On Semantic Types of Coordinated NP's

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Abstract

Our concern in the present paper is with the interpretation of plural noun phrases (NP), particularly conjoined NP's and their semantic types. The discussion mainly focuses on the NP's in subject position, and ends up with the conclusion that the semantic type corresponds with that of quantified NP's. This leads us to the position that coordinated NP's should always be understood as a group-forming unit. In the appendix, we provide a brief survey of sub-classification of predication properties and make a tentative suggestion for more proper semantic interpretation of coordinated NP subjects.

1. Introduction

Within formal approaches to the semantic treatment of conjoined NP's it has become common to accept that they all have translations of the semantic type $\langle\langle e, t\rangle, t\rangle$ just as with quantified NP's. Our present concern is to provide an argument as to how it is possible to keep the position in contention. Additionally, in the appendix we will see what modification of the dichotomy between collective and distributive predicates will follow from the alleged position based on the assumption that coordinated NP structures are non-transforma-

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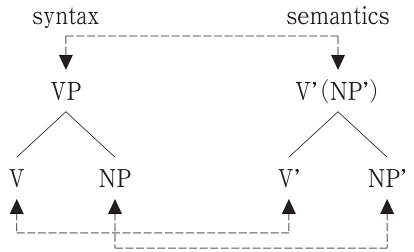
tionally fed for interpretation.

To obey the principle of compositionality, a rule-to-rule hypothesis is adopted in which for every syntactic rule a corresponding semantic rule must be listed. A rule-to-rule hypothesis requires that every syntactic rule should be paired with a corresponding translation rule. To illustrate, our grammar has a structured pair like:

（1）《VP → V, NP; V'(NP')》

where syntactic rules (more exactly, Immediate Dominance Rules: henceforth, ID rules) and translation rules are paired. The syntactic rules form a local tree of depth one, that is, mother-and-daughter relation, and define nothing but an immediate dominance of constituents (in addition, Linear Precedence Rules for word order are provided in the grammar independently of ID rules) (cf. Borsley (1999))[1]. We leave out the latter type of syntactic rules in what follows. The translation rules which we find in the second coordinate of the paired structure (1) provide us with translation of the root node, VP'. In our framework, the isomorphic relation of syntax to semantics is held via a mapping; and so VP' obtains via compositional operation of translations of daughter nodes, V' and NP'.

（2）



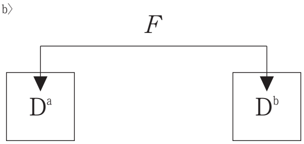
In general, given $\alpha_0 \rightarrow \alpha_1, \ldots, \alpha_n$, we have $F(\alpha_1', \ldots, \alpha_n')$ where F is a function of $\alpha_1', \ldots, \alpha_n'$, and each α with a prime symbol stands for a denotation of a corresponding syntactic constituent. Then our task is to determine what properties the F has and how it is defined. As far as the latter question is concerned, the most important question is whether each translation rule must be specified for different syntactic rules, or whether given translations of daughter-constituents, any general principle could predict a translation.

2. Semantic types

Following Dowty (1978), we assume that there should be a function TYPE which gives a semantic type of a corresponding syntactic category; to mention a few, TYPE(S) $= t$ where t is the semantic value *being true,* TYPE(NP) $= e$ where e stands for an entity, and TYPE(V_i) $= \langle e, t \rangle$ where V_i stands for an intransitive verb, etc. Suppose that a notation D_a is the set of possible denotations of type a and that then we have $D_{\langle e, t \rangle}$, which designates the set of objects or entities that the one-place predicates can denote; in other words, it is a characteristic function which specifies a subset of a set. So sleep' designates a subset of sleeping entities of the whole set A (with respect to a given model), or it is a function from a set A to $\{1, 0\}$.

