify*
      b. *classifi-ed*

(17a) and (17b) share most of their properties: both are verbs, both mean the same and both have a similar distribution, unless we look into contexts where the tense information is crucial (e.g., in consecutio-temporum subordinate clauses). A general, more or less implicit, intuition in lexicalist analyses has been that derivational morphology embeds the base, producing a new structure, while inflectional morphology just gives different forms of the same structure, adapted to different syntactic contexts, and can, thus, be viewed as a modifier of the base:

(18)   a. Derivation: [[Base] affix]
          b. Inflection [Base] (affix)

To the extent that some analyses at least share this intuition implicitly, it would mean that the prominence of inflectional elements is inherent: they would invariably, and independently of the structure where they are inserted, be non prominent. However, it is worth mentioning that the head debate in morphological theory has always mainly revolved around derivation and

compounding, where heads are relationally defined.

2.4 Classical conclusions

Let us take stock of what we have seen in this section by highlighting the two main conclusions that classical analyses of headedness in morphology have reached, on the face of the problems discussed before. Two have been the main proposals:

   i)   There are heads, but what counts as a head can be different at different levels.
   ii)   There are no heads.

One incarnation of the first idea is DiSciullo & Williams' (1987) Relativized Head Hypothesis: what counts as a head can vary depending on the kind of feature one wants to consider. With respect to gender, for instance, the head can be one element in the word, and with respect to the semantic subtype of the structure, the head can be a separate element. In DiSciullo & Williams there is still a positional condition: for a given feature F, the head will be the rightmost element in the structure carrying feature F. There is a second alternative, which is to give up the positional requirement, and simply accept that inside the same structure, different constituents can act as heads for distinct features, each one relevant in a different level. Scalise & Fábregas (2010) suggest we should divide the traditional head into "semantic head", "categorial head" and "morphological head" (cf. also Scalise, Fábregas & Forza 2009), without any positional generalization emerging from the diagnostics.

The big conclusion, for a second group of authors, is that the difficulties in identifying a systematic prominent element inside the word should lead us to the conclusion that there are no heads internal to complex words. Perhaps the clearest incarnation of this view is Anderson's (1992) Amorphous Morphology proposal, where the word – not only for the purposes of the syntax, but also for the purposes of the morphology – does not have an internal structure that can be expressed in terms of hierarchical relations between morphemes. In such an account, necessarily, identifying a subword constituent that is more prominent than others is impossible, because the very existence of subwords constituents at a structural level is denied.

3. HEADS IN MINIMALISM

We move now, after having reviewed the classic proposals that have dealt with prominence in morphology, to the discussion of how prominence / headedness

is dealt with in two contemporary theories that – on the surface – have little in common, but that, as we will see, both favour an account of headedness that is influenced by the challenges noted in Section 2.

We start with Minimalism in the form it is expressed in Chomsky (2013), Epstein, Kitahara & Seely (2014), inter alia.

The notion of head, both in syntax and in those approaches to morphology that accept that words have internal structure, is directly related to labeling. In any combination of items, represented below in set-format (19a), the head is defined as the element that projects / percolates its label to the whole set (19b). This upwards extension is generally manifested as some features of the terminal element becoming features of the whole constituent.

(19)   a. {X, Y}
         b. {X{X,Y}}

The new take of this situation in Minimalism involves removing the second step (19b) from the syntax and taking it to the interface with the Conceptual-Intentional system. Syntax just cares about the combination of items, but does not define the label of the constituents thus created. This label becomes relevant only for interpretation purposes, because it will give the semantic type of each constituent. However, because of Full Interpretation, every set will have to get a label at the interface.

