DP Structure and Flexible Semantics

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Two general paradigms have influenced the study of nominals since the middle eighties. According to the *DP hypothesis* of Abney (1987), the syntactic unit that had formerly been known as *noun phrase* should in fact be analyzed as a phrase headed by a determiner, hence the label *DP*. Figure 1 gives a simple version of the DP hypothesis, without deciding here about the category of the specifier.

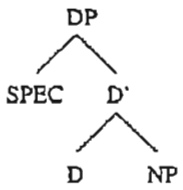

Figure 1: The DP hypothesis

Quite independently of this syntactic development, Partee (1987) proposed a *type shifting* paradigm for the semantic analysis of nominals (now called DPs). In Partee's proposal DPs are ambiguous between a referential reading of type e, a predicative reading of type $\langle e,t\rangle$ and a quantificational reading of type $\langle\langle e,t\rangle,t\rangle$. DP meanings can flexibly move between their different types due to covert application of semantic operators.

The present paper proposes some strong relationships between these syntactic and semantic paradigms. It argues that the structure of the DP affects its semantics in that the NP level within the DP is purely predicative and the DP level itself is purely quantificational. However, the intermediate D' level is flexible between the predicate/quantifier semantic categories, due to the covert application of semantic operators at this level. Par-

Thanks to Edit Doron, Tanya Reinhart and Eddy Ruys for their remarks. Thanks also to the audiences at Leiden University, at the 15th annual conference of the Israel Association for Theoretical Linguistics and at the NELS30 conference.

NELS 30

tee's assumption, adopted from Discourse Representation Theory and more traditional approaches in philosophical logic, that some DPs need to have a (discorse) referential reading, is withdrawn. Instead of Partee's type shifting operators between the three semantic categories she assumes, two operators are used between predicates and quantifiers. The *choice function* operation of Reinhart (1997) and Winter (1997) is used as a general operator from predicates to quantifiers. The *minimum* operator of Winter (1996) is used as a general operator from quantifiers to predicates. These two operations, referred to as *category shifting operators*, account for most of the Partee data and further extend the theory of flexibility to treat some intricate phenomena in the domains of coordination, plurality and scope.

Because of the proposed syntax-semantics mapping, restrictions on category shifting follow in the system from structural considerations. In this way semantic phenomena can be used as arguments for assumptions on the syntax of the DP. Some of the central syntactic claims that are made throughout this paper are the following.

- Simple coordinations of nominals using *and* and *or* can be either DPs or D's. However, complex coordinations using *both...and* and *(n)either...(n)or* can be DPs but not D's.

- Accusative case assignment in Hebrew using the marker *et* is at the DP level but not at the D' level.

- Verbless predicative constructions (e.g. *I consider Mary a teacher*) select for a predicative NP (e.g. *a teacher*), and not for D' (e.g. *some teacher*).

- Plural number marking of nominal conjunctions is at the D' or DP levels. Therefore, so-called "appositional" conjunctions (e.g. *an author and a teacher has passed away*) appear only with NPs but not with D's and DPs (e.g. **some author and some teacher has passed away*).

Section 1 reviews Partee's type shifting paradigm. Section 2 introduces the category shifting proposal of Winter (1998b) and its differences from Partee's system. Section 2 develops and supports the proposed hypothesis about the relationships between DP structure and flexible semantics.

1. Partee's Type Shifting Paradigm

According to Partee, the initial interpretations of different DPs can be of different types. So-called "referential" DPs like proper names and pronouns are lexically of type e as in Discorse Representation Theory. "Quantificational" DPs like *every student* and *no student* basically denote generalized quantifiers of type $\langle\langle e,t\rangle,t\rangle$ following the Montagovian tradition. This happens due to the lexical meaning of the words *every* and *no* as functions from noun denotations to generalized quantifiers. Whether there are also DPs that are basically of the predicative type $\langle e,t\rangle$ is not completely clear from Partee's assumptions. In any case, all DPs under Partee's proposal can have any of the three types available for DP meanings. This is achieved by virtue of type shifting operators that cover the six possibilities to move

from one type to the other.[1] Without reviewing the semantic details in the formalization of these operators, let us briefly review their applications in Partee's proposal.

One of the reasons for Partee to adopt a predicative reading of type $\langle e, t\rangle$ for DPs are *be* sentences like the following.

(1) a. This woman is Mary.
b. This woman is no friend of mine.
c. This woman is the/a teacher.

Unlike previous proposals (e.g. Quine 1960:97,114-5), Partee does not assume any difference between "*be* of identity" and "*be* of predication". The copula can be treated as having no semantic contribution of its own (though see remark in Partee 1987:137). In sentences like *this woman is tall*, this straightforwardly accounts for how the $\langle e, t\rangle$ adjective applies to the subject. In "identity sentences" like (1a), the copula still has no meaning, and the semantics of the sentence is derived by using a phonologically covert operator that maps the e type meaning of the proper noun *Mary* to the $\langle e, t\rangle$ type meaning of the predicate holding only of Mary. In a similar way, Partee lets the DP following the copula in (1b) denote an $\langle e, t\rangle$ predicate. This is achieved by a lowering operation that applies to the $\langle\langle e, t\rangle, t\rangle$ meaning of the DP following the copula. In the case of the in/definite DPs in (1c) there are two possibilities to interpret Partee's proposal. One traditional possibility is to assume that the DPs in this case are basically of type $\langle e, t\rangle$ and then no type shifting operation needs to apply. Under this possibility, however, we expect type shifting to apply to in/definites in argument positions. Another possibility is to assume that in/definites are basically of the types e or $\langle\langle e, t\rangle, t\rangle$, which are suitable for argument positions, but then a type shifting operator maps them to type $\langle e, t\rangle$ in predicative positions as in (1c).

Partee does not compare her flexibility approach to the traditional analysis of the copula as ambiguous. However, one advantage of Partee's unambiguous *be* is that it can straightforwardly account for the interpretation of sentences like the following.

(2) The place we're looking for is either Oslo or in the north of Norway.

Under traditional assumptions, a sentence like *the place we're looking for is Oslo* must be analyzed using "*be* of identity". A sentence like *the place we're looking for is in northern Norway* must be analyzed using another "*be* of predication". This leaves cases like (2) unanalyzed, because in such cases the copula must have both functions. In Partee's system, the denotation of *Oslo* in (2) can be predicative (type $\langle e, t\rangle$), hence it has no problem to appear in a coordination with the predicate denoted by the prepositional phrase. The copula in Partee's analysis can remain meaningless, and it does not intervene in the semantic predication process.