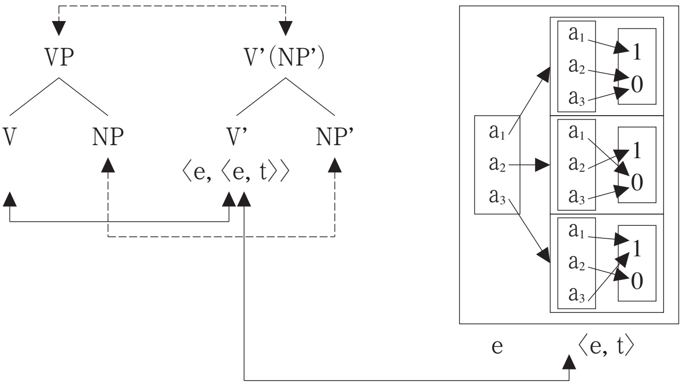
If a and b are types, then type $\langle a, b \rangle$ denotes a function F from D_a to D_b, or ${D_b}^{D_a}$. We could illustrate as follows (cf. Dowty (1978)).

(3) $D_{\langle a, b \rangle}$



One of the advantages of a type theory is that it indirectly connect a syntactic category to its corresponding functional denotation with respect to a model, which in turn could be designated in an isomorphic way via the semantic type, as in (4), for example.

(4)

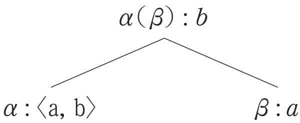


The type ⟨e, ⟨e, t⟩⟩ of the transitive verb corresponds to its denotation in terms of a function with respect to a given model; and the former, on the other hand, is related to the syntactic constituent V. Therefore, syntactic objects and model-theoretic objects are indirectly associated with each other. It is via semantic types that syntax and semantics are interconnected when it comes to interpretation.

3. Type-driven application of function

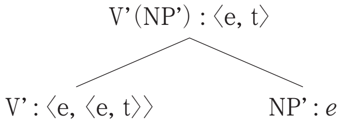
A functional application is type-driven and its operation heavily depends on semantic types of functor and argument. What we need to avoid is to specify applications of a different functor to a different argument: what we need instead is a more general way of functional application. A recursive definition of the set of meaningful expressions of type a, denoted "ME_a" is as follows (cf. Dowty et. al (1981)). For each type a and b, if $\alpha \in ME_{\langle a, b\rangle}$ and $\beta \in ME_a$, then $\alpha(\beta) \in ME_b$, which is illustrated as in (5):

(5)



This means that a functor applies to an argument in such a way that the rule of functional application can result in output type *b* via logical cancellation of input type *a* of functor ⟨*a*, *b*⟩ by means of an argument-type *a*. If this is the case, then we have the analysis tree as in (4′) given the *syntactic* configuration (4).

(4′)



In this case V' applies to NP'; however, it is not always true that predicates apply to nominal constituents, and we will even see a functional application done in a reversed way, instead. When it comes to a sentential interpretation with a conjoined NP subject, a translation of a nominal constituent will apply to that of a verbal element; that is, the subject NP' to the predicate VP'. Yet our type-theory makes it possible for this kind of functional application to be predictable on a more general basis, rather than a rule-particular statement of the application, in that a structure induced by ID rules is interpreted by a compositional operation of semantic rules *on the basis of* semantic types assigned to the corresponding syntactic category or syntactic configuration.

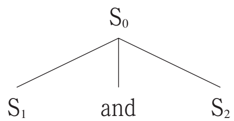
4. Sentential coordination and GPSG

Now with the above-mentioned tools in mind, we observe the following sentential coordinate construction.

(6) John likes comics and Mary likes comics.

A more intuitive preference induces us to postulate a tripartite structure like:

(7)



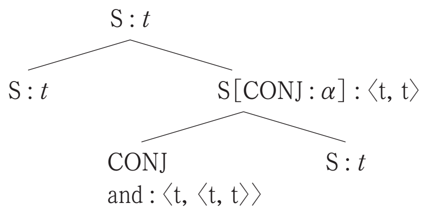
When it comes to translation of the mother S constituent, a conjunction *and* is required to take the pair (S_1', S_2') as an input semantic type. This means that we gain access to a function that takes two daughter-arguments at one time, which our general interpretive strategy of binary operations inclines us to turn down. In tandem with the above-mentioned type theory, here we rather adopt Generalized Phrase Structure Grammar, GPSG for short, to get a translation of ME_{type} of a mother constituent. To put it more simply, we assume a binary structure for sentential coordinate constructions and hypothesize what follows:

(8′) a. S → S S[CONJ : α]

b. S[CONJ : α] → CONJ S

where [CONJ : α] stands for a terminal symbol feature which picks a value out of a finite set of conjunctions, say, *and*. With this in mind, we have the following structure for a conjoined sentence.

