Chapter 8

Nominal structures

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This chapter shows how nominal structures are treated in HPSG. The introduction puts the discussion in the broader framework of the NP vs. DP debate and differentiates three HPSG treatments, i.e. the specifier treatment, the DP treatment and the functor treatment. They are each presented in some detail and applied to the analysis of ordinary nominals, covering both syntactic and semantic aspects. A comparison reveals that the DP treatment does not mesh as well with the monostratal surface-oriented nature of the HPSG framework as the other treatments. Then it is shown how the specifier treatment and the functor treatment deal with nominals that have idiosyncratic properties, such as the Big Mess Construction, gerunds, nominalized infinitives and irregular P+NP combinations. Their analysis typically requires an appeal to phrasal constraints and a modicum of constructionalism.

1 Introduction

We use the term 'nominal' in a theory-neutral way as standing for a noun and its phrasal projection. In this broad sense all of the bracketed strings in (1) are nominals.

(1) [the [red [box]]] is empty

For the analysis of nominals there are two main approaches in generative grammar. One treats the noun (N) as the head all the way through. In that analysis the largest bracketed string in (1) is an NP. The other makes a distinction between the nominal core, consisting of a noun with its complements and modifiers, if any, and a functional outer layer, comprising determiners, quantifiers and numerals. In that analysis the noun is the head of *red box*, while the determiner is the head of *the red box*, so that the category of the latter is DP.

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The first approach, henceforth called the *NP approach*, prevailed in generative grammar up to and including the Government and Binding model (Chomsky 1981). One of its modules, the categorial component, consists of phrase structure rules, such as those in (2).

(2) a. VP → V NP
b. NP → Det Nom

They are required to "meet some variety of X-bar theory" (Chomsky 1981: 5). The original variety is that of Chomsky (1970). It consists of the following cross-categorial rule schemata:

(3) a. X′ → X ...
b. X″ → [Spec, X′] X′

X′ stands for the combination of a head X and its complements, where X is N, A or V, and X″ stands for the combination of X′ and its specifier "where [Spec,N′] will be analyzed as the determiner" (Chomsky 1970: 52). X-bar theory was further developed in Jackendoff (1977), who added a schema for the addition of adjuncts and who extended the range of X with P, the category of adpositions. Generalized Phrase Structure Grammar developed a monostratal version of it, exemplified by the analysis in Figure 1, quoted from Gazdar et al. (1985: 126). The top node is the double-bar category N″, which consists of the determiner and the single-bar category N′. The AP and the relative clause are adjoined to N′, and the lowest N′ consists of the noun and its PP complement.

The second approach, henceforth called the *DP approach*, results from an extension of the range of X in (3) to the functional categories. This was motivated by the fact that some of the phrase structure rules, such as (4), do not fit the X-bar mould.

(4) S → NP Aux VP

To repair this, the category Aux, which contained both auxiliaries and inflectional verbal affixes (Chomsky 1957), was renamed as I(nfl) and treated as the head of S. More specifically, I(nfl) was claimed to combine with a VP complement, yielding I′, and the latter was claimed to combine with an NP specifier (the subject), yielding I″ (formerly S). For the analysis of nominals such an overhaul did not at first seem necessary, since the relevant PS rules did fit the X-bar mould, but it took place nonetheless, mainly in order to capture similarities between nominal and clausal structures. These are especially conspicuous in

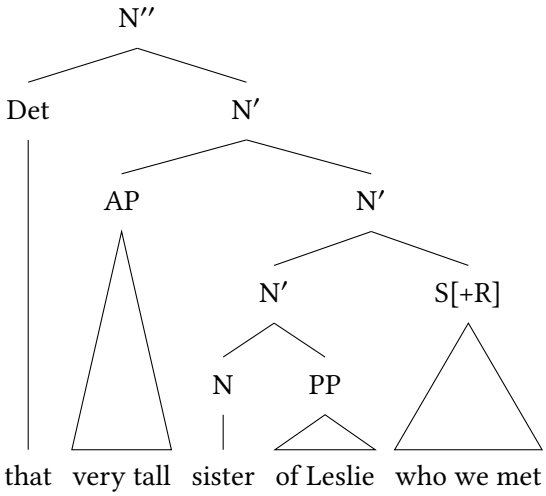

Figure 1: The NP approach

gerunds, nominalized infinitives and nominals with a deverbal head, and were seen as evidence for the claim that determiners have their own phrasal projection, just like the members of I(nfl) (Abney 1987). More specifically, members of D were claimed to take an N'' complement (formerly Nom), yielding D', and the latter was claimed to have a specifier sister, as in Figure 2. The DP approach was also taken on board in other frameworks, such as Word Grammar (Hudson 1990) and Lexical Functional Grammar (Bresnan 2001: 99).

Turning now to Head-driven Phrase Structure Grammar we find three different treatments. The first and oldest can be characterized as a lexicalist version of the NP approach, more specifically of its monostratal formulation in GPSG. It is first proposed in Pollard & Sag (1987) and further developed in Pollard & Sag (1994) and Ginzburg & Sag (2000). We henceforth call it the *specifier treatment*, after the role which it assigns to the determiner. The second is a lexicalist version of the DP approach. It is first proposed in Netter (1994) and further developed in Netter (1996), and Nerbonne & Mullen (2000). We will call it the *DP treatment*. The third adopts the NP approach, but neutralizes the distinction between adjuncts and specifiers, treating them both as functors. It is first proposed in Van Eynde (1998) and Allegranza (1998) and further developed in Van Eynde (2003), Van Eynde (2006) and Allegranza (2006). It is also adopted in Sign-Based Construction Grammar (Sag 2012). We will call it the *functor treatment*. This chapter presents the three treatments and compares them wherever this seems

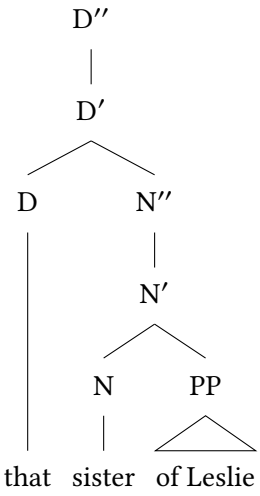

Figure 2: The DP approach

appropriate.

We first focus on ordinary nominals (Section 2) and then on nominals with idiosyncratic properties (Section 3). For exemplification we use English and a number of other Germanic and Romance languages, including Dutch, German, Italian and French. We assume familiarity with the typed feature structure notation and with such basic notions as unification, inheritance and token-identity.

2 Ordinary nominals

We use the term 'ordinary nominal' for a nominal that contains a noun, any number of complements and/or adjuncts and at most one determiner. This section shows how such nominals are analyzed in respectively the specifier treatment (2.1), the functor treatment (2.2) and the DP treatment (2.3).

2.1 The specifier treatment

The specifier treatment adopts the same distinction between heads, complements, specifiers and adjuncts as X-bar syntax, but the integration of these notions in a monostratal lexicalist framework inevitably leads to various differences. The presentation is mainly based on Pollard & Sag (1994) and Ginzburg & Sag (2000). We first discuss the syntactic structure (2.1.1) and the semantic composition (2.1.2)

of nominals, and then turn to nominals with a phrasal specifier (2.1.3).

2.1.1 Syntactic structure

Continuing with the same example as in Figures 1 and 2, a relational noun, such as *sister*, selects a PP as its complement and a determiner as its specifier, as spelled out in its CATEGORY value (5).

(5)
$$\begin{bmatrix} \textit{category} & \\ \textsc{head} & \textit{noun} \\ \textsc{spr} & \langle \textsc{Det} \rangle \\ \textsc{comps} & \langle \textsc{PP}[\textit{of}] \rangle \end{bmatrix}$$

The combination with a matching PP, as in *sister of Leslie*, is subsumed by the *head-comp(lement)s-phr* type, as defined in Borsley & Abeillé (2019), Chapter 1 of this volume, and yields a nominal with an empty COMPS list. Similarly, the combination of this nominal with a matching determiner, as in *that sister of Leslie*, is subsumed by the *head-sp(ecifie)r-phr* type, as defined in Borsley & Abeillé (2019), Chapter 1 of this volume. and yields a nominal with an empty SPR list. This is spelled out in Figure 3.

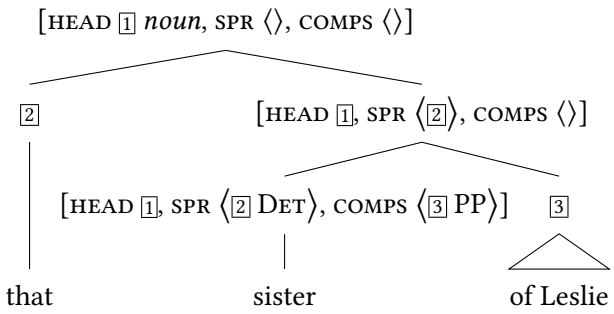

Figure 3: Adnominal complements and specifiers

Since the noun is the head of *sister of Leslie* and since the latter is the head of *that sister of Leslie*, the Head Feature Principle implies that the phrase as a whole shares the HEAD value of the noun (1). The valence features, COMPS and SPR, have a double role. On the one hand, they register the degree of saturation of the nominal; in this role they supersede the bar levels of X-bar theory. On the other hand, they capture co-occurrence restrictions, such as the fact that the

complement of *sister* be a PP, rather than an NP or a clause, and that its specifier be a singular determiner, rather than a plural one.[1]

In contrast to complements and specifiers, adjuncts are not included in valence lists, since their addition has no effect on the degree of saturation. At the same time, since the combination of an adjunct with its head is subject to co-occurrence restrictions, one needs a way to capture those. For that purpose Pollard & Sag (1994: 55–57) employs the feature MOD(IFIED). It is part of the HEAD value of the substantive parts-of-speech, i.e. noun, verb, adjective and preposition. Its value is of type *synsem* in the case of modifying items and of type *none* otherwise.

