

# Coordination of Unlike (?) Categories: How *Not* to Distinguish Categories

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## Abstract

Coordination of unlike categories, e.g., at the complement position of predicative *be*, has been a problem for grammar formalisms and NLP systems. Unlike all previous approaches, this paper challenges the very assumption that such coordination is of unlike categories, by introducing a new category that covers certain NPs, AdjP, etc., on the semantic ground. The paper argues that such a move does not introduce new problems; all the problems discussed in the paper must be dealt with by traditional approaches as well. The proposed approach can not only simplify the coordination process but also shed some new light on the syntax-semantic interface for major nominal categories.

## 1 Introduction

Our arduous journey of dealing with coordination in NLP systems started early [Woods, 1973]. We now understand coordination much better from different angles based on various grammar formalisms: HPSG [Pollard and Sag, 1994], LFG [Kaplan and Maxwell, 1995], TAG [Sarkar and Joshi, 1996], CCG [Steedman, 2000], and so on.

However, the journey is by no means ending soon. For example, the question of coordinating unlike categories remains as a disturbing problem. Some of the examples in Sag et al. [1985] are shown below.

- (1) *a.* Pat is a Republican and proud of it. [NP vs. AdjP]
- b.* That was a rude remark and in very bad taste. [NP vs. PP]
- c.* Pat is healthy and of sound mind. [AdjP vs. PP]
- d.* Pat remembered the appointment and that it was important to be on time. [NP vs. S']
- e.* You can depend on my assistant and that he will be on time. [conjunct type?]

The problem has been tackled by Sag et al. [1985] (GPSG), Jorgensen and Abeillé [1992] (TAG), Bayer [1996] (Lambek calculus), and Levy and Pollard [2001] (HPSG). The assumptions shared by all of these approaches are that the examples (1) involve coordination of unlike categories and that a solution calls for a mechanism specific to coordination. Whereas these proposals contribute a great deal to delineate the problem and this paper also depends at least partially on their contribution, we cannot eliminate the feeling that the proposed solutions appear ad hoc. For example, Sag et al. [1985] need to add category-changing rules only for this purpose. Jorgensen and Abeillé [1992] need to introduce additional coordination schema. Bayer [1996] needs to resort to a proposal of Partee [1986], which mediates the type conflict between *e* and  $\langle e, t \rangle$  via type-shifting operations. But Partee's move inevitably obscures the mapping between syntactic

category, e.g., NP, and semantic types, e.g.,  $e$ ,  $\langle e, t \rangle$ , and  $\langle \langle e, t \rangle, t \rangle$ . Levy and Pollard [2001] do not address the cases such as (1).

This paper attempts a radically different approach to the same problem. Our starting point is to question the assumption that the examples (1) are coordination of *unlike* categories. Instead, we posit that coordination is a very strong phenomenon that would not easily allow conjoining truly unlike categories.

To pursue this direction, we start from the observation of de Swart [2001] that the complement of predicative *be* is of the semantic type  $\langle e, t \rangle$ . Although de Swart does not discuss syntactic categories, we also hypothesize that there is a syntactic category (called ‘Predicative Element’ or *PE* in this paper) corresponding to the type  $\langle e, t \rangle$ . This is the category we assign to all of the complement of predicative *be* in (1*a*, *b*, *c*); note that we are not saying that all NPs and AdjP belong to this category.

Since we are so much used to traditional syntactic categories such as noun, NP, AdjP, and PP, the reader might immediately feel uncomfortable. However, this move does not introduce new complications. The only complications are those already encountered by traditional analyses as well. For example, we will see that the boundary between common nouns and predicative adjectives (in English) is not so clear cut and that the distinction between predicative and attributive adjectives is rather significant. The present proposal is in fact not inconsistent with various past and recent observations in the literature.

The most immediate consequence of the present approach is that we no longer need coordination of unlike categories (at least for the cases under investigation). Then, we can take advantage of the usual coordination schema, e.g., the weak version of Coordination Principle [Pollard and Sag, 1994]. This can drastically simplify the process of coordination involving examples like (1) in theory and in practice, e.g., in NLP systems.