(9)



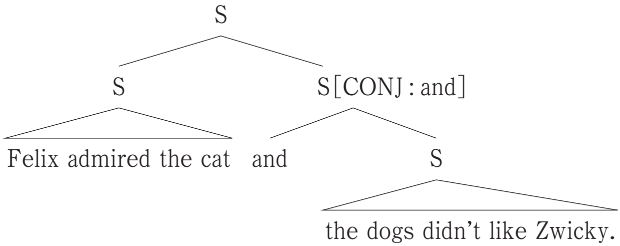
S is of type t, so that our plausible cancellation predicts that and' apparently is of type ⟨t, ⟨t, t⟩⟩. Suppose that p and q in [p∧q] are variables for S'. We then have λ p[λ q[p∧q]] as a translation of “p and q” via λ-abstraction, and it has a functional denotation of type ⟨t, ⟨t, t⟩⟩.

Now consider (10).

(10) Felix admired the cat and the dog didn't like Zwicky.

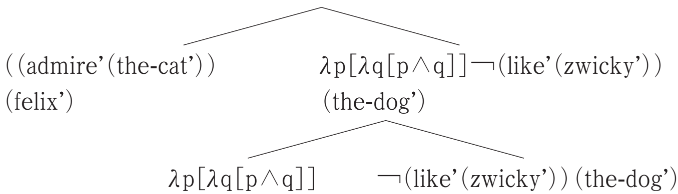
We have the following syntactic structure for (10).

(11)



And with our interpretation of the conjunction *and*, we end up with the isomorphic translation analysis tree to (12).

(12) $(\lambda p[\lambda q[p \wedge q]] \neg(like'(zwicky'))(the\text{-}dog'))((admire'(the\text{-}cat'))(felix'))$ ……………………………………………………………… (i)



We are provided with (i) of (12) for the whole sentence (10). Application of λ-conversion to (i) results in (13a). And a consecutive application of λ-conversion to (13a) ends up with (13b), and finally we get (13c) for the translation of (10) via a commutative law.

(13) a. $\lambda q[\neg(like'(zwicky'))(the\text{-}dog') \wedge q]((admire'(the\text{-}cat'))(felix'))$

b. $\neg(like'(zwicky'))(the\text{-}dog') \wedge (admire'(the\text{-}cat'))(felix')$

c. $(admire'(the\text{-}cat'))(felix') \wedge \neg(like'(zwicky'))(the\text{-}dog')$

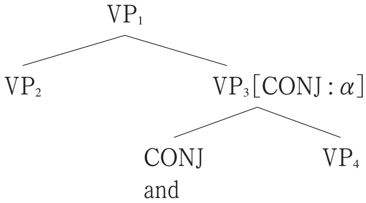
Now let's look at a VP conjunction.

(14) a. Felix admired the cat and didn't love the dog.

b. Felix admired the cat and Felix didn't love the dog.

We can find that (14a) is a common VP coordination, and that (14b) is truth-conditionally equivalent to a full-fledged sentential coordination. In reaching a translation of the whole sentence (14a) on the “type-driven” hypothesis, we seem to be in a predicament. To see what it looks like, let us take a brief look at the derivation of the conjoined VP structure. As with sentential conjunction, we keep our discussion within the GPSG framework.

(15)



Notice that we are compelled to simply reject that and’ is of 〈t, 〈t, t〉〉 because there won’t be any room for a combinatory association of and’ with the translation of VP_4’ in (15) which is of type 〈e, 〈e, t〉〉. Then the question is how we can climb up to VP_1 to get the whole translation.