Labeling works inside a very restricted space, looking for the single terminal node contained in the set that can pass its label. There are two situations that have been discussed:

(20)   a. {X, YP}, that is, merge of a terminal node with a phrase
         b. {XP, YP}, that is, merge of two phrases

In (20a), labeling is straightforward: at the interface, the structure is scanned, and counting nodes in a top-down order, the terminal node X is immediately identified. Thus, X gives its label to the structure, and thus becomes its head. (20b) is more problematic: identifying the head is impossible inside a minimally defined space, because both terminal nodes, X and Y, are embedded down in the structure. In such cases, Chomsky (2013: 43) argues that labeling is impossible, because general economy conditions do not allow the search to go even lower in the structure. There is only one way out, namely that one of the two phrases evacuates the constituent (by movement). In (21), this involves merging XP with ZP (in more traditional terms, XP moves to a specifier position in ZP).

(21)   [XP] ZP ... [[X̶P̶] [YP]]

   The combination of XP and YP can now be labeled, because the lowest copy of XP is ignored and then the search identifies Y as the single closest terminal

node. Note, however, that movement has created another combination of two phrases:

(22)   {XP, ZP}

At this point, either XP moves again (postponing the problem once again) or XP and ZP enter into an agreement relation. In this second case, agreement means that XP and ZP will share some salient features; these common features are taken as the label of the whole structure, solving the problem.

Technical details aside, there are three aspects that we would like to highlight due to their importance for the notion of head in morphology.

First, headedness – and prominence – is no longer taken to be a structural notion, in the sense that the component that combines units together does not try to define one of them as the head. Headedness is only defined at the interface with semantics and phonology, with amounts to saying that prominence is relevant for these two levels of analysis, but not for the computation proper. This is in line with the widely noted fact in morphological analyses that it is extremely difficult to find unique and systematic predictors in the structure for what would become the head inside a word. It also opens the way to fit, inside a general theory, the suggestion that what counts as a head can be different in semantics and morphophonology, because the identification of labels might be slightly different in each one of the two interfaces.

Second, this system allows two kinds of entities to be defined as prominent elements: it can be a constituent (as in (20a)), but it can also be a feature (or set of features) shared by two different constituents, as in (22). In other words, a head does not need to correspond anymore to a single terminal in the structure, essentially because the structure does not need to express headedness anymore when units are combined. This fits, again, with another set of conclusions reached in morphological studies: features, with or without percolation, seem to be more important than single morphemes to define headedness.

Third, given the spirit of the analysis, the identification of the label of a unit will also run into trouble when two terminal nodes are combined, a situation that (at least in lexicalist accounts) would typically happen with morphemes:

(23)   {X, Y}

Here, as in {XP, YP}, there are two terminal nodes at equal distance, and labeling would fail to identify one single element. Consequently, it follows from the theory that in such situations there should be word-internal movement or internal agreement in abstract features between morphemes, a conclusion with wide repercusions for the morphological component that opens new ways of analysis for longstanding problems of morphological description, such as the nature of inflectional morphology, the need for

agreement in some constructions and the mismatches between the linear order and the semantic interpretation of some morpheme combinations.

4. HEADEDNESS IN CONSTRUCTION MORPHOLOGY

Construction Morphology (CxM) is a theory of morphology recently developed by Geert Booij (2010) that is closely connected to the larger framework of Construction Grammar (Goldberg 1995, 2006; Hoffmann & Trousdale 2013). Within this model, complex words are (instantiations of) CONSTRUCTIONS, namely conventionalized associations of a FORM (e.g., phonological, morphological/morphosyntactic, categorial features) and a MEANING (e.g., semantic, pragmatic, and discourse properties). CxM is a word-based, output-oriented model, wherein words and morphological processes are represented by means of constructions of different complexity and specificity organized into a hierarchical lexicon.

Take for instance the construction in (24a), from which actual prefixed words (24b) are formed.