[1] The six operators I refer to here are Partee's *lift, lower, ident, iota, A* and *BE*. I ignore some other operators in Partee's paper that are irrelevant for our present purposes. As mentioned below, the main results of Partee's proposal can in fact be achieved using less than six different operators.

We have seen reasons to assume mapping from types e and $\langle\langle e,t\rangle,t\rangle$ to the $\langle e,t\rangle$ type of DPs in predicate positions. Another reason for Partee to assume type flexibility is the interpretation of DP coordinations like *Mary or Sue* and *neither Mary nor every other student*. Such cases motivated Montague's treatment of DPs in type $\langle\langle e,t\rangle,t\rangle$, which allows a simple boolean analysis of the coordination (cf. Keenan and Faltz 1985, Winter 1998b:ch.1). In Partee's system, where proper names and pronouns are basically of type e, they need to be shifted to the generalized quantifier type in such cases of coordination. This is a motivation for a type shifting operator from type e to type $\langle\langle e,t\rangle,t\rangle$. We end up with two or three type shifting operators that are strictly necessary in Partee's system.[2]

To summarize, Partee's proposal has the following important characteristics:

1. All DPs are ambiguous between types e, $\langle e,t\rangle$ and $\langle\langle e,t\rangle,t\rangle$.
2. Two or three type shifting operators between these types.
3. Coverage: singular predicative DPs, singular coordinations of DPs.
4. No distinction between *be* of identity and *be* of predication.

2. The Category Shifting Alternative

In Winter (1998b:ch.4) I propose an alternative to Partee's view, combining ideas of previous work on the scope of indefinites and collective coordination into a system of so-called *category shifting principles*. In this proposal, unlike Partee's system, DP meanings can be of only two semantic categories: *quantificational* (+Q) and *predicative* (−Q). The quantificational/predicative distinction between DP meanings is expressed using the ±Q feature and not using semantic types. This modification is made for reasons that have to do with the semantics of plurals and are quite irrelevant for the purposes of the present paper. The referential (type e) meaning of DPs, which is not very operative in Partee's system, is withdrawn. As in classical (extensional) Montague grammar, proper names are assumed to be *lexically* quantificational (+Q). For instance, the proper name *Mary* denotes the set of predicates that hold of Mary, and not simply the e type individual for Mary herself.

There are two category shifting operations in the proposed system. One operator, from +Q meanings to −Q denotations, is based on the *choice function* (CF) approach of Reinhart (1992,1997).[3] Roughly speaking, choice functions are functions that pick an individual from the extension of a predicate. For instance, if the extension of the predicate

[2] If all DPs are basically of the types $\langle\langle e,t\rangle,t\rangle$ or e, then the type shifting operators that are strictly required to achieve the analyses sketched above are *lift* (from e to $\langle\langle e,t\rangle,t\rangle$) and *BE* (from $\langle\langle e,t\rangle,t\rangle$ to $\langle e,t\rangle$). The operator *ident* from e to $\langle e,t\rangle$ is derived by applying these two operators sequentially. If simple in/definites are traditionally of type $\langle e,t\rangle$ (as argued below), then at least one additional operator from type $\langle e,t\rangle$ into e or $\langle\langle e,t\rangle,t\rangle$ (*iota* or *A*) is required for such DPs in argument positions.

[3] On choice functions see also Egli and von Heusinger (1995) and Kratzer (1998), among others.

denoted by the noun *student* holds only of Mary, John and Sue (i.e. Mary, John and Sue are the only students), then any CF applying to the noun *student* gives one of these three entities. Since we assume now that there are no DPs with "referential" meanings, it is natural to follow the alternative implementation of CFs in Winter (1997), where a CF applying to a non-empty noun denotation derives the *generalized quantifier* that corresponds to an entity in this extension. This treatment allows a straightforward solution to the problem of how to define CFs for the case where the noun's denotation is empty, as it is reasonably the case with nominals like *unicorn*, *angel* and *round square*. We let CFs in such cases map the empty noun denotation to the *empty generalized quantifier*: the set that contains no sets whatsoever. This definition of CFs correctly analyzes sentences like *Mary drew a round square* as false, as in more standard techniques of quantification.

The main motivation for introducing CFs into semantic theory is the *wide scope* (WS) interpretation of indefinite DPs. Consider for instance the following sentence, a variation on an example from Fodor and Sag (1982).

(3) Prof. Smith will rejoice if a student of mine fails on the exam.

Under the *narrow scope* (NS) reading of the indefinite in (3), Prof. Smith will rejoice if *any* student of mine fails on the exam. However, the sentence also has a wide scope interpretation under which it claims that there is a *particular* student of mine whose failure will make Prof. Smith happy. Reinhart argues that both readings should be captured using CFs, as in the following informal analyses of sentence (3).

(4) a. Prof. Smith will rejoice if $\exists f$[CF(f) $\wedge$ f(a student of mine) fails on the exam] (NS reading)
b. $\exists f$[CF(f) $\wedge$ Prof. Smith will rejoice if f(a student of mine) fails on the exam] (WS reading)

We assume that an indefinite like *a student of mine* basically denotes a predicate (−Q) that is mapped to a quantifier (+Q) using the CF variable f. *Existential closure* (EC) of this variable may apply at any compositional level. When EC applies at the subordinate clause level as in (4a), we obtain the NS reading. When EC applies at the matrix level, it generates the WS interpretation as in (4b). Crucially, the latter reading is derived without any syntactic mechanism that pulls the indefinite out of the adjunct island created by the conditional. Therefore, Reinhart argues that the syntactic theory of scope assignment can remain compatible with the more general theory of island-restricted movement. This retains one of the main motivations for the unified theory of scope and extraction in May (1977). The only departure in the present work from the assumptions in Reinhart (1997) and Winter (1997) is that CFs are now treated not as a construction specific operation for indefinite DPs, but rather as a general category shifting mechanism mapping predicative DP meanings to quantificational ones.