(6) *substantive*: [MOD *synsem* ∨ *none*]

As an example, let us take the number and gender agreement between nouns and adjectives in the Romance languages.[2] The Italian *grossa* 'big', for instance, is compatible with singular feminine nouns, such as *scatola* 'box', but not with plural feminine nouns, such as *scatole* 'boxes', nor with masculine nouns, such as *libro* 'book' or *libri* 'books'. This is made explicit in its MOD value, spelled out in (7).

(7)
$$\left[\begin{array}{l}\textit{category}\\ \textsc{head}\left[\begin{array}{l}\textit{adjective}\\ \textsc{mod|loc|cat}\left[\begin{array}{l}\textsc{head}\left[\begin{array}{l}\textit{noun}\\ \textsc{number}\ \textit{sing}\\ \textsc{gender}\ \textit{fem}\end{array}\right]\\ \textsc{spr}\left\langle \textsc{Det}\right\rangle\end{array}\right]\end{array}\right]\end{array}\right]$$

The token-identity of the MOD(IFIED) value of the adjective with the SYNSEM value of its head sister is part of the definition of type *head-adj(unct)-phr*, as defined in Borsley & Abeillé (2019), Chapter 1 of this volume. Since the MOD(IFIED) feature is part of the HEAD value, it follows from the Head Feature Principle that it is shared between an adjective and the AP which it projects. As a consequence, the MOD(IFIED) value of *molto grossa* 'very big' is shared with that of *grossa* 'big'.

Besides its role in modeling agreement, the MOD value is also instrumental in capturing constraints on linear order. The fact, for instance, that the AP in *that very tall bridge* appears after the determiner and not before, as in **very tall*

[1] The value of the third valence feature (SUBJ) is invariably the empty list for nouns, except in the case of predicative nouns, whose SUBJ list contains an NP that is identified with the target of the predication, see Ginzburg & Sag (2000: 409).

[2] This is an instance of concord, as defined in Wechsler (2019), Chapter 6 of this volume.

that bridge, is captured by the stipulation that the MOD value of the adjective is a nominal with a determiner on its SPR list. This blocks the combination with a fully saturated NP, as in **very tall that bridge*.[3] Also here, the MOD value of the adjective is shared with that of the AP, as shown in Figure 4.

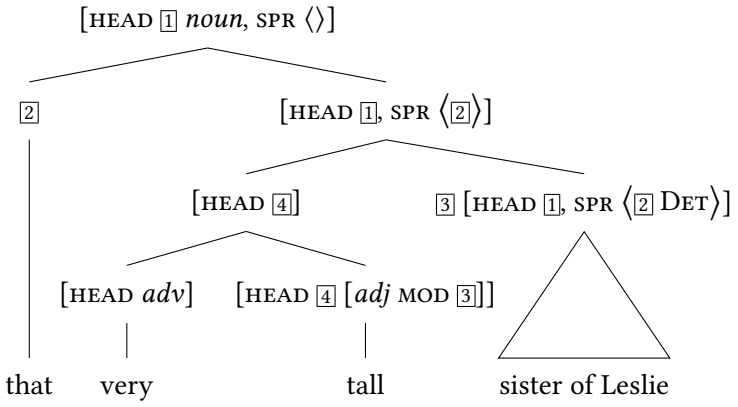

Figure 4: Adnominal modifiers

2.1.2 Semantic composition

Given the monostratal nature of HPSG, semantic representations do not constitute a separate level of representation, but take the form of attribute value pairs that are added to the syntactic representations. Phrase formation and semantic composition are, hence, modeled in tandem. Technically, the CONTENT feature is declared for the same type of objects as the CATEGORY feature.

(8) *local*: $\begin{bmatrix} \textsc{cat} & \textit{category} \\ \textsc{content} & \textit{semantic-object} \end{bmatrix}$

For nominals the value of the CONTENT feature is of type *scope-obj(ect)* in Ginzburg & Sag (2000). A scope-object is an index-restriction pair in which the index stands for entities and in which the restriction is a set of facts which constrain the denotation of the index, as in the CONTENT value of the noun *box*:

(9) $\begin{bmatrix} \textit{scope-obj} \\ \textsc{index}\ \boxed{1}\ \textit{index} \\ \textsc{restr}\ \left\{ \begin{bmatrix} \textit{box} \\ \textsc{arg}\ \boxed{1} \end{bmatrix} \right\} \end{bmatrix}$

[3] This order constraint is overruled in the Big Mess Construction, see Section 3.2.

This is comparable to the representations which are canonically used in Predicate Logic (PL), such as {x|*box*(x)}, where x stands for the entities that the predicate *box* applies to. In contrast to PL variables, HPSG indices are sorted with respect to person, number and gender. This provides the means to model the type of agreement that is called index agreement in Wechsler (2019), Chapter 6 of this volume.

(10) $\textit{index}: \begin{bmatrix} \textsc{person}\ \textit{person} \\ \textsc{number}\ \textit{number} \\ \textsc{gender}\ \textit{gender} \end{bmatrix}$

CONTENT values of attributive adjectives are also of type *scope-object*. When combined with a noun, as in *red box*, the resulting representation is one in which the indices of the adjective and the noun are identical, as in (11).[4]

(11) $\begin{bmatrix} \textit{scope-obj} \\ \textsc{index}\ \boxed{1} \\ \textsc{restr}\ \left\{ \begin{bmatrix} \textit{red} \\ \textsc{arg}\ \boxed{1} \end{bmatrix}, \begin{bmatrix} \textit{box} \\ \textsc{arg}\ \boxed{1} \end{bmatrix} \right\} \end{bmatrix}$

Also this is comparable to the PL practice of representing such combinations with one variable to which both predicates apply, as in {x|*red*(x) & *box*(x)}. What triggers the index sharing is the MOD(IFIED) value of the adjective, as illustrated by the AVM of *red* in (12) (Pollard & Sag 1994: 55).[5]

(12) $\begin{bmatrix} \textsc{cat}|\textsc{head} \begin{bmatrix} \textit{adjective} \\ \textsc{mod}|\textsc{loc}|\textsc{content} \begin{bmatrix} \textit{scope-obj} \\ \textsc{index}\ \boxed{1} \\ \textsc{restr}\ \boxed{\Sigma} \end{bmatrix} \end{bmatrix} \\ \textsc{content} \begin{bmatrix} \textsc{index}\ \boxed{1} \\ \textsc{restr}\ \left\{ \begin{bmatrix} \textit{red} \\ \textsc{arg}\ \boxed{1} \end{bmatrix} \right\} \cup \boxed{\Sigma} \end{bmatrix} \end{bmatrix}$

The adjective selects a scope-object, shares its index and adds its own restriction to those that are already present. The resulting CONTENT value is then shared with the mother.

To model the semantic contribution of determiners, Ginzburg & Sag (2000) makes a distinction between scope-objects that contain a quantifier (*quant-rel*),

[4] This is an example of intersective modification. The semantic contribution of other types of adjectives, such as *alleged* and *fake*, are modeled differently (Pollard & Sag 1994: 330–331).

[5] $\boxed{\Sigma}$ stands for an object of type *set*, as in Ginzburg & Sag (2000).

and those that do not (*parameter*). In terms of this distinction, the addition of a determiner to a nominal, as in *every red box*, triggers a shift from *parameter* to *quant-rel*. To capture this the specifier treatment employs the feature SPEC(IFIED). It is part of the HEAD value of the determiners, and its value is of type *semantic-obj(ect)*.[6]

(13) *determiner*: [SPEC *semantic-obj*]

In the case of *every*, the SPEC value is an object of type *parameter*, but its own CONTENT value is a subtype of *quant-rel* and this quantifier is put in store, to be retrieved at the place where its scope is determined, as illustrated by the AVM of *every* in (14) (Ginzburg & Sag 2000: 204).

(14)
$$\begin{bmatrix} \text{CAT}|\text{HEAD} \begin{bmatrix} \textit{det} \\ \text{SPEC} \begin{bmatrix} \textit{parameter} \\ \text{INDEX } \boxed{1} \\ \text{RESTR } \boxed{\Sigma} \end{bmatrix} \end{bmatrix} \\ \text{CONTENT } \boxed{2} \begin{bmatrix} \textit{every-rel} \\ \text{INDEX } \boxed{1} \\ \text{RESTR } \boxed{\Sigma} \end{bmatrix} \\ \text{STORE } \{\boxed{2}\} \end{bmatrix}$$

Notice that the addition of the SPEC feature yields an analysis in which the determiner and the nominal select each other: The nominal selects its specifier by means of the valence feature SPR and the determiner selects the nominal by means of SPEC.

2.1.3 Nominals with a phrasal specifier

Specifiers of nominals tend to be single words, but they can also take the form of a phrase. The bracketed phrase in [*the Queen of England's*] *sister*, for instance, is in complementary distribution with the possessive determiner in *her sister* and has a comparable semantic contribution. For this reason it is treated along the same lines. More specifically, the possessive marker *'s* is treated as a determiner that takes an NP as its specifier, as shown in Figure 5 (Pollard & Sag 1994: 51–54) and (Ginzburg & Sag 2000: 193).[7]

[6] In Pollard & Sag (1994: 45) the SPEC(IFIED) feature was also assigned to other function words, such as complementizers, and its value was of type *synsem*.

[7] The treatment of the phonologically reduced *'s* as the head of a phrase is comparable to the treatment of the homophonous word in *he's ill* as the head of a VP. Notice that the possessive *'s* is not a genitive affix, for if it were, it would be affixed to the head noun *Queen*, as in **the Queen's of England sister*, see Sag et al. (2003: 199).