(24)   a. $< [un\text{-} [x]_{A\alpha i}]_{A\alpha j} \leftrightarrow [\text{NOT SEM}_i]_j >$
        b. *unfair*, *unreal*, *uncivil*, *unstable*

This is a semi-abstract morphological schema, whose FORM part contains: the lexically-specified prefix *un-* (a bound morpheme with no index and no category); an open slot marked with the category A(djective), the set of formal features α,[4] and the index 'i' (*x* is a variable for phonological shape); output properties (i.e., category A, set of features α, and index 'j'). The MEANING counterpart of the schema to which FORM is associated ($\leftrightarrow$) contains a semantic operator (NOT) and a denotation (SEM), which is co-indexed with the A in the input ('i'); the output meaning is also co-indexed with the output form ('j').

In this notation, the head is not overtly marked.[5] However, we can identify the rightmost constituent as what we traditionally call the head by looking at the features and indexes within the construction: the category A and the feature blundle α are associated to both the input adjective and the output form, SEM is co-indexed with the input adjective ('i') and the output meaning is co-indexed with the output form ('j'). What if we have a category-changing affix? The representation would be the following:

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[4] The notation used here for features slightly differs from the one Booij (2010: 18) proposes, but they are substantially equivalent. The current notation is used for practical reasons only.

[5] The issue of headedness in derivation and compounding in a CxM perspective is addressed in depth by Arcodia (2012), to which we refer for further discussion and exemplification.

(25) a. $< [[x]_{A\alpha i}$ -*ness*$]_{N\beta j}$ ↔ [STATE of being SEM$_i$]$_j >$
     b. *liveliness, sadness, kindness, craziness*

Here input and output features do not match (Aα vs. Nβ), so the base adjective cannot be the head. The suffix itself has no index and bears no features. Therefore, headedness in this case is a constructional property, i.e. the information usually associated with the head constituent (lexical category, morphosyntactic features, semantic features, etc.) is recovered from the whole suffixation construction, and more precisely from the output form (Nβ) and its co-indexed ('j') overall semantics.

Let us now consider the schema for English XN compounding (26) (adapted from Booij 2010: 17). The generalization that XN compounds in English are right-headed is captured by the fact that the right constituent shares its features with the output and that the semantic structure also reflects this fact.

(26) a. $< [[a]_{X\alpha k} [b]_{N\beta i}]_{N\beta j}$ ↔ [SEM$_i$ with relation R to SEM$_k$]$_j >$
     b. *bookshelf* (NN), *drawbridge* (VN), *blackboard* (AN)

The presence of the construction like (26a) does not imply that all XN compounds are necessarily right-headed in English: it only means that we have an abstract construction that can *productively* form new XN right-headed compounds within a given semantics. Instances that do not comply with this generalization (cf. e.g. *pickpocket*, which IS *NOT* A *pocket*) can be handled by either positing another schema or by using 'default inheritance' (Goldberg 1995: 73), i.e. the mechanism by which "properties of higher nodes are percolated to lower nodes, unless the lower node bears a contradictory specification for the relevant property" (Booij 2009: 206). For languages such as Chinese/Japanese and Nizaa, where productive compounds are both right-headed and left-headed depending on either the output category or the semantics of the compound (cf. examples (5)-(6) in Section 2.1), CxM would simply posit different constructional schemas.

Cases of exocentricity in compounding are in a way similar to suffixation (see (25)), since headedness, again, is a constructional property that cannot be deduced from the input elements, as exemplified in (27). In both examples, the formal properties of the output (Nγ) do not coincide with those found in the input, and the meaning parts of the construction refer to an external element of denotation (PERSON, EVENT) that is not co-indexed with any part of the input and is therefore provided by the construction itself.