The category shift used in the opposite direction, from quantifiers to predicates, is the *minimum operator* of Winter (1996). The main motivation for the introduction of

the *min* operator in that paper is the interpretation of DP conjunctions as in the following sentence.

(5) Mary and John are a good team.

As mentioned above, the proper names *Mary* and *John* are standardly assumed to denote generalized quantifiers. Conjunction between these two quantifiers is standardly obtained using the set intersection operation ($\cap$). This leads to the generalized quantifier containing all the predicates that hold of both Mary and John. To get the collective reading of (5), the minimum operator maps the resulting quantifier to a predicate holding (only) of the *collection* of Mary and John. Further application of the CF mechanism picks this collection from the predicate, and hence the sentence ends up getting the correct collective meaning. This two stage process of category shifting is more formally illustrated below.

(6) $\exists f$[CF(f) $\wedge$ $f(min(\text{Mary} \cap \text{John}))$ are a good team]

This analysis, which combines the *min* operator with the CF existential operator, allows us to retain the Boolean analysis of *and* (Keenan and Faltz, 1985) also for sentences like (6), which have often been claimed to show evidence for another, non-Boolean, reading of *and* (cf. Hoeksema, 1983; Link, 1983). However, the fact that no language shows a morphological distinction between Boolean conjunction and non-Boolean conjunction suggests that a unified treatment of conjunction as in Winter (1996) is advantageous.

After introducing the initial motivations for the CF and *min* category shifts, let us move on to their implementations for the constructions that motivated Partee's type shifting system. In predicative constructions like *this woman is the/a teacher* as in (1c), we explicitly assume now that the in/definite basically denotes a predicate (−Q), so the analysis of the whole sentence is straightforward under the common assumption that the copula *be* has no contribution to its meaning. Likewise, the indefinite article *a* also has a null meaning, or denotes the identity function, so that the indefinite *a teacher* ends up synonymous to the noun *teacher*.[4] Under this view, English morphology obscures a fact that is overt in languages like Hebrew, which can do away with both the copula and the indefinite article in such cases (see below). The definite article *the* is analyzed as a predicate modifier: a function from predicates to predicates. The role of this modifier is to impose uniqueness by ruling in sets with exactly one member (singletons) and ruling out non-singleton sets. Under a Russellian analysis of definiteness, *the* maps any singleton to itself and every non-singleton to the empty set. Formally – for every set A: *the*(A) is defined as A itself if $|A| = 1$ and as the empty set otherwise. Because both indefinites and definites are assumed to basically denote predicates, their interpretation in predicative position is straightforward. In argument positions, interpretation is uniformly achieved using the CF category shift. For instance, the sentences in (7) get the analyses in (8) respectively.

(7) a. A teacher smiled.

[4] The case of the English article *some* is somewhat different, as will be discussed below.

b. The teacher smiled.

(8) a. $\exists f[CF(f) \wedge f(\text{teacher})\ \text{smiled}]$
b. $\exists f[CF(f) \wedge f(\text{the(teacher)})\ \text{smiled}]$

For sentences like *this woman is Mary* (=(1a)), recall our Montagovian assumption that proper names basically denote generalized quantifiers. Such sentences are analyzed using the *min* category shifting operation, which maps the quantifier denotation of *Mary* to a predicate. Coordinations like *Mary or Sue* require no category shifting whatsoever and they are simply analyzed using generalized quantifiers as in traditional extensional Montague Grammar.

Partee allows all DPs to undergo type shifting. In the alternative developed here, however, many DPs are not allowed to undergo category shifting. This will be one of the main points of the discussion below. Specifically, sentences like *this woman is no friend of mine* (=(1b)) are left here with no straightforward analysis. The reason is that unlike Partee's analysis, the present system takes DPs like *no friend of mine* to denote "rigid" quantifiers, which cannot be mapped to predicative meanings. Like Doron (1983:160-1), I speculate that in cases like (1b) the function of the word *no* is to express predicate negation or sentential negation, and it does not appear in its usual determiner function. Hence, the DP does not start here with its regular quantificational meaning as in argument positions and no category shifting needs to apply. Unlike Partee (1987:132), and in agreement with Williams (1983), I believe that such grammatical appearances of "real quantificational" DPs in predicative positions are marked and require a more sophisticated syntactic analysis than in Partee's assumptions. For more discussion of this point see Winter (1998b:154-6).

In addition to the treatment of singular DPs as in Partee's paper, the semantic system in Winter (1998b) addresses many problems of plurality and DP interpretation. We have already seen the analysis of plural conjunctions like *Mary and John* in (5) above. A further analysis which is relevant for the present paper is the treatment of simple numeral indefinites like *three students* and plural definites like *the students*. Like the singular in/definites *a/the student* discussed above, these plural DPs are treated as basically predicative. The numeral *three* is assumed (as in Link 1987, among others) to denote a predicate modifier. Thus, *three students* denotes the set of collections of students with exactly three members. The definite article with plural nouns is treated following Sharvy (1980) and Link (1983) as a "maximality/uniqueness inducer". Thus, *the students* denotes the predicate holding of the unique maximal collection of students, in case there is such a collection. These assumptions lead to a straightforward analysis of plural in/definites in predicate positions as in (9) below. In argument positions as in (10) the analysis using CFs is analogical to the analyses in (8) of singular in/definites.

(9) Those women over there are three/the students in my class.

(10) Three/the students smiled.

For this reason, wide scope effects with plural numeral indefinites are analyzed in an analogous way to the analysis (4) of the singular indefinite in (3). For instance, sentence (11) below has a reading paraphrased in (12), where the plural indefinite *three students* takes existential scope over the conditional.[5]

(11) Prof. Smith will rejoice if three students of mine fail on the exam.

(12) There are three students of mine such that Prof. Smith will rejoice if they all fail on the exam.

It should be mentioned that the formal treatment of plurals in Winter (1998b:ch.4) makes use of another version of the CF operator, needed to derive distributivity at the DP level. However, this complication is quite irrelevant for our present purposes.

To summarize, in comparison to Partee's proposal as reviewed above, the present proposal has the following characteristics:

1. Some, but not all, DPs are ambiguous between the semantic categories $\pm Q$. Other DPs are unambiguously $+Q$.

2. Two category shifting operators mediate between the two semantic categories of flexible DPs:
   a. From $-Q$ to $+Q$: the choice function mechanism.
   b. From $+Q$ to $-Q$: the minimum operator.