Another important implication of the present approach is that we can streamline the syntax-semantic interface along the tradition of Montague [1974b], cf. Partee [1986].

Among a potentially diverse range of phenomena involved in (1), this paper focuses on common nouns, NPs, and AdjPs in English as exemplified in (1*a*). We leave (1*b*, *c*) to future work as they involve PPs. We also leave (1*d*) to future work; the coordination of NP and *S'* at the object position involves the type  $e$  or  $\langle \langle e, t \rangle, t \rangle$ . Both of these cases, however, would become feasible with the analysis proposed here. We will also exclude (1*e*) because there are factors other than coordination [Sag et al., 1985, Sec. 4.4].

There is another type of coordination that had been a problem until relatively recently, i.e., so-called non-constituent coordination. This type of coordination is not discussed either, as it does not require a special treatment if we adopt a grammar formalism such as Combinatory Categorical Grammar (CCG) [Steedman, 2000].

The rest of the paper is organized as follows. In Section 2, we present our hypothesis more in detail and explicate potential problems. Sections 3 through 7 examine each of these potential problems: the relation between predicative and attributive adjectives; syntactic categories for NP; possibility of purely adjectival complement; the relation between common nouns and adjectives; and the relation between common nouns and NPs. Although the rest of this paper is mostly linguistic, many points could directly affect theories in Computational Linguistics and implementation of NLP systems, and thus must be of interest to the CL/NLP community.

## 2 New Category ‘Predicative Element’ (*PE*)

In this section, we introduce our hypothesis that the complement of predicative *be* has a single syntactic category and then list several potential issues to be examined.

de Swart [2001] observes that the complement of predicative *be* for each of the following cases has the semantic type  $\langle e, t \rangle$ .

- (2) *a*. Sue is a genius.

	$e$	$\langle\langle e, t \rangle, t\rangle$	$\langle e, t \rangle$	Nominal modifier	Verbal modifier
NP	✓	✓	✓		
AdjP			✓	✓	
PP			✓	✓	✓

Table 1: Category-type mapping: a complicated view

- b. Sue is no genius.
- c. Sue is the chair of the department.
- d. Sue is happy.

Although it is customary to assume the type  $\langle e, t \rangle$  for adjectives, it is not the case for NPs. What de Swart [2001] proposes is that the NPs that can appear as a complement of predicative *be* are ‘weak’ in the sense of Milsark [1977] (roughly, the NPs that can appear with existential *there* are weak), and the weak NPs can have the type  $\langle e, t \rangle$  via type-shifting of Partee [1986]. For example, a NP *a genius* with the interpretation  $\lambda p. \exists x [\textit{genius}(x) \wedge p(x)]$  has the type  $\langle\langle e, t \rangle, t\rangle$ , the type for generalized quantifiers. Then, it can be shifted to  $\langle e, t \rangle$ , with the interpretation  $\lambda x. \textit{genius}(x)$ . However, de Swart still distinguishes the categories of the complements in (2) as NP and AdjP, and thus, coordination of these categories would still be of unlike categories.

This type of analysis would yield a rather complicated syntax-semantic mapping as can be seen in Table 1. What we seek here is a simpler mapping in the spirit of Montague [1974b].

In order to represent syntactic categories, semantic types, and their relation in a transparent manner, we adopt the notation of Combinatory Categorical Grammar (CCG) [Steedman, 2000]. Note that other variants of Categorical Grammars would work for this purpose as well. To match the semantic type  $\langle e, t \rangle$ , we might consider a syntactic category either  $S/NP$  or  $S \backslash NP$ . Both of these categories take an *NP* as their arguments and return an *S* (sentence) as the result. The distinction between the two variants is the directionality of the argument: the former seeks the argument to the right and the latter, to the left. For example, intransitive verbs in English has the category  $S \backslash NP$  with the corresponding type  $\langle e, t \rangle$ , e.g.,  $\lambda x. \textit{sleeps}'(x)$ . The verb *sleep* would thus take a subject, e.g., *John*, whose category is *NP* and type,  $e$ . The resulting category and type for the sentence *John sleeps* would be *S* and  $t$ , respectively, with the interpretation  $\textit{sleeps}'(\textit{john}')$ .