One of the possible ways to get around this is to look at the analysis tree in a ‘retrospective’ or *top-down* way, getting down to a direct translation of the whole VP. We have been taking a step-by-step functional operation to the daughters’ translations in a compositional fashion: however, our main idea is to get back to a previous stage of each derivation where we find a λ-expression prior to a functional operation of the functor to the argument, and move down to the conjoined VP. Again (14a) is truth-conditionally equivalent to (14b), and (14b) has a translation like (16a): therefore, (14a) has the same translation, that is, (16a). The λ-expression prior to application of λ-conversion is supposed to be (16b).

(16) a. (admire’(the-cat’))(felix’) ∧ ¬ (like’(the-dog’))(felix’)

b. λx[(admire’(the-cat’))(x) ∧ ¬ (like’(the-dog’))(x)](felix’)

So we have the following analysis tree (17) for VP_1.

(17) $(\lambda x[(\text{admire}'(\text{the-cat}'))(x) \wedge \neg(\text{like}'(\text{the-dog}'))(x)]$ ……(ii)

VP_2 VP_3

$\lambda p[\lambda q[p \wedge q]]$ VP_4

It is impossible to regard and' as type ⟨t, ⟨t, t⟩⟩ because if that were the case, VP_4 should be either *t* or ⟨⟨t, ⟨t, t⟩⟩, ⟨⟨e, t⟩, ⟨e, t⟩⟩⟩. VP_4 is allegedly not of type *t* nor is it of type ⟨⟨t, ⟨t, t⟩⟩, ⟨⟨e, t⟩, ⟨e, t⟩⟩⟩. All the VP's of the present example are transitive, and (ii) is a λ-expression of ⟨e, t⟩ because a variable x of type *e* is abstracted out of the open formula which is of type *t*: hence, VP_4 cannot be of type ⟨⟨t, ⟨t, t⟩⟩, ⟨⟨e, t⟩, ⟨e, t⟩⟩⟩. For the direct translation of VP_1, prior to λ-conversion to (ii), we substitute a variable P for admire' (the-cat') on the first conjunct in the scope of λx in (ii) to get to (18a); and then λ-abstraction on the P in (18a) applies to obtain (18b).

(18) a. $\lambda x[P(x) \wedge \neg(\text{like}'(\text{the-dog}'))(x)]$

b. $\lambda P[\lambda x[P(x) \wedge \neg(\text{like}'(\text{the-dog}'))(x)]$

As we mentioned earlier, and' has as a translation $\lambda p[\lambda q[p \wedge q]]$ which serves here as a functor so that we can have (19) for VP[CONJ; and]' and end up with (20) for the analysis tree for VP_1.

(19) $\lambda P[\lambda x[(\lambda p[\lambda q[p \wedge q]](P(x))(\neg(\text{like}'(\text{the-dog}'))(x)]]$

(20) a. $\lambda P[\lambda x[(\lambda p[\lambda q[p \wedge q]](P(x))(\neg(\text{like}'(\text{the-dog}'))(x)]](\text{admire}'(\text{the-cat}'))$

VP_2 $\lambda P[\lambda x[(\lambda p[\lambda q[p \wedge q]](P(x))(\neg(\text{like}'(\text{the-dog}'))(x)]]$

$\lambda p[\lambda q[p \wedge q]]$ VP_4

b. $\lambda P[\lambda x[(\lambda p[\lambda q[p \wedge q]](P(x))(\neg(\text{like'}(\text{the-dog'}))(x)]](\text{admire'}(\text{the-cat'}))$

As is indicated in (21a-d) below, by means of consecutive applications of λ-conversion, we have a translation for (20b) which is associated with VP_1.

(21) a. $\lambda P[\lambda x[(\lambda p[\lambda q[p \wedge q]](P(x))(\neg(\text{like'}(\text{the-dog'}))(x)]](\text{admire'}(\text{the-cat'}))[=(20b)]$

b. $\Rightarrow \lambda P[\lambda x[\lambda q[P(x) \wedge q]](\neg(\text{like'}(\text{the-dog'}))(x)]](\text{admire'}(\text{the-cat'}))$

c. $\Rightarrow \lambda P[\lambda x[P(x) \wedge \neg(\text{like'}(\text{the-dog'}))(x)]](\text{admire'}(\text{the-cat'}))$

d. $\Rightarrow \lambda x[(\text{admire'}(\text{the-cat'}))(x) \wedge \neg(\text{like'}(\text{the-dog'}))(x)]]$

For a complete translation of our given sentence (14a) that includes a conjoined VP, we apply (21d) to the subject *Felix*. Application of λ-conversion to (22a) yields (22b), which is the same translation as a truth-conditionally equivalent (14b), as desired.