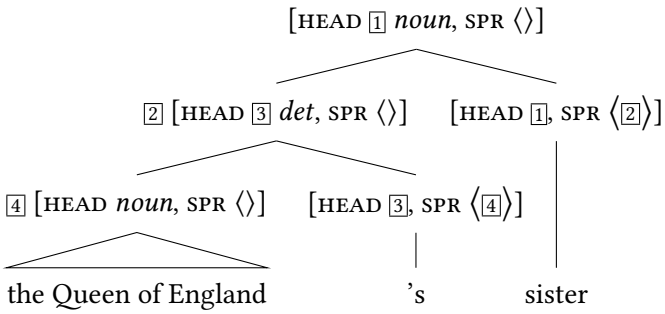

Figure 5: Phrasal specifiers

In this anaysis the specifier of *sister* is a DetP that is headed by *'s* and the latter takes the NP *The Queen of England* as its specifier.[8] Semantically, *'s* relates the index of its specifier (the possessor) to the index of the nominal that it selects (the possessed), as spelled out in (15).[9]

(15)
$$\left[\begin{array}{l} \textsc{cat}\left[\begin{array}{l} \textsc{head}\left[\begin{array}{l} \textit{det} \\ \textsc{spec}\left[\begin{array}{l} \textit{parameter} \\ \textsc{index}\ \boxed{1} \\ \textsc{restr}\ \boxed{\Sigma} \end{array}\right] \end{array}\right] \\ \textsc{spr}\left\langle\left[\textsc{index}\ \boxed{3}\right]\right\rangle \end{array}\right] \\ \textsc{content}\ \boxed{2}\left[\begin{array}{l} \textit{the-rel} \\ \textsc{index}\ \boxed{1} \\ \textsc{restr}\left\{\left[\begin{array}{l} \textit{poss-rel} \\ \textsc{possessor}\ \boxed{3} \\ \textsc{possessed}\ \boxed{1} \end{array}\right]\right\} \cup \boxed{\Sigma} \end{array}\right] \\ \textsc{store}\left\{\boxed{2}\right\} \end{array}\right]$$

The assignment of *the-rel* as the CONTENT value captures the definiteness of the resulting NP. Notice that this analysis contains a DetP, but in spite of that, it is not an instance of the DP approach, since the determiner does not head the nominal, but only its specifier.

[8] Since the specifier of *'s* is an NP, it may in turn contain a specifier that is headed by *'s*, as in *John's uncle's car*.

[9] The terms 'possessor' and 'possessed' are meant to be understood in a broad not-too-literal sense.

2.2 The functor treatment

The functor treatment also adopts the NP approach, but –in contrast to the specifier treatment– it does not draw a distinction between specifiers and adjuncts, nor between lexical (or substantive) and functional categories.[10] The presentation in this section is mainly based on Van Eynde (2006) and Allegranza (2006). We first introduce the basics (Section 2.2.1) and then turn to nominals with a phrasal specifier (Section 2.2.2) and to nominals without specifier (Section 2.2.3).

2.2.1 Basics

The distinction between specifiers and adjuncts is usually motivated by the assumption that the former are obligatory and non-stackable, while the latter are optional and stackable. In practice, though, this distinction is blurred by the fact that many nominals are well-formed without specifier. To accommodate this one can employ phonetically empty determiners, optionality in the SPR list or a non-branching phrase type, but the functor treatment provides a more radical response and abandons the distinction between specifiers and adjuncts. Technically, this implies that the SPR feature is dropped.[11]

Besides, the functor treatment abandons the distinction between lexical and functional categories. The words which are commonly treated as determiners are not treated as members of a separate functional category 'Det', but are claimed to belong to independently needed lexical categories, such as Adjective, Adverb, Pronoun and Noun. The argumentation is mainly –but not only– based on matters of NP-internal agreement and inflectional variation (Van Eynde 2006). In Dutch, for instance, prenominal adjectives show agreement with the nouns they modify: They take the affix *-e* in combination with plural and singular non-neuter nominals, but not in combination with singular neuter nominals.[12]

(16) zwarte muren, zwarte verf, zwart zand
black wall.PL, black paint.SG.FEM, black sand.SG.NEU

[10] The term *functor* is also used in Categorial (Unification) Grammar, where it has a very broad meaning, subsuming the nonhead daughter in combinations of a head with a specifier or an adjunct, and the head daughter otherwise, see Bouma (1988). This broad notion is also adopted in Reape (1994). We adopt a more restrictive version in which functors are nonhead daughters which lexically select their head sister.

[11] Intriguingly, Chomsky has recently argued that there is no need for the notion of specifier in Transformational Grammar either, see Chomsky (2013: 43).

[12] If the adjective is preceded by a definite determiner, it also takes the affix in singular neuter nominals. This phenomenon is treated in Section 2.2.2.

The same holds for several of the words that are claimed to be determiners, such as the possessive *ons* 'our' and the interrogative *welk* 'which'.

(17) onze ouders, onze muur, ons huis
our parent.PL, our wall.SG.MAS, our house.SG.NEU

(18) welke boeken, welke man, welk boek
which book.PL, which man.SG.MAS, which book.SG.NEU

By contrast, prenominal (pro)nouns do not show NP-internal agreement and never take the *-e* affix. This not only holds for genitive nouns, such as *Jans*, but also for several of the words that are claimed to be determiners, such as the interrogative *wiens* 'whose' and the quantifying *wat* 'some'.

(19) Jans ouders, Jans fiets, Jans huis
Jan.GEN parent.PL, Jan.GEN bike.SG.MAS, Jan.GEN house.SG.NEU

(20) wiens ouders, wiens muur, wiens huis
whose parent.PL, whose wall.SG.MAS, whose house.SG.NEU

(21) wat boeken, wat verf, wat zand
some book.PL, some paint.SG.FEM, some sand.SG.NEU

To model this the functor treatment assigns adjectival status to determiners like *ons* 'our' and *welk* 'which', and pronominal status to determiners like *wiens* 'whose' and *wat* 'some'. This distinction is also relevant for other languages. The Italian possessives of the first and second person, for instance, show the same alternation for number and gender as the adjectives and are subject to the same constraints on NP-internal agreement.

(22) il nostro futuro, la nostra scuola, i nostri
the our future.SG.MAS, the our school.SG.FEM, the our
genitori, le nostre scatole
parent.PL.MAS, the our box.PL.FEM

The possessive of the third person plural, by contrast, does not show any inflectional variation and does not show agreement with the noun.[13]

(23) il loro futuro, la loro scuola, i loro genitori,
the their future.SG.MAS, the their school.SG.FEM, the their parent.PL.MAS,
le loro scatole
the their box.PL.FEM

[13] Confirming evidence for the pronominal status of *loro* is provided by the fact that it is also used as a personal pronoun, as in *l'ho dato a loro* 'I gave it to them'.

An example from French is provided in Abeillé et al. (2004), which assigns adverbial status to the specifier in *beaucoup de farine* 'much flour'. Technically, the elimination of the distinction between lexical and functional categories implies that there is no longer any need for drawing a distinction between the selection features MOD(IFIED) and SPEC(IFIED).

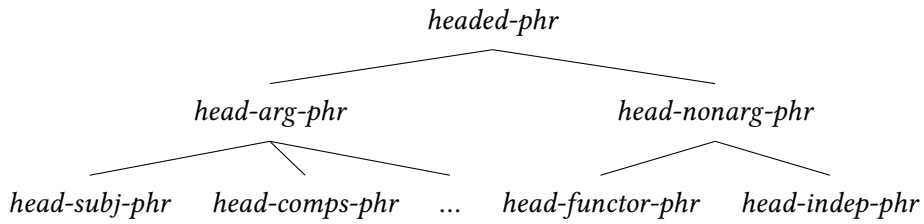

Figure 6: Hierarchy of headed phrases

To spell out the functor treatment we start from the hierarchy of headed phrases in Figure 6. The basic distinction is that between *head-argument-phr* and *head-nonargument-phr*. In the former the head daughter selects its non-head sister(s) by means of valence features, such as COMPS and SUBJ (but not SPR!), and it is their values that register the degree of saturation of the phrase, as shown for COMPS in Section 2.1.1. In head-nonargument phrases the degree of saturation is registered by the MARK(ING) feature. It is declared for objects of type *category*, along with the HEAD and valence features.[14] Its value is shared with the head daughter in head-argument phrases and with the non-head daughter in head-nonargument phrases, as spelled out in (24) and (25) respectively.

(24)
$$\begin{bmatrix} \textit{head-arg-phr} \\ \textsc{synsem|loc|cat|mark}\ \boxed{1}\ \textit{marking} \\ \textsc{head-dtr|synsem|loc|cat|mark}\ \boxed{1} \end{bmatrix}$$

(25)
$$\begin{bmatrix} \textit{head-nonarg-phr} \\ \textsc{synsem|loc|cat|mark}\ \boxed{1}\ \textit{marking} \\ \textsc{dtrs}\left\langle \left[\textsc{synsem|loc|cat|mark}\ \boxed{1}\right], \boxed{2} \right\rangle \\ \textsc{head-dtr}\ \boxed{2}\ \textit{sign} \end{bmatrix}$$

Besides, instead of MOD and SPEC, the functor treatment employs one feature to model the selection of a head by its non-head sister. It is called SEL(ECT), and its value is an object of type *synsem* that is shared with the head daughter, as spelled out in (26).

[14] The MARKING feature is introduced in Pollard & Sag (1994: 46) to model the combination of a complementizer and a clause.

(26)
$$\begin{bmatrix} \textit{head-functor-phr} \\ \textsc{dtrs}\left\langle \left[\textsc{synsem|loc|cat|head|sel}\ \boxed{1}\right], \boxed{2}\ \textit{sign}\right\rangle \\ \textsc{head-dtr}\ \boxed{2}\left[\textsc{synsem}\ \boxed{1}\ \textit{synsem}\right] \end{bmatrix}$$

This is a subtype of *head-nonargument-phr*. It subsumes the phrases in which the non-head daughter selects its head sister. As such it contrasts with phrases of type *head-independent-phr*, whose defining characteristic is that the nonhead daughter does not select its head sister: Its SEL value is hence *none*.[15]

(27)
$$\begin{bmatrix} \textit{head-independent-phr} \\ \textsc{dtrs}\left\langle \left[\textsc{synsem|loc|cat|head|sel}\ \textit{none}\right], \boxed{1}\right\rangle \\ \textsc{head-dtr}\ \boxed{1}\ \textit{sign} \end{bmatrix}$$

An illustration of the functor treatment is given in Figure 7. The combination of the noun with the adjective is an instance of *head-functor-phr*, in which the adjectival functor selects an unmarked nominal (3), shares its MARKING value (5), and, being a non-argument, shares it with the mother as well. The combination of the resulting nominal with the demonstrative is also an instance of *head-functor-phr*, in which the demonstrative functor selects an unmarked nominal (4), but –differently from the adjective– its MARKING value is of type *marked*, and this value is shared with the mother (2). This accounts for the fact that adjectives can be stacked, while determiners cannot. It also accounts for the ill-formedness of combinations like **long the bridge*, since attributive adjectives are not compatible with a marked nominal. Notice that the demonstrative does not belong to a functional part of speech, such as Det. Instead, it is claimed to be a pronoun. The only difference between adnominal *that* and nominal *that* concerns the SEL(ECT) value: While the former selects an unmarked singular nominal, the latter does not select anything.