3. Coverage: singular and plural predicative DPs, singular and plural coordinations of DPs (using only boolean coordination), scope of indefinites.

4. No distinction between *be* of identity and *be* of predication (as in Partee's proposal).

3. The Flexible DP Hypothesis

The first aspect mentioned above of the proposed system is one of the main modifications it introduces in Partee's conception. All DPs in the proposed analysis have a quantificational meaning. However, only some DPs have an additional predicative meaning, while others have no such interpretation and are therefore "purely quantificational". The theory has now to determine which DPs belong to which of the two classes. To get an idea of the centrality of this problem, let us review some examples of DPs that should not be given a flexible meaning and of the problems that may appear if they are.

Consider first DPs in predicate positions. The following sentences are clearly much less acceptable than the sentences in (1).

[5] Existential scope should be distinguished from the scope of distributivity of plural DPs. For an extensive discussion of this point, elaborating on observations by Ruys (1992), see Winter (1997,1998b:ch.3).

(13) a. *This woman is every teacher I know.
b. *This woman is no friend of mine except Mary.

Partee's system allows all DPs to have a predicative meaning and to appear in predicative positions. The only reason sentences like (13) may be ruled out under Partee's (1987:119) approach is pragmatic: that the interpretations her system assigns to them express "unsatisfiable or otherwise degenerate" propositions. However, this reasoning is not quite solid: in Partee's system the sentences in (13) are analyzed as equivalent to the following (acceptable) statements, respectively.

(14) a. This woman is the teacher I know.
b. This woman is Mary and she is not a friend of mine.

Sentence (13a), like (14a), is analyzed in Partee's system as contingent in case there is exactly one teacher I know, and pragmatically/semantically deviant otherwise. Sentence (13b), under virtually all analyses of *except*, becomes equivalent in Partee's system to the statement in (14b).[6] Because the sentences in (14) are pragmatically acceptable, we may conclude that in Partee's system there must be a syntactic or semantic reason for the ill-formedness of the sentences in (13), contrary to her assumptions.

In the present proposal there are many more potential problems of this sort. Consider for instance the following contrastive pairs of sentences.

(15) a. Mary and John are a good team. (=(5))
b. *Both Mary and John are a good team.

(16) a. The teachers a good team.
b. *All the teachers are a good team.

(17) a. Three teachers I know are the team that won the cup yesterday.
b. *Exactly three teachers I know are the team that won the cup yesterday.

In sentences (16a) and (17a) we can analyze the collectivity effect by applying the same method we used in (6) for analyzing sentence (15a) (=(5)).[7] Similar collective interpretations are clearly unavailable in the *b* cases, and hence some principle must block application of category shifting in these sentences.[8]

[6] For the semantics of exception phrases, see von Fintel (1993), Moltmann (1995) and Lappin (1996), and the references therein.

[7] In the case of (16a) and (17a) the *min* operator is even unnecessary, as we assume that *the teachers* and *three teachers* are basically predicative, so the CF mechanism can apply to them directly.

[8] The acceptability of sentences (16b) and (17b) ameliorates when the predicate is replaced by other collective predicates like *meet* or *gather*. For an extensive study of this phenomenon and the semantics of the resulting sentences see Winter (1998a,1998b:ch.5,1999).

What the examples above show is that we should impose restrictions on the class of DPs where collective interpretations are allowed, and therefore on the application of the *min* operator that derives them. A similar point holds for the phenomenon of wide scope beyond islands, which motivated the CF operation. As mentioned in previous work on the scope of indefinites,[9] complex numerals like *exactly one student* or *at least three students* seem to differ from simple indefinites (e.g. *some/a student*) and simple numerals (e.g. *three students*) in not allowing wide scope readings beyond island boundaries. Consider for example the contrasts between the following pairs.

(18) a. Prof. Smith will rejoice if a student of mine fails on the exam. (=(3))
b. Prof. Smith will rejoice if exactly one student of mine fails on the exam.

(19) a. Prof. Smith will rejoice if three students of mine fail on the exam. (=(11))
b. Prof. Smith will rejoice if exactly three students of mine fail on the exam.

While we have seen above that sentence (18a) can be interpreted with the indefinite taking scope over the conditional, this is hardly the case in (18b), with the complex numeral *exactly one*. The sentence cannot mean that there is exactly one student of mine whose failure in the exam will make Prof. Smith happy. Rather, sentence (18b) only has the narrow scope reading of the indefinite, where Prof. Smith is interested in the exact number of my students who fail on the exam, and will rejoice if this number is one. In a similar way, sentence (19a), but not (19b), has a wide scope reading for the indefinite over the conditional. The conclusion is that the CF mechanism should be restricted so that it does not apply to modified numeral indefinites.

In addition to these needed restrictions on category shifting, there is another central question that the theory of flexibility needs to answer, and this has to do with the "initial" semantic category of flexible DPs. We have assumed above that proper names like *Mary* and *John* are lexically quantificational as in traditional Montague Grammar, whereas simple definites and indefinites are basically predicative. This decision may seem quite arbitrary, as category shifting anyway allows all these DPs to have both a quantificational and a predicative reading, independently of their initial semantic category. As things stand, no empirical reason was shown for the assumed choice of the initial $\pm Q$ value.

To summarize: we want the theory to give principled answers to the following questions:

(i) Which DPs are flexible between predicates and quantifiers and which DPs rigidly denote quantifiers?

(ii) Of the flexible DPs, which ones start as predicates and which start as quantifiers?

As a working hypothesis for the study of these questions, I propose the following

[9] See Liu (1990), Beghelli (1995) and Corblin (1997).

general assumption on the relationships between DP structure (cf. figure 1) and flexible semantics.[10]

The flexible DP hypothesis: *The DP level is rigidly quantificational. The NP level is rigidly predicative. The D' level is flexible between the two semantic categories.*

Using this hypothesis, we classify the following kinds of DPs:

1. *Rigid DPs*: DPs with a filled SPEC position. These DPs are assumed to be purely quantificational because the SPEC position denotes a function from predicates to generalized quantifiers (a semantic determiner).