(22) a. $\lambda x[(\text{admire'}(\text{the-cat'}))(x) \wedge \neg(\text{like'}(\text{the-dog'}))(x)]](\text{felix'})$

b. $(\text{admire'}(\text{the-cat'}))(\text{felix'}) \wedge \neg(\text{like'}(\text{the-dog'}))(\text{felix'})$

5. NP coordination

The same strategy as in VP conjunction can be taken advantage of to see how an NP coordination is interpreted and what semantic type it is assigned. As with the discussion of interpretation of conjoined VP's, it is apparent that we cannot deal with NP coordination in the same way as sentential coordination. Observe the following pair.

(23) a. Felix and Zwicky are smart.

b. Felix is smart and Zwicky is smart.

c. $\text{smart'}(\text{felix'}) \wedge \text{smart'}(\text{zwicky'})$

There is evidently a truth-conditional parallelism between (23a) and (23b).

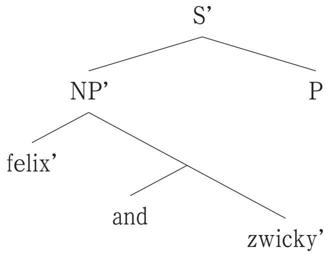
(23b) has the interpretation (23c). For the predicate smart' on both conjuncts of (23b) we replace a variable P of type $\langle e, t \rangle$; then we obtain the following (where "be" is left out in representing (24a))[2].

(24) a. Felix P and Zwicky P

b. $P(felix') \wedge P(zwicky')$

A rough approximation of the analysis tree for (23a) is as follows:

(25)



(24b) is provided for logical formula of (24a), and (23a) also has (24b) for the translation of its S'. We use the same tactic as VP coordination of translation for NP', [felix' and zwicky'] as a whole, moving down directly onto the NP'. We start off with S' of (25). (26a) is provided for the translation of the verbal constituent prior to functional application; and by gaining a direct access to the conjoined NP's, we obtain (26b).

(26) a. $\lambda P[P(felix') \wedge P(zwicky')]$

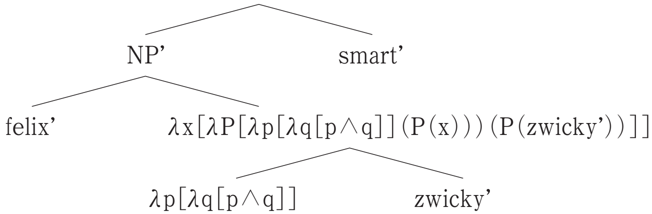
b. $\lambda x[\lambda P[P(x) \wedge P(zwicky')](felix')$

As usual, we interpret the conjunction and' as $\lambda x[\lambda q[P(x) \wedge q]]$; and then from (26b) we get (26c).

(26) c. $\lambda x[\lambda P[\lambda p[\lambda q[p \wedge q]](P(x)))(P(zwicky'))]](felix')$

In sum, we have the analysis tree (27) for (23a).

(27)　$(\lambda x[\lambda P[\lambda p[\lambda q[p \wedge q]](P(x)))(P(zwicky'))]](felix')))(smart')$ ……(i)



To see if the translation of the NP-coordinated (23a) has (23c) [=(28a)], which is allegedly the translation of (23b), the sentential variant of (23a), we iteratively apply λ-conversion to (i) of (27) [=(28b)].