(27) a. *porta-lettere* lit. bring-letters 'postman'   (Italian)
       $< [[porta]_{V\alpha k} [lettere]_{N\beta i}]_{N\gamma j}$ ↔ [PERSON who has to do with SEM$_k$ and SEM$_i$ being in a relation R with each other]$_j >$
     b. *dormi-veglia* lit. sleep.wake 'drowse'
       $< [[dormi]_{V\alpha k} [veglia]_{V\alpha i}]_{N\gamma j}$ ↔ [EVENT that has to do with SEM$_k$ and

SEM_i being in a relation R with each other]$_j$ >

Finally, it is worth mentioning conflicting cases. Consider for instance the Italian coordinate compound *bar-pasticceria* (lit. bar-pastry.shop), which identifies a place that is both a bar and a pastry shop. This clearly looks like a 'double-headed' compound: input constituents are Ns, and the output is also a N. However, the features of the output N match *bar* ($N\alpha$), not *pasticceria* ($N\beta$), since *bar-pasticceria* is masculine, like *bar*, and unlike *pasticceria*, which is feminine (*il bar pasticceria* 'the.M bar-pastry.shop', but **la bar-pasticceria* 'the.F bar-pastry.shop'). Thus, despite being semantically double-headed, the compound is formally left-headed. Within the construction, both properties can be specified:

(28)   < [[*bar*]$_{N\alpha k}$ [*pasticceria*]$_{N\beta i}$]$_{N\alpha j}$ ↔ [ENTITY which is both SEM_k and SEM_i]$_j$ >

In conclusion, what is crucial is that in CxM the head is not a structural notion, i.e. there is no constituent marked as such. Rather, the relevant information can be deduced from the construction itself, namely from (mis)matches between input and output features, and co-indexation. This has at least two consequences. The first regards the relation between exocentricity and endocentricity: no prominent (or, conversely, exceptional) role is given to either, both are virtually possible, and, in fact, both are attested (and productive) in the languages of the world. The second regards the position issue. Since we have no head constituent proper, we cannot have a 'canonical position' of the head (Scalise & Fábregas 2010: 118) either. What can be *interpreted* as the 'canonical position' of the head in a given language is basically the position – within synchronically productive word-formation schemas – in which we typically find input constituents that share their features with the output. Needless to say, for languages like Chinese or Japanese, where productive compounds are both right-headed and left-headed, this position is necessarily construction- specific.[6]

5. CONCLUSIONS: THE CURRENT CONSENSUS

The notion of head – intended as the prominent input constituent within a complex word that helps predicting the properties of the output – has been one

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[6] Nonetheless, the notion of canonical position may still sound appealing in order to explain the fact that the example in (28), despite having two semantic heads, has the formal head on the left, i.e. on what is considered the canonical position for heads in Romance languages. However, some sort of 'canonical position effect' may operate even without stating that there is a 'head constituent', since the system can still keep track of the fact that the leftmost constituent is the one that typically shares its features with the ouput.

of the central notions in morphological theory in the recent past. However, it brings about a number of problems – empirical and theoretical – that has led scholars either to redefine it (by splitting the head in multiple heads according to the level of analysis, or by positing covert heads) or to give it up completely. What emerges from the picture outlined above of Minimalism (Section 3) and Construction Morphology (Section 4) is that both approaches, which are very different in terms of both basic assumptions and representation mechanisms, agree in that headedness is not a relevant notion when building a complex form; the component that produces new forms (through structures or through constructions) does not need to make reference to headedness. In Minimalism headedness becomes necessary at the interfaces, in order to give labels to complex constituents that would then be interpreted and categorized; the head is, then, defined at the interface, but never before. In Construction Morphology, what is perceived as the head constituent (if any) is a by-product of feature matching and co-indexation within the construction, whereas both exocentricity and headedness conflicts are the result of *mis*matches of features between the information associated to the whole construction and that contained in its internal slots.

Ultimately, the point of having a head constituent was guaranteeing that the ouput construction contained enough and non-ambiguous information to be rightly interpreted; positing the notion, however, turned out to be problematic. If the interpretation can be granted by the interplay of features within the structure (whatever structure you may have), we may well do without a separate notion of head, because the features themselves (not necessarily associated to a single unique constituent) would guide interpretation in a sufficient manner.

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