2. *Flexible DPs*: DPs with an empty SPEC position. These include:
   a. DPs with a filled D position. These DPs are assumed to be initially quantificational because D, like SPEC, denotes a semantic determiner function. However, since category shifting may freely apply at the D' level, these DPs can denote predicates as well.
   b. DPs where also the D position is empty. These DPs are initially predicative, because NP, like AP, is a phrase that is headed by a predicate denoting lexical element. Such DPs can also denote quantifiers due to category shifting at the D' level.

By way of abbreviation, let us refer to the two sub-classes of flexible DPs as **D's** and **NPs** respectively.

This *a priori* division of DPs into the three classes, with their different semantic properties, follows from the flexible DP hypothesis. The actual classification of various DPs as rigid, D's or NPs is a complex syntactic-semantic decision that should be empirically motivated. Thus, questions (i) and (ii) above are now stated in the following terms.

(i') What are the criterions that distinguish between flexible DPs (=NPs and D's) and rigid DPs?

(ii') What are the criterions that distinguish between NPs and D's?

In this paper I am able to address only a small part of the numerous ramifications of these questions for syntax and semantics. The rest of this section will show the assumptions about DP structure that are needed to account for the semantic data above, as well as more evidence for them.

3.1. Flexible DPs vs. Rigid DPs

The criterions employed above for deciding on the flexible/rigid status of DPs were the

[10] For a somewhat different proposal about the relationships between the DP's semantics and its internal structure see Zamparelli (1996) as well as the references therein.

following:

1. *Collectivity*: Flexible DPs show collectivity effects with predicates like *be a good team*, whereas rigid DPs do not.

2. *Wide scope*: Flexible DPs can take existential scope over syntactic islands,[11], whereas rigid DPs can not.

3. To a lesser extent – grammaticality in *predicative positions*: flexible DPs easily appear in such positions (e.g. following the copula), whereas rigid DPs are syntactically or semantically marked when they appear there.

An additional straightforward criterion for distinguishing flexible DPs from rigid DPs comes from X-bar theory. Complex numerals like *more than three, between two and four, fewer than five* must sit in SPEC, while bare numerals like *three* can sit lower within the DP (see Danon (1996) and Reinhart (1997)). Thus, the former DPs should be classified as rigid and the latter as flexible, in agreement with the other criterions.

An especially interesting test case for the distinction between flexible DPs and rigid DPs is the case of conjunction. Since we assume that proper names have an empty SPEC, they can be analyzed at the D' level.[12] Under the standard categorical identity requirement of coordination, it follows that proper name conjunctions can also be D', hence flexible. This is expected by other considerations as well, as we have already seen in (15a) that proper name conjunctions have a collective interpretation. In general, the system correctly predicts that a coordination of flexible DPs is also a flexible DP. For instance, the subject in the following sentence is a coordination of two flexible DPs (in this case, D's) and it indeed has a collective reading.

(20) Mary and four other women I know are a good basketball team.

However, when one of the elements in the coordination is semantically rigid, this means it has a non-empty SPEC, and therefore the whole coordination can be neither an NP nor a D', hence it must be semantically rigid as well. This prediction is borne out in the following sentence, contrasted with (20).

(21) *Mary and exactly four other women I know are a good basketball team.

[11] DPs that are clearly flexible according to this criterion are simple indefinites like *some/a student* and *some/three students*. With many other DPs that are assumed to be flexible it is not easy to use this criterion, simply because their WS readings are equivalent to their NS readings. However, at least as far as proper name *disjunctions* concern, Winter (1998b:175) follows Rooth and Partee (1982) and argues that also these items show wide scope effects in sentences like *if Bill praises Mary or Sue then John will be happy*.

[12] Whether proper names are D's or NPs is not relevant at this stage, but see the discussion below.

Because the second conjunct is assumed to have a filled SPEC position, also the first conjunct must be analyzed as a full DP (with an empty SPEC). Therefore, the whole subject is also analyzed as a full DP, which allows no category shifting. Collective readings are therefore correctly ruled out.

A second notable point about coordination is the distinction between conjunctions like *Mary and John* and conjunctions like *both Mary and John*. Because of contrasts as in (15) above, we assume that *Mary and John* is a flexible DP whereas *both Mary and John* is rigid. This agrees with a syntactic observation by Neijt (1979), who points out contrasts as in the following phrases.

(22) every (*both) man and woman, three/most (*either) men or women

(23) very (*both) tall and thin, ten meters (*both) above the house and below the cloud

According to Neijt, such contrasts show that while *and* and *or* can apply at the X' level, complex coordinations like *both...and* and *either...or* require a full XP. Thus, our assumption that *both Mary and John* is unambiguously a (rigid) DP whereas *Mary and John* can be analyzed as D' has evidence coming from general phrase structure.

In Hebrew, this syntactic distinction between *both...and/either...or* and "bare" *and/or* coordinations has further evidence coming from the accusative marker *et*. This particle obligatory precedes proper names and other definite DPs in object positions, as in the following sentences.

(24) dan makir et rina/ ha-mora
Dan knows ACC Rina/ the-teacher
'Dan knows Rina/the teacher'

When the object is a simple *and/or* coordination, there are two options: either *et* precedes the whole coordination or there is a separate *et* for each conjunct. This is illustrated below.

(25) i. dan makir et rina ve/o sara
Dan knows ACC Rina and/or Sara
'Dan knows Rina and/or Sara'
ii. dan makir et rina ve/o et sara
Dan knows ACC Rina and/or ACC Sara
'Dan knows Rina and/or Sara'

However, when the coordination is the Hebrew parallel to *both...and* (*gam...ve-gam*) or the parallel to *either...or* (*o...o*), the accusative marker *et* must precede each conjunct separately. This is shown by the following examples.

(26) a. i. * dan makir et gam rina ve gam sara
Dan knows ACC too Rina and too Sara
ii. dan makir gam et rina ve gam et sara
Dan knows too ACC Rina and too ACC Sara
'Dan knows both Rina and Sara'
b. i. * dan makir et o rina o sara
Dan knows ACC or Rina or Sara
ii. dan makir o et rina o et sara
Dan knows or ACC Rina or ACC Sara
'Dan knows either Rina or Sara'

If we naturally assume that DPs, but not D's, are assigned accusative case using Hebrew *et*, then these contrasts follow from our previous assumptions. Namely, when the coordination is a simple *velo* ("*and/or*") coordination, each conjunct can be analyzed as a D' and then only the complex DP needs to be assigned case using *et*. However, when the coordination is using the more complex constructions *gam...ve-gam* and *o...o*, we must have two separate DPs, which require two separate *et*'s.[13]

A closely related fact was noticed in an unpublished work by Dorit Ben-Shalom and Ziva Wijler, who argue that DP conjunctions with double *et* can be interpreted only distributively. The following example from Winter (1998b:185) supports this claim.