The syntactic category for the complement of predicative *be* must be distinct from that of the intransitive verb because syntactically speaking, the former never takes an argument. Due to the lack of name for this syntactic category, we adopt a special name ‘Predicative Element’ (*PE*). That is, *PE* is the category for all the complements in (2) corresponding to the semantic type  $\langle e, t \rangle$ . To avoid confusion, categories specific to this paper are shown in italic, e.g., *PE*. Traditional categories are written in roman (upright), e.g., *PP*.

The new category *PE* also appears in another environment, the complement (second argument) of the verb *consider* as shown below, taken from de Swart [2001].

- (3) a. I consider him a genius.  
b. I consider him no genius.  
c. I consider him the best soccer player ever.  
d. I consider him sick.

These complement positions are also of the category *PE*. Although one might analyze this type of construction as a small clause, thus as a variant of the copular construction, it is also possible to analyze that *consider* directly subcategorizes *PE*.

Unlike some of the type-shifting operations of Partee [1986], the classic type raising proposed by Montague [1974b] operates both syntactically and semantically in parallel. The relation holds between  $NP : e$  and  $S / (S \backslash NP) : \langle\langle e, t \rangle, t\rangle$  (or its directional variant  $S \backslash (S / NP)$ ), the latter corresponding to the category/type

Traditional categories	NP		CN	AdjP	
Subclassification	individual or quantified	predicative		predicative	attributive
Proposed categories and types	$NP$ or $S/(S \setminus NP)$ $e$ or $\langle\langle e, t \rangle, t\rangle$		$PE$ $\langle e, t \rangle$	$PE/PE$ $\langle\langle e, t \rangle, \langle e, t \rangle\rangle$	

Table 2: Correspondence between traditional and proposed categories

of generalized quantifier. This can be seen in the following way: while  $NP$  is the argument of an intransitive verb  $S \setminus NP$ , the type-raised version  $S/(S \setminus NP)$  takes  $S \setminus NP$  as the argument; either way, the sentence category  $S$  can be obtained. Any type- $e$  NP can be shifted to  $\langle\langle e, t \rangle, t\rangle$ . A type- $\langle\langle e, t \rangle, t\rangle$  NP can be shifted back to  $e$  if the NP is originally of the individual type. To simplify, we will mainly use just  $NP$  even for positions where the type-raised category are also applicable.

There are a few more categories/types involved in this paper. First, since common nouns (CN) have the type  $\langle e, t \rangle$  and do not take an argument, they can also be classified as  $PE$ . The type of adjective that we see in (2d), i.e., that belongs to  $PE$ , is commonly called predicative adjective. They are often distinguished from attributive adjectives that modify common nouns, for which we consider another category  $PE/PE$ .

Then, the present position about categories/types can be summarized in Table 2. Once we hypothesize this new category  $PE$ , the NP-AdjP coordination in (1a) would become a coordination of  $PE$ s.

This move would certainly simplify the coordination of the type in (1). But would there be any problems? Here are some questions, especially focusing on the junctures around categories, traditional and proposed.

1. Is it reasonable to consider separate categories for predicative and attributive adjectives?
2. Is it appropriate to separate NPs into two categories:  $NP$  (individual/quantified) and  $PE$  (among other predicative types)?
3. How can we handle the case where only adjectives, but not NP, are subcategorized?
4. What would be the potential problems of combining common nouns and predicative adjectives under  $PE$ ?
5. What would be the potential problems of combining common nouns and certain NPs under  $PE$ ?

We will answer these question in the following sections, one by one.

### 3 Predicative and Attributive Adjectives

In this section, we justify the use of distinct categories for predicative and attributive adjectives, in contrast to the traditional analysis of adjectives as a single category.