Whether an adnominal functor is marked or unmarked is subject to cross-linguistic variation. The Italian possessives, for instance, are unmarked and can, hence, be preceded by an article, as in *il suo cane* 'the his dog' and *un mio amico* 'a my friend', while the French possessives are marked: *(*le) mon chien* '(*the) my dog' and *(*un) mon ami* '(*a) my friend'.

The treatment of postnominal dependents is similar to that in the specifier treatment. A relational noun like *sister*, for instance, takes an optional PP[*of*] complement. Similarly, a deverbal noun like *description* takes two optional PP complements. If realized, as in *a description of the Hungarian NP by Ivan*, their

[15] This type is introduced in Van Eynde (1998: 130). It will be used in Section 3 to deal with idiosyncratic nominals.

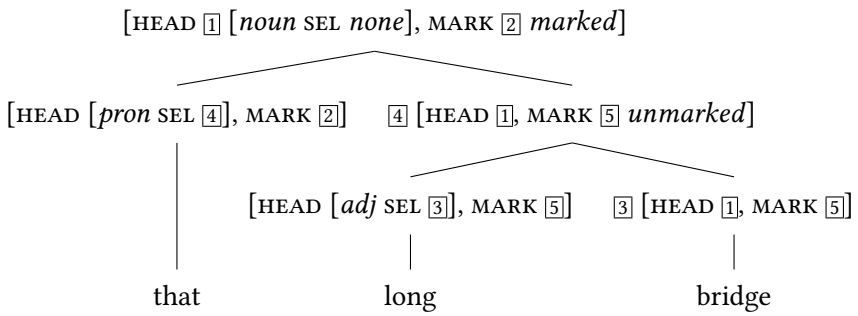

Figure 7: Adnominal functors

indices are identified with those of the second and the first argument respectively. There is a difference, though, in the treatment of nominals whose first argument is realized as a possessive, as in *his description of the Hungarian NP*. In this case, the first argument is not put on the SPR list of the noun. Instead, the possessive selects an unmarked nominal with an optional PP[*by*] complement on its COMPS list, and shares the index of that PP, as spelled out in Figure 8.

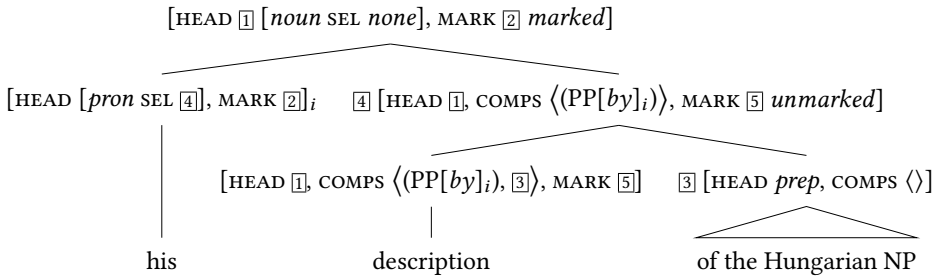

Figure 8: Deverbal nominals

2.2.2 Nominals with a phrasal functor

To illustrate how the functor treatment deals with phrasal specifiers we take the nominal *a hundred pages*. It has a left branching structure in which the indefinite article selects the unmarked singular noun *hundred* –its plural counterpart is *hundreds*– and in which the resulting NP selects the unmarked plural noun *pages*, as spelled out in Figure 9. The MARKING value of the article is shared with its mother (1), yielding a marked NP, and since the latter is a functor it is also shared

with the NP as a whole (1). This accounts for the fact that it cannot be preceded by a determiner, as in **those a hundred pages*. By contrast, if the place of the article is taken by a numeral, as in *two hundred pages*, the addition of a determiner is possible, as in *those two hundred pages*, since the numeral is unmarked. Notice that the HEAD value of the entire NP is identified with that of *pages*. This accounts for the fact that it is plural.

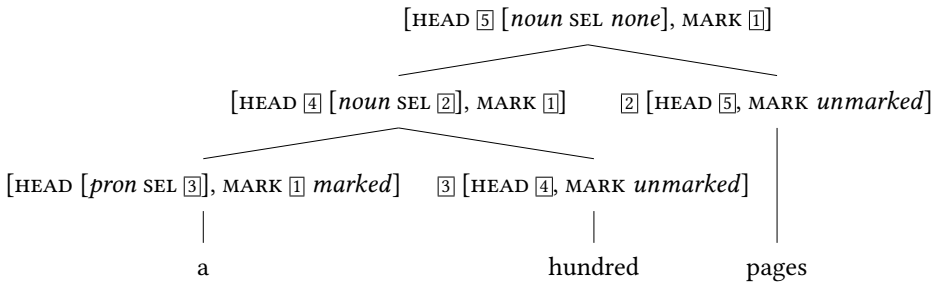

Figure 9: Phrasal functors

2.2.3 The hierarchy of MARKING values

Nominals without specifier have a MARKING value of type *unmarked*. Whether they need to be marked, depends on a multitude of factors and is largely language specific. Latin, for instance, does not require its nominals to contain a specifier, also if they are singular and count. Yet, there are cases in which an unmarked nominal is incomplete. To illustrate this let us take the attributive adjectives of Dutch again. As already pointed out in Section 2.2.1, they take the form without affix in singular neuter nominals, as in *zwart zand* 'black sand'. A complication, though, is that they canonically take the form with the affix if the nominal is introduced by a definite determiner, as in *het zwarte zand* 'the black sand'. This has consequences for the status of nominals with a singular neuter head: *zwart zand* and **zwarte zand*, for instance, are both unmarked, but while the former is well-formed as it is, the latter is only well-formed if it is preceded by a definite determiner. To model this Van Eynde (2006) differentiates between two types of *unmarked* nominals, as shown in Figure 10.

Employing the more specific subtypes, the adjectives without affix which select a singular neuter nominal have the value *bare*, while their declined counterparts which select a singular neuter nominal have the value *incomplete*. Since this MARKING value is shared with the mother, the MARKING value of *zwart zand*

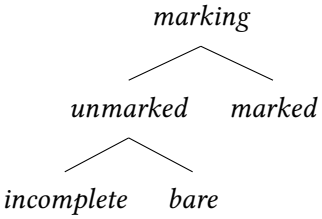

Figure 10: Hierarchy of MARKING values

is *bare*, while that of **zwarte zand* is *incomplete*. The fact that the latter must be preceded by a definite determiner is modeled in the SEL(ECT) value of the determiner: While definite determiners select an unmarked nominal, which implies that they are compatible with both bare and incomplete nominals, non-definite determiners select a bare nominal and are, hence, not compatible with an incomplete one, as in **een zwarte huis* 'a black house'. The MARKING feature is, hence, useful to differentiate bare nominals from incomplete nominals. In a similar way, one can make finer-grained distinctions in the hierarchy of *marked* values to capture co-occurrence restrictions between determiners and nominals, as in the functor treatment of the Italian determiner system of Allegranza (2006). See also the treatment of nominals with idiosyncratic properties in Section 3.

2.3 The DP treatment

In contrast to the specifier treatment and the functor treatment, the DP treatment identifies the determiner as the head of an NP. The presentation in this section is mainly based on Netter (1994). We first sketch its main characteristics (2.3.1) and then list some problems for it (2.3.2).

2.3.1 Two types of complementation

As in the transformational DP treatment, nominal projections are divided in a nominal core, consisting of a noun and its complements and/or adjuncts, on the one hand, and an external functional layer, comprising the determiner, on the other hand. The former is analyzed in much the same way as in the specifier treatment. The relational noun *sister* in Figure 11, for instance, is combined with its PP complement in the usual way. The addition of the determiner, by contrast, is modeled differently. It is not the nominal which selects its specifier by means of the valence feature SPR; instead, it is the determiner which selects a nomi-

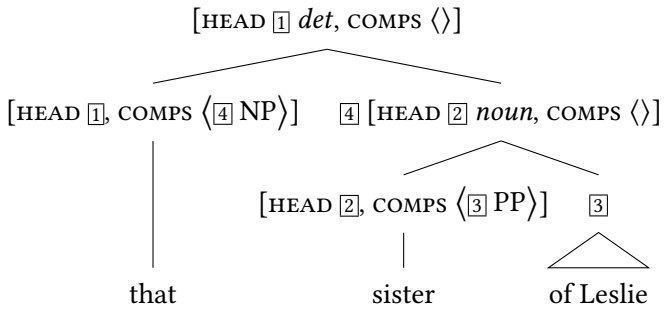

Figure 11: Lexicalist DP treatment

nal by means of the valence feature COMPS, yielding a DP with an empty COMPS list. To account for the fact that this DP inherits many of its properties from its nominal non-head daughter, Netter makes a distinction between functional complementation and ordinary complementation, and differentiates between major and minor HEAD features:

(28) *part-of-speech*:
$$\begin{bmatrix} \textsc{major} \begin{bmatrix} \textsc{n}\ \textit{boolean} \\ \textsc{v}\ \textit{boolean} \end{bmatrix} \\ \textsc{minor} \left[\textsc{fcompl}\ \textit{boolean}\right] \end{bmatrix}$$

The MAJOR attribute includes the boolean features N and V, where nouns are [+N, –V], adjectives [+N, +V], verbs [–N, +V] and prepositions [–N, –V]. Besides, [+N] categories also have the features CASE, NUMBER and GENDER. Typical of functional complementation is that the functional head shares the MAJOR value of its complement (Netter 1994: 311–312).