(27) dilan avar be-mispar ha-širim še katav et simon ve garfunkel
Dylan exceeded in-number the-songs that wrote ACC Simon and Garfunkel
'Dylan wrote more songs than Simon and Garfunkel'

(28) dilan avar be-mispar ha-širim še katav et simon ve et garfunkel
Dylan exceeded in-number the-songs that wrote ACC Simon and ACC Garfunkel
'Dylan wrote more songs than both Simon and Garfunkel'

As the English translations indicate, there is a semantic difference between sentence (27) and sentence (28). Suppose that Dylan wrote more songs than what the couple Simon and Garfunkel wrote *together*, but suppose further (unrealistically) that Dylan wrote less songs than Simon and also less songs than Garfunkel. In this situation sentence (27) can be interpreted as true but (28) is univocally false. Thus, the doubly accusative marked conjunction *et simon ve et garfunkel* in (28) must be read distributively. This is what we expect if, as assumed above, *et* applies only at the DP level and DP conjunctions are rigid, hence unambiguously distributive.

To conclude, from the syntactically plausible assumption that *both...and* and *either...or* apply with DPs and not D's, we are able to derive not only the lack of collectivity with these constructions as witnessed in (15b), but also some further facts concerning the

[13] Thanks to Tanya Reinhart for discussion.

distribution of accusative marking in Hebrew.

3.2. NPs vs. D's

So far, we have concentrated only on the distinction between rigid DPs and flexible DPs (NPs as well as D's). Now it is time to address question (ii) above about the distinction between NPs and D's. From the flexible DP hypothesis it follows that D's are initially quantificational whereas NPs are initially predicative. The semantic category of both kinds of flexible DPs can be shifted of course, but only at the D' level. There are two, seemingly independent, effects that I will argue correspond to the NP/D' distinction within the DP: the phenomenon of *verbless predication* and the so-called *appositional* use of conjunction. I propose that NPs can appear with no overt copula in predicative constructions and allow appositional conjunction, while D's require an overt copula and rule out appositional uses of conjunction.

3.2.1. Verbless Predication

A well-known cross-linguistic fact is the contrast between DPs with respect to the obligatory/optional status of the copula in various predicative constructions.[14] In English, this contrast can be illustrated using "small clauses" like the following.

(29) a. John considers this woman to be *a good teacher/the best teacher/Mary/some good teacher I know/you.*
b. John considers this woman *a good teacher/the best teacher/*Mary/*some good teacher I know/*you.*

(30) a. I found John my strongest supporter.
b. *I found my strongest supporter John.

While all the italicized DPs in (29a) appear with an overt *be* copula, only two of them are allowed in (29b) where the copula is missing. A similar contrast is illustrated in (30), where the definite *my strongest supporter* is allowed without a preceding copula, but the proper noun *John* is not.

As pointed out by Doron (1983), in Hebrew this kind of contrasts is more easily visible than in English. Hebrew also allows matrix sentences to appear with no overt copula, similarly to English small clauses. With the Hebrew bare indefinite in (31) and the definite in (32), the copula is only optional as with the English *a* indefinite and definite in (29).

(31) ha-xavera haxi tova šeli (hi) mora.
the-friend most good of-I (is) teacher
'My best friend is a teacher'

[14] See Doron (1983), Higginbotham (1987), Rapoport (1987), and Zaring (1996), among others.

(32) dana (hi) ha-mora, lo at!
Dana (is) the-teacher, not you
'Dana is the teacher, not you!'

By contrast, the Hebrew copula is obligatory with proper names, pronouns and *eize* ("*some*") indefinites, as illustrated by the pairs of sentences below.

(33) a. *ha-xavera haxi tova šeli dana.
the-friend most good of-I Dana
b. ha-xavera haxi tova šeli hi dana.
the-friend most good of-I is Dana
'My best friend is Dana'

(34) a. *ha-mora at, lo dana!
the-teacher you, not Dana
b. ha-mora hi at, lo dana!
the-teacher is you, not Dana!
'The teacher is you, not Dana!'

(35) a. *dana eizo mora še-ani makir.
Dana some teacher that-I know
b. dana hi eizo mora še-ani makir.
Dana is some teacher that-I know
'Dana is some teacher I know'

As Doron further observes, the presence/absence of the copula corresponds to the presence/absence of a wide scope reading for a bare indefinite in the predicate position. Thus, while the sentence in (36a) is scopally ambiguous, as indicated by the translation, this is is not the case in (36b), where the copula is missing.

(36) a. rina ša'ala im dani hu psantran še-šaxaxti et šmo
Rina asked if Dani is pianist that-forgot-I ACC name-his
Ambiguous: 'Rina asked whether Dani was a pianist whose name I had forgotten' or 'There is a pianist whose name I forgot and Rina asked whether Dani was that pianist'
b. rina ša'ala im dani psantran še-šaxaxti et šmo
Rina asked if Dani pianist that-forgot-I ACC name-his
Unambiguous: 'Rina asked whether Dani was a pianist whose name I had forgotten'

Summarizing, there are two kinds of DPs with respect to the status of the copula in predicative constructions:

(37) Optional copula:
a. definites

b. *a*/bare indefinites interpreted narrowest scope

(38) Obligatory copula:
a. proper names and pronouns
b. *some/eize* indefinites (all scopes)
c. *a*/bare indefinites interpreted wide scope

Let us assume that the DPs in (37) are initially NPs, whereas the DPs in (38) are initially D'. Verbless predicative constructions require NP and an overt copula requires D'. Thus, for the sake of presentation we can assume that a predicative VP in a Hebrew matrix sentence or an English small clause of the form DP-VP is introduced by one of the following rules, where BE is a morphological realization of the copula.