Assuming the category for the common noun as  $PE$ , the category for the attributive adjective must be  $PE/PE$  with the type  $\langle\langle e, t \rangle, \langle e, t \rangle\rangle$  because it modifies a  $PE$ . This is analogous to the traditional analysis, e.g., Montague [1974a], of attributive adjective as CN/CN where CN stands for common noun. However, predicative *be* takes a complement of the type  $\langle e, t \rangle$  [Partee, 1986; de Swart, 2001]. Thus, in order to correctly reflect the distinct syntactic and semantic roles, it is more natural to have distinct categories and types.

Here is another point about separation of the two types of adjectives. Although the majority of adjectives can function as both attributive and predicative positions, there are adjectives that can appear at only one of the two positions. For example, *ill* can only be used as predicative adjective [Quirk et al., 1985]; *mere* can only be used as attributive adjective [Biber et al., 1999]. If we attempt to derive predicative adjectives

from attributive ones [Montague, 1974a], we would have difficulty accounting for the existence of purely predicative adjectives. If we attempt the other direction, we still have an analogous problem.

The semantic distinction between the two groups is also significant. Predicative adjectives have the interpretation of  $\lambda x.\text{prop}(x)$  for some property  $\text{prop.}$ , e.g.,  $\lambda x.\text{green}(x)$ . Many of them can be used attributively (i.e., intersective adjectives), e.g.,  $\lambda p.\lambda x.[p(x) \wedge \text{prop}(x)]$ . It is not clear why *ill* cannot be used this way; this kind of limitation must be marked lexically. On the other hand, attributive-only adjectives, e.g., *mere*, are non-intersective and must have a higher-order interpretation such as  $\lambda p.\lambda x.(\text{mod}(p))(x)$ , where  $\text{mod}$  is the interpretation of the attributive adjective, e.g.,  $\lambda p.\lambda x.\forall q[p(x) \wedge (q \neq p \Rightarrow \neg q(x))]$  for *mere*. Such an adjective does not have a natural predicative counterpart.<sup>1</sup> Even for adjectives that can appear at both positions, e.g., *true*, depending on its fine semantics, attributive/predicative use can be different.

(4) *a.* This is a true story. ( $\text{true/false}$ )  $\Leftrightarrow$  This story is true.

*b.* He is a true scholar. ( $\text{really}$ )  $\not\Leftrightarrow$  \*This scholar is true.

If we stick to the single traditional category adjective, it would be difficult to explain the category/type distinction discussed above. Thus, it is beneficial to separate predicative adjective as a part of *PE* and attributive adjective as *PE/PE*.

## 4 Fine-Tuned Syntactic Categories for NPs

This section justifies the dichotomy between the predicative NP that belongs to *PE* and the non-predicative NP (individual and quantified varieties).

Let us first examine the claim of de Swart [2001] that a subject NP can have the type  $\langle e, t \rangle$ . Her motivation is as follows. The subject position of a stage-level predicate (roughly, of temporarily status) can be both strong and weak NPs while that of an individual-level predicate (roughly, of permanent status) can only be strong NPs. Since she associates weak NPs with the type  $\langle e, t \rangle$  as she does for the complement of predicative *be*, she argues that state-level predicates can have the type- $\langle e, t \rangle$  subjects.

Although de Swart writes that this type still corresponds to the category NP as in Partee [1986], this would re-introduce the complicated view of syntax-semantic interface (Table 1). On the other hand, *PE* (corresponding to  $\langle e, t \rangle$ ) could not be the category for the subject (or object) position of a verb as AdjP and PP cannot appear at the position, unlike the complement position of predicative *be*. But we can still say that the strong-weak distinction is not a type distinction and that the subject/object position of a verb takes a *NP*, i.e., non-predicative NPs.

de Swart [2001] also discusses a situation where *seek* (and the light verb *have* as well) takes weak NPs as arguments, but not adjectives and PPs. Her analysis is to accept  $\langle e, t \rangle$ -type NPs but fails non-NP on a semantic condition (underlying monotonicity property) included in the verb. However, as we will see in the next section, the semantic distinction between common nouns (and NPs) and predicative adjectives is not very clear. Then, we should expect fuzzy cases as will be seen for adjective-taking verbs in the next section. But it is not the case. So, it seems more appropriate to analyze that *seek* takes the syntactic category *NP*, and the strong-weak distinction is made based on some semantic condition. This is in line with the argument in the previous section.