(29) In a lexical category of type *func-cat* the value of its MAJOR attribute is token identical with the MAJOR value of its complement.

Since a determiner shares the MAJOR value of its nominal complement and since this value is also shared with the DP (given the Head Feature Principle), it follows that the resulting DP is [+N,–V] and that its CASE, NUMBER and GENDER values are identical to those of its nominal non-head daughter. This differentiates functional complementation from ordinary complementation, where a head and its complement do not share their MAJOR value. The noun *sister* in Figure 11, for instance, does not share the part-of-speech of its PP complement.

The MINOR attribute is used to model properties which a functional head does *not* share with its complement. It includes FCOMPL, a feature which registers whether a projection is functionally complete or not. Its value is positive for determiners, negative for singular count nouns and underspecified for plurals and mass nouns. Determiners take a nominal complement with a negative FCOMPL value, but their own FCOMPL value is positive and since they are the head, they share this value with the mother, as in Figure 12. In this analysis, a nominal is complete, if it is both saturated (empty COMPS list) and functionally complete (positive FCOMPL).

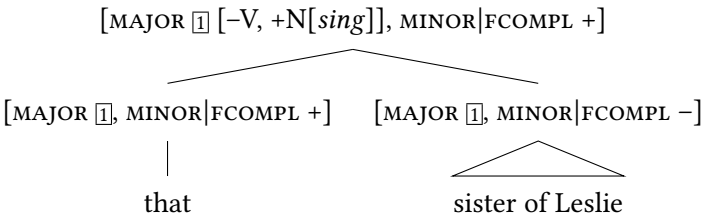

Figure 12: Functional completeness

2.3.2 Two problems for the DP treatment

A problem for the DP treatment concerns the notion of functional complementation, as defined in (29). If determiners share the MAJOR value of the nominals which they select, then it follows that they are nominal themselves, i.e. [+N, –V]. However, while this makes sense for determiners with (pro)nominal properties, such as the English *that*, the Dutch *wat* 'some' and the Italian *loro* 'their', it is rather implausible for determiners with adjectival properties, such as the Italian *mio* 'my', the Dutch *ons* 'our' and the German *welch* 'which'. The problem also affects the associated agreement features, i.e. CASE, NUMBER and GENDER. If a determiner is required to share the values of these features with its nominal complement, as spelled out in (29), then we get implausible results for nominals in which the determiner and the noun do not show agreement. In the Dutch *wiens huizen* 'whose houses' and *'s lands hoogste bergen* 'the highest mountains of the country', for instance, the selected nominals are plural and non-genitive, and so are the entire DPs, but the selecting determiner (phrase) is singular and genitive.

Another problem concerns the assumption "that all substantive categories will require the complement they combine with to be both saturated and function-

ally complete" (Netter 1994: 311). Complements of verbs and prepositions must, hence, be positively specified for FCOMPL. This, however, is contradicted by the existence of prepositions which require their complement to be functionally incomplete. The German prepositions *am, im, vom, beim* and *zum*, for instance, which diachronically result from the incorporation of a dative form of the definite article (*dem*) in respectively *an* 'at', *in* 'in', *von* 'of', *bei* 'at' and *zu* 'to', count as syntactic atoms in HPSG, just like the forms without incorporated article, but in contrast to the latter they require their complement to lack a determiner: While *in dem/diesem Zimmer* 'in the/this room' and *im Zimmer* 'in.the room' are both well-formed, **im dem/diesem Zimmer* 'in.the the/this room' is not.[16] Moreover, there are prepositions which do not contain an incorporated article, but nonetheless require a determinerless nominal. The Dutch *te* and *per*, for instance, are not compatible with nominals that contain a determiner, even if the nominal is singular and count, as in *te (*het/een) paard* 'on horse' and *per (*de/een) trein* 'by train'. This must be due to a lexical property of these prepositions, since most other prepositions require such nominals to have a determiner, as in *ze viel van *(het/een) paard* 'she fell from *(the/a) horse' and *ze zit op *(de/een) trein naar Londen* 'she is on *(the/a) train to London'. The requirement that complements of prepositions must be functionally complete is, hence, untenable.

2.4 Conclusion

This section has presented the three main treatments of nominal structure in HPSG. Two adopt the NP approach and one the DP approach. Overall, the former turn out to be more amenable to integration in a monostratal surface-oriented framework like HPSG than the latter. See also Müller (2020). Of the two NP treatments the specifier treatment is closer to early versions of $\overline{\text{X}}$ syntax and to GPSG. The functor treatment is closer to versions of Categorial (Unification) Grammar, and has also been adopted in Sign-Based Construction Grammar (Sag 2012).

[16] A similar phenomenon exists in Italian, where the prepositions *a* 'at', *da* 'from', *su* 'on', *di* 'of' and *in* 'in' have alternate forms with an incorporated form of the definite article, as in *al, dal, sul, del* and *nel*, each with feminine and plural counterparts (*alla, agli, alle, dalla, dagli, dalle, ...*). The nominals which combine with such forms may not be introduced by a determiner: *di/*della questa scatola* 'of/*of.the this box' and *in/*nel ogni palazzo* 'in/*in.the every palace'. The same holds m.m. for the French portemanteau forms *du, des, au* and *aux*.

3 Idiosyncratic nominals

This section focusses on the analysis of nominals with idiosyncratic properties. Since their analysis often requires a relaxation of the strictly lexicalist approach of early HPSG we first introduce some basic notions of constructional HPSG.

The lexicalist approach of early HPSG can be characterized as one in which the properties of phrases are mainly determined by properties of the constituent words and only to a small extent by properties of the combinatory operations as such. Pollard & Sag (1994: 391), for instance, employs no more than seven types of combinatory operations, including those which were exemplified in Section 2.1, i.e. head-specifier, head-complements and head-adjunct.[17] Over time, though, this radical lexicalism gave way to an approach in which the properties of the combinatory operations play a larger role. The small inventory of highly abstract phrase types got replaced by a more fine-grained hierarchy in which the types contain more specific and –if need be– idiosyncratic constraints. This development started in Sag (1997), was elaborated in Ginzburg & Sag (2000), and gained momentum afterward, leading to what is now known as constructional HPSG. Characteristic of this approach is the use of a bi-dimensional hierarchy of phrasal signs. In such a hierarchy the phrases are not only partitioned in terms of HEADEDNESS, but also in terms of a second dimension, called CLAUSALITY, as in Figure 13.

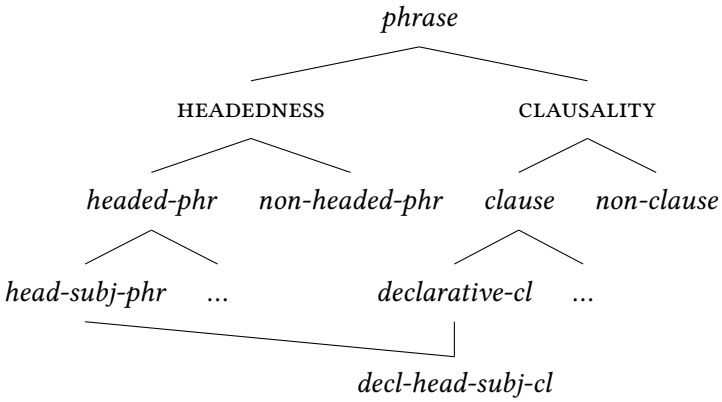

Figure 13: Bi-dimensional hierarchy of clauses

The types in the CLAUSALITY dimension are associated with constraints, in

[17] The remaining four are head-subject, head-subject-complements, head-marker and head-filler.

much the same way as the types in the HEADEDNESS dimension. Clauses, for instance, are required to denote an object of type *message* (Ginzburg & Sag 2000: 41).

(30) $\begin{bmatrix} \textit{clause} \\ \text{SYNSEM|LOC|CONTENT } \textit{message} \end{bmatrix}$

At a finer-grained level, the clauses are partitioned into declarative, interrogative, imperative, exclamative and relative clauses, each with their own constraints. Interrogative clauses, for instance, denote a question, while indicative declarative clauses denote a proposition.

Exploiting the possibilities of multiple inheritance one can define types which inherit properties from more than one supertype. The type *decl(arative)-head-subj(ect)-cl(ause)*, for instance, inherits the properties of *head-subject-phr*, on the one hand, and *declarative-cl*, on the other hand. Besides, it may have properties of its own, such as the fact that its head daughter is a finite non-inverted verb (Ginzburg & Sag 2000: 43). This combination of multiple inheritance and specific constraints on maximal phrase types is also useful for the analysis of nominals with idiosyncratic properties, as will be shown presently.

3.1 The Big Mess Construction

In ordinary nominals determiners precede attributive adjectives. Changing the order yields ill-formed combinations, such as **long that bridge* and **very tall every man*. However, this otherwise illegitimate order is precisely what we find in the Big Mess Construction (BMC), a term coined by Berman (1974).

(31) a. It's *so good a bargain* I can't resist buying it.
b. *How serious a problem* is this?

The idiosyncratic order in (31) is required if the nominal is introduced by the indefinite article, and if the preceding AP is introduced by one of a small set of degree markers, including *so, as, how, this, that* and *too*.

A specifier treatment of the BMC is provided in Ginzburg & Sag (2000: 201). It adopts a left branching structure, as in [[[*so good*] *a*] *bargain*], in which *so good* is the specifier of the indefinite article and in which *so good a* is the specifier of *bargain*. This is comparable to the treatment of the possessive in [[[*the Queen of England*] *'s*] *sister*], see Section 2.1.3. However, while there is evidence that *the Queen of England's* is a constituent, since it may occur independently as in *this crown is the Queen of England's*, there is no evidence that *so good a* is a constituent.

Instead, there is evidence that the article forms a constituent with the following noun, since it also precedes the noun when the AP is in postnominal position, as in *we never had a bargain so good as this one*.