$VP \rightarrow NP$

$VP \rightarrow BE\ D'$

The scope effect observed by Doron in (36) gets a straightforward account in this system. Since choice functions apply only at the D' level, their introduction requires an overt copula as in (36a). This is the origin of the wide scope reading in this case. When the copula is missing as in (36b), the only possible analysis of the predicative nominal is as an NP, where CFs cannot apply. Hence, the sentence does not have any wide scope interpretation for the predicative indefinite.

The analysis of proper nouns deserves some elaboration. According to the copula test, proper nouns are D's since they require an overt copula. However, this is not always the case. As pointed out by Partee (1987) and Zwarts (1992), among others, proper nouns often behave like "ordinary" nouns, as in examples like *he is a real Einstein*, *the Vermeer she bought is beautiful*, etc. I propose that proper nouns are in fact "ordinary" nouns that come from the lexicon with a D' structure that semantically imposes uniqueness on the noun denotation.[15] Syntactically, let us assume the following (possibly lexical) structure for English proper nouns, with an empty definite article ϕ_{the} and an empty determiner ϕ_{cf} with the meaning of a choice function variable.

(39) $[_{D'}\ \phi_{cf}\ [_{NP}\ \phi_{the}\ N]]$

Semantically, as in the case of regular definites (cf. (7b)-(8b) above), the empty definite article imposes uniqueness and the choice function has no alternative but to "choose" the unique element from the noun's denotation. The noun can also appear without the additional D' structure and then it behaves like any other "ordinary" noun. In Hebrew, Doron points out that it is precisely those situations where the uniqueness requirement of proper nouns is relaxed that allow them to appear without a copula. Doron's example is along the lines of the following.

[15] This is similar to a proposal in Barwise and Cooper (1981).

(40) ha-yom dana trocki ve-sara lenin
today Dana Trotsky and-Sara Lenin
'Today Dana is Trotsky and Sara is Lenin'

In the context of a play about the Russian revolution, where Dana plays Trotsky and Sara plays Lenin, (40) is perfectly acceptable. In such a context, however, the proper nouns *Trotsky* and *Lenin* lose their uniqueness requirement, as there may be many Trotskys and Lenins in such plays. Thus, these proper nouns in (40) behave more like ordinary Hebrew bare indefinites. We may assume that the D' analysis of "proper nouns" is in principle available for all nouns, and that the question of which nouns prominently appear as "proper" (with a D' structure) and which nouns tend to function as "bare" Ns is primarily an extra-grammatical matter of language use. This line of reasoning expects a third kind of nouns: ones with only an NP structure without the additional D' level. Such bare nouns would behave like the English/Hebrew definite, allowing verbless predication, but imposing uniqueness without any overt definite article. Possibly relevant examples may include the English noun *president* (as in *John is president*, cf. Partee, 1987:125) or languages like Polish and Russian, which express uniqueness without definite articles.

3.2.2. A Further Prediction: Collectivity and Verbless Predicates

Additional evidence for the present approach comes from the contrast between the following Hebrew sentences.

(41) a. (shtey) ha-našim halalu hen soferet ve-mora.
(two) the-women these are author and-teacher
'These (two) women are an author and a teacher'
b. *(shtey) ha-našim halalu soferet ve-mora.
(two) the-women these author and-teacher

In (41a) there is an overt copula and the sentence has a coherent interpretation, asserting that one of the women under discussion is an author while the other is a teacher. In (41b), where the copula is omitted, the sentence becomes unacceptable. Recall that Hebrew bare indefinites are in general allowed to appear without an overt copula (cf. (31)) and note, moreover, that this is also so with conjunctions of bare indefinites as in the following sentence.

(42) dana (hi) soferet ve-mora.
Dana (is) author and-teacher
'Dana is an author and a teacher'

Why is the copula obligatory in (41) but only optional in (42)? The answer is straightforward in the present system. Since NP denotations are predicates, nothing prevents a simple analysis of the coordination in (42) using set intersection of the predicate denotations. The resulting (correct) interpretation of the sentence states that Dana is an author and that she is also a teacher. Without the copula, NP coordination in (42) is thus sufficient to obtain this intuitive interpretation. However, such a simple analysis in (41b) will not do, as it would

generate an odd statement entailing that "the two women are an author/a teacher". To get the collectivity effect we intuitively accept in (41b), we have to apply category shifting as in the following semantic analysis.

(43) $\exists f \exists g[\mathrm{CF}(f) \wedge \mathrm{CF}(g) \wedge$ these (two) women are $min(f(\text{an author}) \cap g(\text{a teacher}))$

In words, what this representation states is that there is a possibility to choose an author and a teacher, such that the predicate these two entities form together (using the *min* operator) holds of the plurality of the two women. This is the intuitive interpretation of sentence (41a). However, crucially, it can only be obtained by virtue of category shifting operations. Since these operations apply only at the D' level, an overt copula is obligatory for this analysis to become available in (41a), and where a copula is missing, as in (41b), the sentence becomes incoherent.

The (previously unnoticed) contrast in (41), *vis à vis* (42), is a surprising piece of evidence in favour of the proposed analysis. My English informants identify a parallel pattern in the following English small clause constructions.[16]

(44) a. To my delight, I found my two new students to be a first-rate pianist and a professional singer.
b. *To my delight, I found my two new students a first-rate pianist and a professional singer.

(45) To my delight, I found my new student (to be) a first-rate pianist and a professional singer.

3.2.3. Appositional Conjunction

Most English DP conjunctions are in the plural. However, some DPs are known to be an exception to this rule. Consider for instance the following examples from Hoeksema (1988:36).

(46) { a. A great man and a good father / b. My great opponent and the hero of my youth / c. A great man and the best magician in New Jersey } *has* passed away.

This phenomenon is sometimes called *appositional conjunction*. The semantic intuition about these examples is that the two conjoined DPs must be coreferential. For example, the opponent and the hero in (46b) must be the same person. By contrast, Hoeksema notes that with other DPs, as in the following examples, appositional conjunction is impossible even when the DPs are known to be coreferential.

[16] Thanks to Edit Doron for her help with the formulation of this test.

(47) *{ a. Dr. Jekyll and Mr. Hyde; b. Charles Dodgson and Lewis Carroll; c. Charles Dodgson and the author of *Alice*; d. John and my best friend; e. My hero and Houdini; f. Amy and a long-time lover } *has* passed away.

Note further that indefinites with the article *some*, by contrast to the *a* indefinites in (46), do not allow appositional conjunction. This is illustrated below.