Similarly, de Swart [2001] makes an analogous argument for existential *there*. However, we again stick to the idea that existential *there* subcategorizes a *NP* and strong-weak distinction is made semantically. It seems to be wrong to abuse the type  $\langle e, t \rangle$  without seriously considering the corresponding syntactic category.

<sup>1</sup>Although *small* is often used as an example of non-intersective adjective [Heim and Kratzer, 1998], the following intersective interpretation seems possible:  $\lambda x.\exists q[q(x) \wedge (q \text{ is a typical class for } x) \wedge \text{size}(x) < \frac{\sum_{y \in q} \text{size}(y)}{\text{card}(q)}]$ . Then, the use of *small* as a predicative adjective does not pose a problem.

As mentioned earlier, the relation between the types  $e$  and  $\langle\langle e,t \rangle, t\rangle$  is much more transparent. Both of them can combine with a predicate of the type  $\langle e,t \rangle$ . Thus, it is straightforward to maintain both  $NP$  and  $S/(S\backslash NP)$  as the categories for the subject/object, along the line of Montague [1974b].

We next discuss the relation between  $NP$  and  $PE$ . Following de Swart [2001], this paper assumes that the  $NP$  subclass of  $PE$  is in general weak and that  $NPs$  at the subject position can be strong or weak. The most common mechanism of relating  $PE$  and  $NP$  is the use of determiners. Strong determiners, e.g., quantifiers, must have the category  $NP/PE$ , and thus cannot appear at the complement position of predicative  $be$ . Weak determiners, e.g., indefinite article, must have the type  $PE/PE$  so that they can appear at such a position.

In addition to predicative complement positions, weak  $NPs$  can also appear at subject/object positions. This phenomenon can be explained by way of the type shifting operations of Chierchia [1998]: ‘up’ from  $e$  to  $\langle e,t \rangle$  and ‘down’ from  $\langle e,t \rangle$  to  $e$ . Although Chierchia does not distinguish the syntactic categories corresponding to these types either, we can naturally maintain a tighter category-type mapping.

Considering that only weak  $NPs$  can be a part of  $PE$ , we can hypothesize that the ‘up’-operation applies only to weak  $NPs$ . As for the other direction, only the  $NP$  subclass of  $PE$  can in general be  $NP$ . According to Chierchia [1998], a property can be ‘down’ed to  $NP$  if the property can be a ‘kind’.

For example, a weak  $NP$  *a dog* can refer to the kind corresponding to the set of all dogs. Thus, while *a dog* can act as  $PE$  at the complement position of predicative  $be$ , its ‘kind’ counter part can be a subject of a verb, e.g., *a dog is a domestic animal*. Note that the same  $NP$  *a dog* can also be referential, but in that case, it is ‘strong’ and there is no corresponding expression in  $PE$ , as can be seen in the sentence *this morning, a dog showed up at the door*, where *a dog* is referential. Other members of the  $NP$  subclass of  $PE$ , e.g., plurals and noncount nouns, too have corresponding ‘kinds’ [Chierchia, 1998]. Thus, they can be ‘down’ed to  $NP$ .

On the other hand, the remaining subclasses of  $PE$ , i.e.,  $AdjPs$  and  $PPs$ , do not in general have the corresponding ‘kind’. For example, although *green* and *in this house* represent properties, they cannot select a particular kind by themselves. The case of, say, *rich* may fall on the borderline.

Unlike Partee [1986], we distinguish two sorts of type shifting: type raising (and its reverse) as a transparent operation and ‘up’/‘down’ as semantically-conditioned operation. This position seems to work well with the current proposal as well as the analysis of Chierchia [1998].