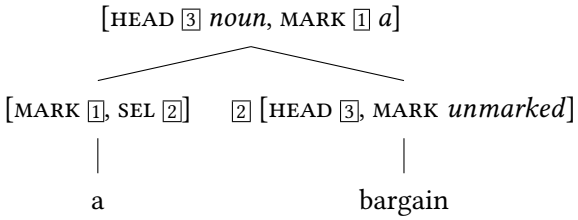

Figure 14: The lower NP

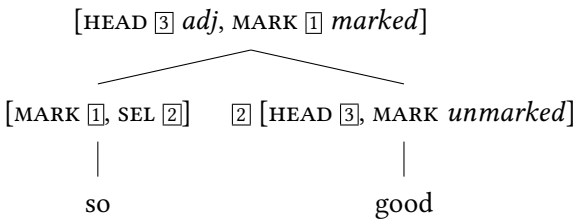

Figure 15: The marked AP

A structure in which the article sides with the noun, as in [[*so good*] [*a bargain*]], is adopted in Van Eynde (2007), Kim & Sells (2011), Kay & Sag (2012), Arnold & Sadler (2014) and Van Eynde (2018), all of which are functor treatments. The structure of the lower NP is spelled out in Figure 14. The article has a MARKING value of type *a* which is a subtype of *marked* and which it shares with the mother.[18] The AP is also treated as an instance of the head-functor type in Van Eynde (2007), Kim & Sells (2011) and Van Eynde (2018). The adverb has a MARKING value of type *marked*, so that the AP is marked as well, as shown in Figure 15. In combination with the fact that the article selects an unmarked nominal, this accounts for the ill-formedness of (32).

(32) a. * It's a so good bargain I can't resist buying it.
b. * A how serious problem is it?

[18] The MARKING value of the article looks similar to its PHONOLOGY value, but it is not the same. The PHONOLOGY values of *a* and *an*, for instance, are different, but their MARKING value is not.

By contrast, adverbs like *very* and *extremely* are unmarked, so that the APs which they introduce are admissible in this position, as in (33).

(33) a. This is a very serious problem.
b. We struck an extremely good bargain.

To model the combination of the AP with the lower NP it may at first seem plausible to treat the AP as a functor which selects an NP that is introduced by the indefinite article. This, however, has unwanted consequences: Given that SEL(ECT) is a HEAD feature, its value is shared between the AP and the adjective, so that the latter has the same SEL(ECT) value as the AP, erroneously licensing such combinations as **good a bargain*. To avoid this Van Eynde (2018) exploits the possibilities of the bi-dimensional hierarchy of phrase types in Figure 16.

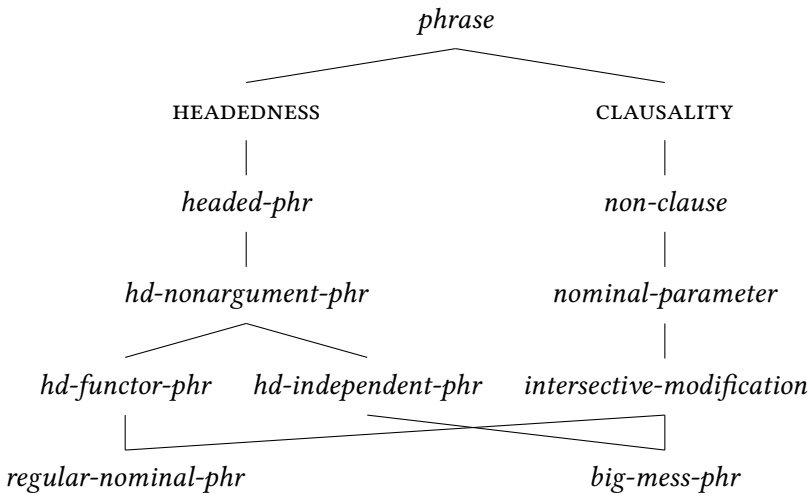

Figure 16: Bi-dimensional hierarchy of nominals

The types in the HEADEDNESS dimension are a subset of those in Figure 6. The types in the CLAUSALITY dimension mainly capture semantic and category-specific properties, in analogy with the hierarchy of clausal phrases in Ginzburg & Sag (2000). One of the non-clausal phrase types is *nominal-parameter*:

(34)
$$\begin{bmatrix} \textit{nominal-parameter} \\ \textsc{synsem|loc} \begin{bmatrix} \textsc{cat|head} \ \textit{noun} \\ \textsc{content} \begin{bmatrix} \textit{parameter} \\ \textsc{index} \ \boxed{1} \ \textit{index} \\ \textsc{restr} \ \boxed{\Sigma_1} \cup \boxed{\Sigma_2} \end{bmatrix} \end{bmatrix} \\ \textsc{dtrs} \left\langle \left[\textsc{synsem|loc|content|restr} \ \boxed{\Sigma_1} \right], \boxed{2} \right\rangle \\ \textsc{head-dtr} \ \boxed{2} \begin{bmatrix} \textsc{synsem|loc|content} \begin{bmatrix} \textit{parameter} \\ \textsc{index} \ \boxed{1} \\ \textsc{restr} \ \boxed{\Sigma_2} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

The mother shares its index with the head daughter (1) and its RESTR(ICTION) value is the union of the RESTR values of the daughters (Σ_1 and Σ_2). In the hierarchy of non-clausal phrases, this type contrasts amongst others with the quantified nominals, which have a CONTENT value of type *quant-rel* (Ginzburg & Sag 2000: 203–205). A subtype of *nominal-parameter* is *intersective-modification*, as defined in (35).

(35)
$$\begin{bmatrix} \textit{intersective-modification} \\ \textsc{synsem|loc|content|index} \ \boxed{1} \ \textit{index} \\ \textsc{dtrs} \left\langle \left[\textsc{synsem|loc|content|index} \ \boxed{1} \right], \boxed{2} \right\rangle \\ \textsc{head-dtr} \ \boxed{2} \ \textit{sign} \end{bmatrix}$$

This constraint requires the mother to share its index also with the non-head daughter. It captures the intuition that the noun and its non-head sister apply to the same entities, as in the case of *red box*.[19]

The maximally specific types inherit properties of one of the types of headed phrases, on the one hand, and of one of the non-clausal phrase types, on the other hand. Regular nominal phrases, for instance, such as *red box*, are subsumed by a type, called *regular-nominal-phr*, that inherits the constraints of *head-functor-phrase*, on the one hand, and *intersective-modification*, on the other hand. Another maximal type is *big-mess-phrase*. Its immediate supertype in the CLAUSALITY hierarchy is the same as for the regular nominal phrases, i.e. *intersective-modification*, but the one in the HEADEDNESS hierarchy is different: Being a subtype of *head-independent-phrase*, its non-head daughter does not select the head-daughter. Beside the inherited properties the BMC has some properties of its own. They are spelled out in (36).

[19] Another subtype of *nominal-parameter* is *inverted-predication*, which subsumes amongst others the binominal noun phrase construction and certain types of apposition (see Section 3.4).

(36)
$$\begin{bmatrix} \textit{big-mess-phr} \\ \textsc{dtrs}\left\langle \begin{bmatrix} \textit{hd-functor-phr} \\ \textsc{synsem|loc|cat}\begin{bmatrix} \textsc{head}\ \textit{adjective} \\ \textsc{mark}\ \textit{marked} \end{bmatrix} \end{bmatrix}, \boxed{1} \right\rangle \\ \textsc{head-dtr}\ \boxed{1}\begin{bmatrix} \textit{regular-nominal-phr} \\ \textsc{synsem|loc|cat|mark}\ a \end{bmatrix} \end{bmatrix}$$

The head daughter is required to be a regular nominal phrase whose MARKING value is *a*, and the non-head daughter is required to be an adjectival head-functor phrase with a MARKING value of type *marked*. This licenses APs which are introduced by a marked adverb, as in *so good a bargain* and *how serious a problem*, while it excludes unmarked APs, as in **good a bargain* and **very big a house*. Iterative application is not licensed, since (36) requires the head daughter to be of type *regular-nominal-phr*, which is incompatible with the type *big-mess-phrase*. This accounts for the fact that a big mess phrase cannot contain another big mess phrase, as in **that splendid so good a bargain*. A reviewer remarked that this analysis allows combinations like *so big a red expensive house*, suggesting that it should not. We are not sure, though, that this combination is ill-formed, and are anyway not inclined to exclude the presence of adjectives in the lower NP, since that would erroneously block the formation of the well-formed combinations in (37).

(37) a. How big a new shrub from France were you thinking of buying?
b. That's as beautiful a little black dress as I've ever seen.

These are quoted from Zwicky (1995: 116) and Troseth (2009: 42) respectively.

3.2 Nominals with a verbal core

Ordinary nominals have a nominal core, but there are also nominals with a verbal core, such as gerunds and nominalized infinitives. They are of special interest, since they figure prominently in the argumentation that triggered the shift from the NP approach to the DP approach in Transformational Grammar. We first present a specifier treatment of the English gerund and then a functor treatment of the Dutch nominalized infinitive.

3.2.1 The English gerund: a mixed category

Some examples of gerunds are given in (38–40), quoted from Quirk et al. (1985: 1290).

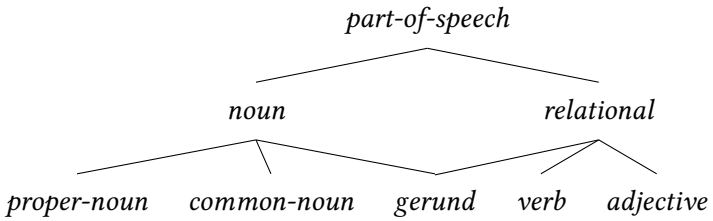

Figure 17: Gerunds as a mixed category

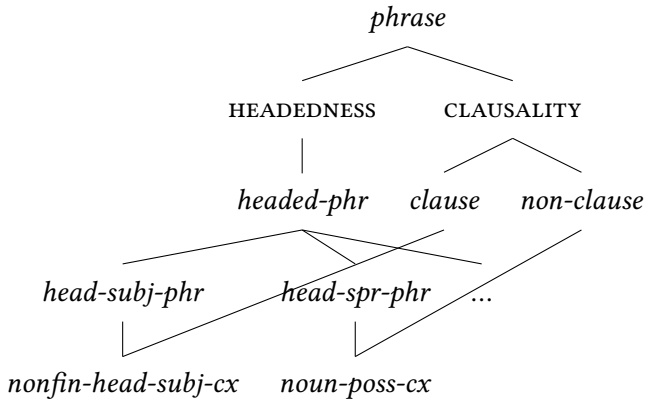

Figure 18: Bi-dimensional hierarchy of gerundial phrases

(38) [Brown's deftly painting his daughter] is a delight to watch.