(48) *{ a. Some great man and some good father; b. Some great man and the best magician in New Jersey } *has* passed away.

Importantly, what we observe here is that the DPs in (37), which can appear without a copula, also allow appositional conjunction. Conversely, the D's in (38), which require a copula, also require plural number of conjunctions they appear in. The theoretical intuition that accounts for this generalization is straightforward: since the DPs that require no copula are NPs, hence basically predicative, their conjunction, like the conjunction of other predicative categories (e.g. AP and PP) requires no change in the number feature. However, at the D' level, which is not purely predicative like NP, conjunction must be in the plural. This immediately accounts for the "coreferential" interpretation in (46): the structure of the subjects in these examples is roughly as follows.

(49) $[_{DP}\ [_{D'}\ \phi_{cf}\ [_{NP}$ NP and NP$]]]$

Semantically, the CF variable, denoted by the empty ϕ_{cf} category, chooses one entity from the intersection of the two predicates. This is illustrated in the following semantic analysis of (46a).

(50) $\exists f[\mathrm{CF}(f) \wedge f(\text{a great man} \cap \text{a good father})$ has passed away$]$

If however the two coordinated elements must be D's, as it is the case in (47) and (48), then plural number becomes obligatory, and the coreference impression disappears.

4. Summary

Two general assumptions have been explored in this paper. First it was assumed, following Partee's work, that some DPs are ambiguous between predicates and quantifiers. Partee's assumption about a third kind of "referential" DPs was eliminated. The predicate/quantifier ambiguity was derived by two phonologically covert *category shifting* operations: the *choice function* mechanism and the *minimum* operator. Unlike Partee, it was proposed that only some DPs are flexible in this way, while others are rigidly quantificational. A second element in the proposal, the *flexible DP hypothesis*, employs the DP structure to put restrictions on the circumstances where category shifting can apply. While DPs and NPs were assumed to be rigidly quantificational/predicative respectively, the intermediate D' level was assumed to be the location where category shifting mechanisms

apply.

Because of this "mapping hypothesis", syntactic differences between DPs are semantically manifested. One such difference is the distinction between DPs with a null SPEC and DPs with a full SPEC. According to the flexible DP hypothesis, the former are predicted to be semantically flexible while the latter rigidly denote quantifiers. It was argued that this syntactic/semantic distinction is reflected in the availability of collective interpretations and of wide scope construals beyond syntactic islands. While D's allow category shiftings that derive these effects, DPs with a full SPEC position rule them out. Special attention was given to the syntactic distinctions between *both...and* constructions, which apply only at the XP level, and plain *and* conjunctions, which also apply at the X' level. These two kinds of constructions were shown to exhibit semantic contrasts as anticipated by the flexible DP hypothesis. Another syntactic distinction that turns out to be semantically relevant is the distinction between D's and NPs. According to the flexible DP hypothesis, the former are initially quantificational while the latter are initially predicative. This distinction was shown to have semantic implications for the analysis of verbless predicative constructions and appositional conjunctions. While NPs were assumed to allow such constructions, D's rule them out. Some previously noticed and unnoticed generalizations were accounted for in this way.

Syntax	Semantics	
	value	category
$[_{NP}$ a student$]$	$\mathbf{student}'$	$-Q+F$
$[_{NP}$ the student$]$	$\mathbf{the}'(\mathbf{student}')$	$-Q+F$
$[_{NP}$ three students$]$	$\mathbf{three}'(\mathbf{students}')$	$-Q+F$
$[_{D'}$ some $[_{NP}$ student$]]$	$f(\mathbf{student}')$	$+Q+F$
$[_{D'}\ \phi_{cf}\ [_{NP}\ \phi_{the}$ Mary$]]$	$f(\mathbf{the}'(\{\mathrm{m}'\}))$	$+Q+F$
$[_{D'}[_{D'}\ \phi_{cf}\ [_{NP}\ \phi_{the}$ Mary$]]$ and $[_{D'}\ \phi_{cf}\ [_{NP}\ \phi_{the}$ John$]]]$	$f(\mathbf{the}'(\{\mathrm{m}'\})) \cap g(\mathbf{the}'(\{\mathrm{j}'\}))$	$+Q+F$
$[_{D'}[_{D'}\ \phi_{cf}\ [_{NP}\ \phi_{the}$ Mary$]]$ and $[_{D'}\ \phi_{cf}\ [_{NP}$ the student$]]]$	$f(\mathbf{the}'(\{\mathrm{m}'\})) \cap g(\mathbf{the}'(\mathbf{student}'))$	$+Q+F$
$[_{DP}$ every $[_{D'}[_{NP}$ student$]]]$	$\mathbf{every}'(\mathbf{student}')$	$+Q-F$
$[_{DP}$ no $[_{D'}[_{NP}$ student$]]]$	$\mathbf{no}'(\mathbf{student}')$	$+Q-F$
$[_{DP}$ exactly three $[_{D'}[_{NP}$ students$]]]$	$\mathbf{exactly\_three}'(\mathbf{students}')$	$+Q-F$
$[_{DP}[_{DP}[_{D'}\ \phi_{cf}\ [_{NP}\ \phi_{the}$ Mary$]]$ and $[_{DP}$ every $[_{D'}[_{NP}$ student$]]]]$	$f(\mathbf{the}'(\{\mathrm{m}'\})) \cap \mathbf{every}'(\mathbf{student}')$	$+Q-F$
$[_{DP}$ both $[_{DP}[_{D'}\ \phi_{cf}\ [_{NP}\ \phi_{the}$ Mary$]]$ and $[_{DP}[_{D'}\ \phi_{cf}\ [_{NP}\ \phi_{the}$ John$]]]]$	$f(\mathbf{the}'(\{\mathrm{m}'\})) \cap g(\mathbf{the}'(\{\mathrm{j}'\}))$	$+Q-F$

Table 1: DP syntax and semantics

By way of summarizing the main proposal in this paper, table 1 gives the proposed syntax and initial semantics of the various DPs that were discussed. The label $\pm Q$ denotes whether a DP is quantificational or predicative. The label $\pm F$ denotes whether a DP is flexible or rigid. The table illustrates the assumption that all NPs are initially predicative and flexible, all D's are initially quantificational and flexible, and all full DPs are rigidly (hence also initially) quantificational.

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