## 5 Purely Adjectival Complement

In this section, we maintain that a predicative complement subcategorizes a  $PE$ , not a purely adjectival argument.

First, many verbs that are commonly considered to take an adjective complement also take a  $NP$ : *remain good friends*, *seems a good idea*, *turn traitor* [Quirk et al., 1985; Biber et al., 1999]. This suggests that these verbs actually take a  $PE$  possibly with some additional selectional constraints.

There are copular verbs that take adjectives but no  $NPs$  as complement: *come true*, *go sour* [Quirk et al., 1985]. In these cases, even the selection of adjectives is strongly restricted. Thus, it seems that the unavailability of  $NP$  as complement can be attributed to the selectional constraints of the verbs.

Some other verbs take only adjectives, but again, the selection is very limited: *loom large*, *fall silent* [Quirk et al., 1985]. These cases can be considered collocational.

The existence of degrees of selection suggests that there is no clear demarcation between adjective and  $NP$  complementation in these verbs. Thus, it still seems possible to say that these verbs take a  $PE$  as their complement with different degrees of selectional constraints.

## 6 Common Nouns vs. Adjectives

Although we have combined certain NPs, common nouns, and predicative adjectives as a single category *PE*, there still are cases where these (traditional) subclasses need to be distinguished. This section examines the distinction between common nouns and adjectives with respect to syntax (distribution), morphology, and semantics referring to the analysis in Quirk et al. [1985].

Probably the most obvious relation between common nouns and adjectives is that in an NP, attributive adjectives modify the head common noun. We have already separated attributive adjectives from predicative ones so that their syntax/semantics is consistent with their distribution.

However, there is a potential problem. Since we have grouped common nouns, adjectives, and some NPs, as *PE*, attributive adjectives (with the category *PE/PE*) is allowed to modify any of these, unless we apply some restriction. An approach we adopt here is to assign distinct features, e.g., *+head* to common nouns and *-head* to predicative adjectives and predicative NPs. At the same time, we fine-tune the category for attributive adjectives as  $PE_{[+head]}/PE_{[+head]}$  and that of determiner as  $PE_{[-head]}/PE_{[+head]}$  or  $NP/PE_{[+head]}$ . This way, only common nouns (including those already modified by an attributive adjective) can be modified by attributive adjectives or combine with a determiner. In contrast to the traditional approach, which distinguishes major categories between common nouns and predicative adjectives, we acknowledge a minor distinction that is recognized only within an NP.

There are a few advantages of our approach. First, some adjectives can be the head of a NP, e.g., *the rich*. For a case like this, we may want to relax the feature *-head* on a predicative adjective under certain circumstance. Second, some nouns can be used as a nominal modifier. Syntactically speaking, they are an attributive adjective. In a case like this, we may need to establish lexical relation between a noun and the corresponding modifier category much the same way we establish the relation between predicative and attributive adjectives.

Whereas the noun-adjective distinction clearly exhibits syntactic phenomena, it is still possible to attribute it to semantics. One of the main semantic distinctions is gradability. Many adjectives are gradable and this property seems to make it more difficult to select an individual or a subset (generalized quantifier) without a more specific set, i.e., the head common noun. For example, Quirk et al. [1985] point out that only adjectives can be modified by *very*. But this phenomenon is more to do with the gradability. Non-gradable adjectives cannot be modified by *very*, e.g., *\*very mere*. But a distinction like this is fuzzy, and there is a shade of gray. Then, it is natural to see analyses that investigate indeterminacy between nouns and adjectives [Mutt, 1976; Leech and Li, 1995].

Furthermore, the morphological distinction observed by Quirk et al. [1985] is also due to gradability. Only gradable adjectives have comparative and superlative forms.

Thus, the distinction between common nouns and predicative adjectives is more to do with distinct semantics of these subclasses, and does not call for a distinction of major categories. Now, once we introduce subclasses for *PE* with distinct features, the ability to coordinate these subclasses may require neutralization of features. On this point, we refer to the work of Bayer [1996] and others.