(39) I dislike [Brown painting his daughter].

(40) Brown is well known for [painting his daughter].

The bracketed phrases have the external distribution of an NP, taking the subject position in (38), the complement position of a transitive verb in (39) and the complement position of a preposition in (40). The internal structure of these phrases, though, shows a mixture of nominal and verbal characteristics. Typically nominal is the presence of the possessive in (38). Typically verbal are the presence of the accusative subject in (39), of the adverbial modifier in (38) and of the NP complements in (38–40). To model this Rob Malouf treats the gerund as a mixed category, introducing a separate part-of-speech for it, which is a subtype of *noun*, on the one hand, and *relational*, on the other hand, see Figure 17 (Malouf 2000: 65). The distinctive properties of this mixed category are spelled out in a lexical

rule which derives gerunds from the homophonous present participles (Malouf 2000: 66).[20]

(41)
$$\begin{bmatrix} \textsc{head} & \begin{bmatrix} \textit{verb} \\ \textsc{vform}\ \textit{prp} \end{bmatrix} \\ \textsc{subj} & \langle \boxed{1}\ \textsc{np} \rangle \\ \textsc{comps} & \boxed{A} \\ \textsc{spr} & \langle\rangle \end{bmatrix} \Rightarrow \begin{bmatrix} \textsc{head} & \textit{gerund} \\ \textsc{subj} & \langle \boxed{1} \rangle \\ \textsc{comps} & \boxed{A} \\ \textsc{spr} & \langle \boxed{1} \rangle \end{bmatrix}$$

The gerunds are claimed to take the same kind of complements as the present participles from which they are derived (A), and the compatibility with adverbial modifiers follows from the fact that adverbs typically modify objects of type *relational*. The availability of different options for realizing the subject is captured by the inclusion of the subject requirement of the present participle in both the SUBJ list and the SPR list of the gerund (1). To model the two options Malouf (2000: 15) employs the bi-dimensional hierarchy of phrase types in Figure 18. The combination with an accusative subject is subsumed by *nonfin-head-subj-cx*, which is a subtype of *head-subject-phr* and *clause*. Its defining properties are spelled out in (42) (Malouf 2000: 16).

(42)
$$\begin{bmatrix} \textit{nonfin-head-subj-cx} \\ \textsc{synsem|loc|cat|head|root}\ - \\ \textsc{dtrs} \left\langle \left[\textsc{synsem|loc|cat|head} \begin{bmatrix} \textit{noun} \\ \textsc{case}\ \textit{acc} \end{bmatrix} \right], \boxed{1} \right\rangle \\ \textsc{head-dtr}\ \boxed{1} \end{bmatrix}$$

This construction type subsumes combinations of a non-finite head with an accusative subject, as in (39). When the non-finite head is a gerund, the HEAD value of the resulting clause is *gerund* and since that is a subtype of *noun*, the clause is also a nominal phrase. This accounts for the fact that its external distribution is that of an NP. By contrast, the combination with a possessive subject is subsumed by *noun-poss-cx*, which is a subtype of *head-spr-phr* and *non-clause* (Malouf 2000: 16).

(43)
$$\begin{bmatrix} \textit{noun-poss-cx} \\ \textsc{synsem|loc} \begin{bmatrix} \textsc{cat|head}\ \textit{noun} \\ \textsc{content}\ \textit{nom-obj} \end{bmatrix} \\ \textsc{dtrs} \left\langle \left[\textsc{synsem|loc|cat|head} \begin{bmatrix} \textit{noun} \\ \textsc{case}\ \textit{gen} \end{bmatrix} \right], \boxed{1} \right\rangle \\ \textsc{head-dtr}\ \boxed{1} \end{bmatrix}$$

[20] Boxed capitals stand for objects of type *list*, as in Ginzburg & Sag (2000).

This construction subsumes combinations of a nominal and a possessive specifier, as in *Brown's house*.[21] It also subsumes combinations with the gerund, as in (38), since *gerund* is a subtype of *noun*.

In sum, Malouf's analysis of the gerund involves the postulation of a mixed type in the part-of-speech hierarchy, which allows the gerund to simultaneously function as a nominal and a relational category.

3.2.2 The Dutch nominalized infinitive: phrasal conversion

The closest equivalent of the gerund in Dutch is the nominalized infinitive. Some examples are given in (44–45).

(44) [geld wegschenken] maakt vrouwen gelukkig
[money donate.INF] makes women happy
'Donating money makes women happy'

(45) voor [het op diepte houden van de Vlaamse kusthavens] dient
for [the on depth keep.INF of the Flemish coast.ports] needs
gebaggerd te worden
dredged to be
'Dredging is necessary to keep the Flemish coastal harbors accessible'

Also here the bracketed phrases have the external distribution of an NP, taking the subject position in (44) and the complement position of a transitive verb in (45). And also here, the internal structure shows a mix of nominal and verbal characteristics. Typically nominal are the presence of the article and the postnominal PP complement in (45). Typically verbal are the presence of the direct object complement in (44) and the predicative PP complement in (45). To model this Van Eynde (2019) makes a distinction between the verbal core and the nominal fringe of a nominalized infinitive, as in the structure of (45), spelled out in Figure 19.

The infinitive is treated as unambiguously verbal at the lexical level and remains verbal when combined with its predicative PP complement, but then it is converted into a nominal projection and combined with a postnominal PP[*van*] complement and the definite article.[22] The conversion is modelled in terms of a non-headed phrase type, since it does not comply with the Head Feature Principle: The HEAD value of the mother is not shared with the daughter. More specif-

[21] Malouf treats the English possessive as a genitive, differently from Sag et al. (2003).

[22] Since the article is a pronominal determiner, it is assigned the category N in the functor treatment.

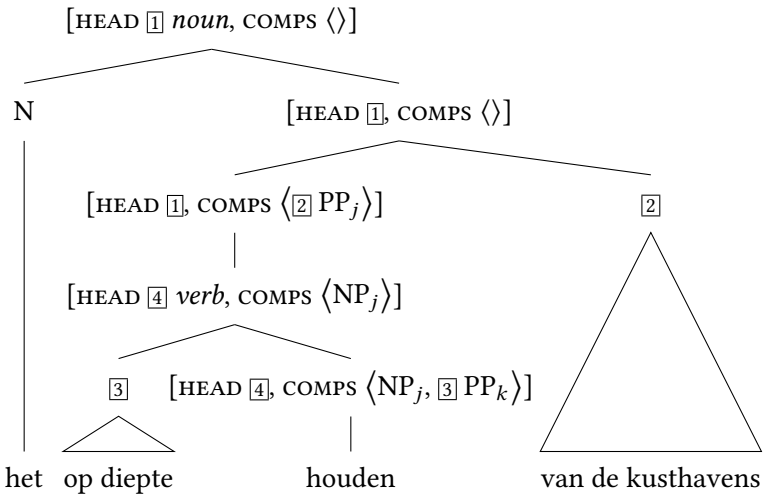

Figure 19: Dutch nominalized infinitive

ically, there is a subtype of the non-headed phrases, called *convert-phr*, whose defining characteristic is that they have a single daughter. In that respect they differ from coordinate phrases, which have at least two daughters.

(46) $\begin{bmatrix} \textit{convert-phr} \\ \textsc{dtrs}\langle \text{X} \rangle \end{bmatrix}$

The conversion which we observe in the Dutch nominalized infinitive is modeled in terms of a phrase type that inherits properties of *convert-phr* and *non-clause*. Its properties are spelled out in (47).

(47) $\begin{bmatrix} \textit{nom-inf-phr} \\ \textsc{synsem|cat} \begin{bmatrix} \textsc{head} \begin{bmatrix} \textit{noun} \\ \textsc{number}\ \textit{singular} \\ \textsc{gender}\ \textit{neuter} \end{bmatrix} \\ \textsc{subj}\ \langle\rangle \\ \textsc{comps} \left\langle \left(\text{PP}_j \right) \right\rangle \oplus \left\langle \left(\text{PP}_i \right) \right\rangle \oplus \boxed{\text{A}} \\ \textsc{marking}\ \textit{unmarked} \end{bmatrix} \\ \textsc{dtrs} \left\langle \begin{bmatrix} \textsc{synsem|cat} \begin{bmatrix} \textsc{head|vform}\ \textit{inf} \\ \textsc{subj}\ \langle \text{NP}_j \rangle \\ \textsc{comps} \left\langle \left(\text{NP}_i \right) \right\rangle \oplus \boxed{\text{A}} \end{bmatrix} \end{bmatrix} \right\rangle \end{bmatrix}$

The daughter is an infinitive with a non-empty SUBJ list and a possibly empty

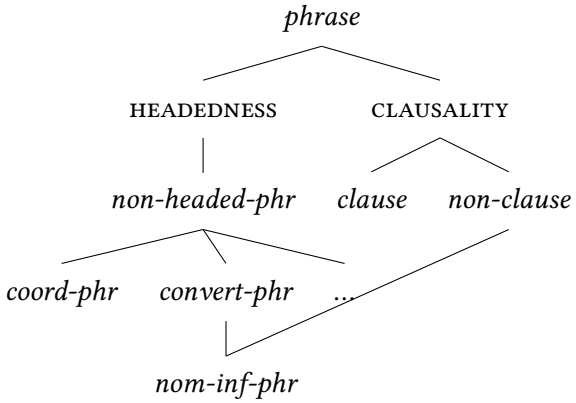

Figure 20: Nominalized infinitives in the bi-dimensional hierarchy

COMPS list. The mother is an unmarked singular neuter nominal that inherits the unsaturated complement requirements of its daughter, albeit with the twist that NP complements become PP complements. The subject requirement of the infinitive is added to the COMPS list of the nominal and becomes a PP too. It is made optional, since it is often left unexpressed, as in (44–45). If present, it is introduced by *van* 'of' or *door* 'by', as in (48) and (49) respectively.

(48) het trage afsterven van de koraalriffen
the slow die.INF of the coral.reefs
'the slow dying of the coral reefs'

(49) het uitschakelen van Chelsea door Real Madrid
the eliminate.INF of Chelsea by Real Madrid
'the elimination of Chelsea by Real Madrid'

For a full treatment that also covers the semantic type shift that accompanies the syntactic conversion, we refer to Van Eynde (2019).

3.3 Idiosyncratic P+NP combinations

When a nominal combines with a preposition the result is usually a PP, but not always. The French *de* 'of', for instance, heads a PP in *je viens de Roubaix* 'I come from Roubaix', but not in *beaucoup de farine* 'much flour'. As argued in Abeillé et al. (2004), there are many differences between these two uses of *de*, both syntactic and semantic ones. To model them they treat the former as the ordinary head of

a PP and the latter as a weak head. Typical of a weak head is that it shares nearly all properties of its complement, as spelled out in (50).

(50)
$$\left[\begin{array}{l}\textsc{cat}\left[\begin{array}{l}\textsc{head}\ \boxed{1}\\ \textsc{subj}\ \boxed{A}\\ \textsc{spr}\ \boxed{B}\\ \textsc{comps}\left\langle\left[\begin{array}{l}\textsc{cat}\left[\begin{array}{l}\textsc{head}\ \boxed{1}\\ \textsc{subj}\ \boxed{A}\\ \textsc{spr}\ \boxed{B}\\ \textsc{comps}\ \langle\rangle\end{array}\right]\\ \textsc{mark}\ \textit{unmarked}\\ \textsc{content}\ \boxed{4}\end{array}\right]\right\rangle\\ \textsc{mark}\ \textit{de}\end{array}\right]\\ \textsc{content}\ \boxed{4}\end{array}\right]$$

de has the same values for HEAD, SUBJ, SPR and CONTENT as its complement. When combined with *farine* 'flour', it is, hence, a noun that selects a specifier and that denotes a parameter.[23] The only difference between the weak head and its complement concerns the MARKING value: *de* requires an unmarked complement, but its own MARKING value is of type *de*, and this value is shared with the mother. Specifiers that require the presence of *de*, such as *beaucoup* 'much/many', select a nominal with that MARKING value, as shown in (51).[24]

(51)
$$\left[\begin{array}{l}\textsc{cat}|\textsc{head}\left[\begin{array}{l}\textit{adverb}\\ \textsc{spec}|\textsc{loc}\left[\begin{array}{l}\textsc{cat}\left[\begin{array}{l}\textsc{head}\ \textit{noun}\\ \textsc{spr}\ \langle \mathrm{X}\rangle\\ \textsc{mark}\ \textit{de}\end{array}\right]\\ \textsc{content}\left[\begin{array}{l}\textsc{index}\ \boxed{2}\\ \textsc{restr}\ \boxed{\Sigma}\end{array}\right]\end{array}\right]\end{array}\right]\\ \textsc{content}\ \boxed{1}\left[\begin{array}{l}\textit{beaucoup-rel}\\ \textsc{index}\ \boxed{2}\\ \textsc{restr}\ \boxed{\Sigma}\end{array}\right]\\ \textsc{store}\ \{\boxed{1}\}\end{array}\right]$$

Besides, the selected nominal is required to be unsaturated for SPR and the quantifier is required to share the index and restrictions of its head sister.

[23] The weak *de* also combines with infinitival VPs, as in *de sortir un peu te ferait du bien* 'getting out a bit would do you some good'. In that combination, *de* is a verb that selects a subject and that denotes a state-of-affairs.

[24] In this AVM, quoted from Abeillé et al. (2004: 18), the value of SPEC is of type *synsem*, as in Pollard & Sag (1994), and not of type *semantic-object*, as in Ginzburg & Sag (2000).

The weak head analysis of Abeillé et al. (2004) fits the mold of the specifier treatment. The same data can be analyzed in a way that fits the mold of the functor treatment, as shown in Figure 21. In this analysis the preposition in *beaucoup de farine* 'much flour' is a functor that selects a nominal of type *bare* and that shares its own MARKING value (*de*) with the mother. The functor *beaucoup* in its turn selects a nominal with the MARKING value *de* and shares its own MARKING value with the NP as a whole. In this analysis *de* does not share the part-of-speech, valence and meaning of its nominal sister. Instead, those properties are shared directly between *farine* and *de farine*.

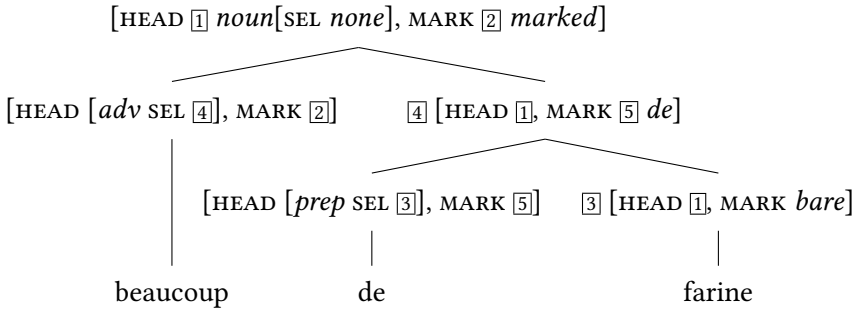

Figure 21: A prepositional functor

While the differences between the weak head treatment and the functor treatment are small and subtle, they may have empirical consequences. This is shown in Maekawa (2015), which offers an analysis of English nominals of the *kind/type/sort* variety. To account for the fact that the determiner shows agreement with the rightmost noun in *these sort of problems* and *those kind of pitch changes* Maekawa considers the option of treating *of* and the immediately preceding noun as weak heads, but considers this unsatisfactory, since it has the unwanted effect of treating *sort/kind/type* as plural. As an alternative, he develops an analysis in which *of* and the preceding noun are functors (Maekawa 2015: 149). This avoids the unwanted side-effect, since functors do not share the HEAD value of their head sister. Further evidence is provided in Maekawa (2016), which analyzes combinations of a singular numeral with a plural noun, as in *these thousand pages*. If *thousand* is treated as a weak head, it inadvertantly inherits the number value of *pages*, i.e. plural, whereas it is in fact singular, its plural counterpart being *thousands*. This unwanted effect is avoided if *thousand* is treated as a functor.

3.4 Other nominals with idiosyncratic properties

A much studied nominal with idiosyncratic traits is the binominal noun phrase construction (BNPC), exemplified in (52).

(52) a. She blames it on [her nitwit of a husband].
b. She had [a skullcracker of a headache].

In contrast to ordinary [NP–*of*–NP] sequences, as in *an employee of a Japanese company*, where the first nominal is the head of the entire NP, and where the second nominal is part of its PP adjunct, the BNPC shows a pattern in which the relation between the nominals is a predicative one: her husband is claimed to be a nitwit, and the headache is claimed to be like a skullcracker. HPSG treatments of the BNPC are provided in Kim & Sells (2014) and Van Eynde (2018). The latter uses the phrase type hierarchy in (16), defining the BNPC as a maximal type that inherits from *head-independent-phr* and *inverted-predication*. To capture the intuition that the second nominal is the head of the entire NP, the preposition *of* is not treated as the head of a PP, but as a functor that selects a nominal head.

Comparable to NPs with a verbal core are NPs with an adjectival core, such as *the very poor* and *the merely skeptical*. They are described and provided with an HPSG analysis in Arnold & Spencer (2015). Interestingly, it employs a device for phrasal conversion that is similar to the one for the Dutch nominalized infinitive in Section 3.2.2.

Idiosyncratic are also the nominals with an extracted determiner, as in the French (53) and the Dutch (54).

(53) Combien as-tu lu [__ de livres en latin] ?
how.many have-you read [__ of books in Latin]
'How many books have you read in Latin?'

(54) Wat zijn dat [__ voor vreemde geluiden] ?
what are that [__ for strange noises]
'What kind of strange noises are those?'

The French example is analyzed in Abeillé et al. (2004: 20–21) and the Dutch one in Van Eynde (2004: 47–50).

Another special case is apposition. It comes in (at least) two types, known as close apposition and loose apposition. Relevant examples are respectively *my brother Richard is a soldier* and *Sarajevo, the capital of Bosnia, is where WW I began*. Both are compared and analyzed in Kim (2012) and Kim (2014). Van Eynde & Kim (2016) provides an analysis of loose apposition in Sign-Based Construction Grammar.

4 Conclusion

This chapter has provided a survey of how nominals are analyzed in HPSG. Over time three treatments have taken shape, i.e. the specifier treatment, the functor treatment and the DP treatment. They were presented and applied to ordinary nominals in Section 2. Nominals with idiosyncratic properties were discussed in Section 3. Modeling them requires a relaxation of the strictly lexicalist stance of early HPSG. The more flexible tools of constructional HPSG have been put to use in the analysis of the Big Mess Construction and of nominals with a verbal core, such as gerunds and nominalized infinitives. For other nominals with idiosyncratic properties pointers have been given to relevant literature.

In terms of the NP vs. DP debate, it is clear that the NP approach has been more successful in HPSG than the DP approach. This fits in with the tendency to avoid the postulation of functional categories with their respective projections. Clauses, for instance, are not analyzed as IPs either. The finer-grained differences between the specifier treatment and the functor treatment are a topic of ongoing debate. They both have their advocates and for the analysis of ordinary nominals there does not seem to be any evidence that decisively tilts the balance. For nominals with idiosyncratic properties, however, there is a clear tendency in the recent literature to adopt the functor treatment, usually in combination with phrasal constraints.

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