## 7 Common Nouns vs. NPs

While predicative NPs and predicative adjectives can stand as argument by themselves, most common nouns cannot do so without the help of a determiner, although all of them belong to *PE*. This section analyzes the following environments: the complement of predicative *be* and the subject/object position of a verb in this respect.

First, let us discuss the complement position of predicative *be*. In order to account for the distinction, we need another feature  $\pm arg$  following the idea of Chierchia [1998]. Common nouns have *-arg* and

predicative NPs and predicative adjectives have  $+arg$ . If predicative *be* takes  $PE_{[+arg]}$ , common nouns are excluded. The  $-arg$  feature can naturally be converted by a determiner  $PE_{[+arg,+head]}/PE_{[-arg,-head]}$  (the *head* feature is irrelevant here). Attributive adjectives do not change this feature, but simply pass it to the resulting phrase using a variable, i.e.,  $PE_{[Xarg,-head]}/PE_{[Xarg,-head]}$ , using a feature variable  $X$ . Noncount and plural nouns are by themselves of the argument type and can occur without a determiner. But they can also occur with determiner. Thus, the feature must be underspecified as in  $PE_{[?arg,+head]}$ .

The choice of the *arg* feature seems to do with countability, i.e., another semantic property. One possible analysis is that a countable noun without the count information is considered incomplete as an argument. Although this condition may be related to the condition for the ‘down’-operation from *PE* to *NP*, it seems impossible to reduce one to the other.

The situation with the relation between common nouns and *NPs* at an NP argument position, e.g., subject/object position, is analogous, except that the resulting category must be *NP* and the other feature  $\pm head$  is also relevant.

The treatment of noncount and plural nouns is also complicated in the traditional approach. They must belong to both common nouns and *NPs*, or their category/type must be shifted. So, the current approach is no more complicated than the traditional one.

## 8 Conclusion

This paper begins with a hypothesis that predicative *be* takes as its complement a single syntactic category ‘Predicative Element’ (*PE*) that would correspond to several traditional categories: common nouns, predicative adjectives, predicative *NPs*, and (certain) *PPs*. An immediate consequence of this position is that the most prominent case of coordination of unlike categories, i.e., the one involving predicative *be*, no longer involves unlike categories; we can analyze the case as coordination of like categories.

The main part of this paper focuses on the relation between common nouns, *NPs*, and adjectives and demonstrates that our proposal does not introduce new problems. All sorts of complications involving *PE* would exist regardless of the choice of categorial distinction: the traditional analysis or the proposed one.

Since the present proposal does not introduce new complications to the analysis of nominal categories, the simplified analysis of the argument category of predicative *be* is an advantage. With a new set of syntactic categories, NLP systems need not worry about coordination of unlike categories, at least in connection to predicative *be*; the case can be handled by a general form of coordination schema.

The proposed analysis of nominal categories has additional advantage of streamlined syntax-semantic mapping in the spirit of Montague [1974b]. This contrasts with more complicated syntax-semantics mapping of Partee [1986] and de Swart [2001].

Although this paper does not discuss in detail the distinction between ‘strong’ and ‘weak’ *NPs* and a subcase of *PE* involving *PPs*, we do have components for further discussion. The former seems to be related to the condition for the ‘up’-operation of Chierchia [1998]. The latter is not a simple issue due to various complications involved in the analysis of *PPs*. However, we could say that *PPs* that belong to *PE* are similar to predicative adjectives and that they even may share certain aspects of attributive-predicative connection for adjectives, e.g., *out-of-print* as an adjective, and as well as certain aspects of common nouns, e.g., again, *out-of-print* as a noun.

Furthermore, it would be interesting to apply the present approach to cross-language analysis of, e.g., Chierchia [1998]. For example, one might argue that Chinese does not have the category *PE*. In Chinese, common nouns are indistinguishable with *NPs* syntactically (even attributive adjectives could be combined with this group, calling for the use of particle *de*). On the other hand, predicative adjectives are indistinguishable with intransitive verbs. Such an analysis could provide a clearer picture of categories/types involved in various languages than traditional categorization could.

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