(28) a. $smart'(felix') \wedge smart'(zwicky')$

b. $(\lambda x[\lambda P[\lambda p[\lambda q[p \wedge q]](P(x)))(P(zwicky'))]](felix')))(smart')$

c. $\Rightarrow \lambda x[\lambda P[(\lambda q[P(x) \wedge q])(P(zwicky'))]](felix'))](smart')$

d. $\Rightarrow \lambda x[\lambda P[[P(x) \wedge P(zwicky')]](felix')](smart')$

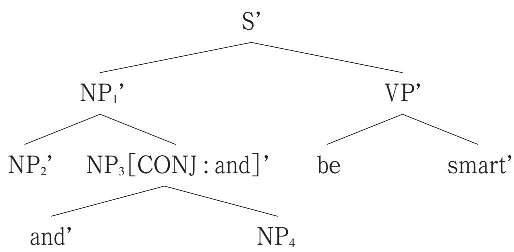
e. $\Rightarrow \lambda P[P(felix') \wedge P(zwicky')](smart')$

f. $\Rightarrow smart'(felix') \wedge smart'(zwicky')$

We obtain the result as desired.

What remains to be answered is what semantic type is of coordinated NP subject, or NP_1'.

(29)



Since "be" is interpreted as an identity function, the VP' amounts to smart' as such, or a one-place predicate whose semantic type is of ⟨e, t⟩. Notice that the denotation of NP_3' is:

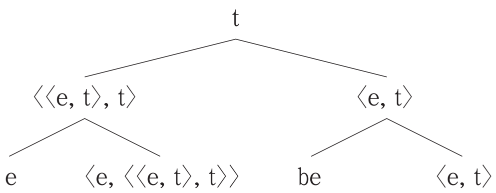
(30) a. $\lambda x[\lambda P[\lambda p[\lambda q[p \wedge q]](P(x)))(P(zwicky'))]]$

(30a) indicates a function from entities to function from characteristic function to truth value, which means that it is of type ⟨e, ⟨⟨e, t⟩, t⟩⟩. If this is the case and NP_2' is of type *e*, then NP_1' or (30b)

(30) b. $\lambda x[\lambda P[(\lambda q[P(x) \wedge q])(P(zwicky'))]](felix')$

is of ⟨⟨e, t⟩, t⟩; then VP'(NP_1'), or S', ends up with the truth value *t*, which is supposed to be assigned to a proposition, or S' in the present case. As it turns out, the rough approximation of analysis tree for (23a) in terms of semantic types is represented in (29)[3)]:

(29)



6. Concluding comment

Our discussion has revealed so far that semantic interpretation of given nodes depends upon the type-driven principle. Special attention has to be paid to the semantic type ⟨⟨e, t⟩, t⟩ of conjoined NP's as in (29), which means that it denotes sets of sets, or a characteristic function of the (proper) subset of a given set X, the implication being that the conjoined NP's (perhaps appearing in a subject position) must refer to groups. Most importantly, the semantic type has the same type as a generalized quantifier; or every NP coordination could be analyzed as quantificational NP's, and this result favorably coincides with the discussions by Partee (1986) and Partee and Rooth (1983).

Appendix:

In the present appendix we take a brief look at

(i) what problems we face, and

(ii) what kind of overall strategy of explanation for them could be developed

under the assumption that conjoined NP's at subject positions (plural NP's for that matter) are all interpreted as a group but not understood on an individual-level; or we entertain the idea of treating them all as collectives but not distributives.

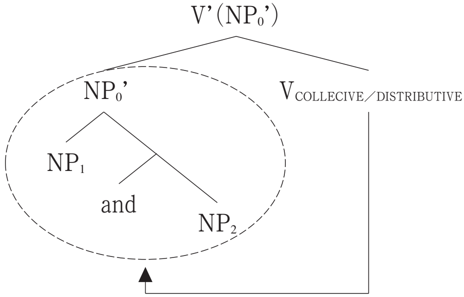
We have seen that conjoined NP's refer to a group. The assumption is that the conjoined subject in (1), "Mary and Susan", is to be treated as a group; and being considered to have a group-reading from scratch, the subjects of plurality in (1) and (2) both have the same type of denotation, not a different type of denotation.

(1) Mary and Susan are pregnant.

(2) John and Mary are a nice couple.

(1) is true if and only if Mary is pregnant and Susan is pregnant. (1) refers to Mary and Susan individually. The predicate "being pregnant" has distributive reading. The predicate "be a nice couple" in (2) refers to John and Mary as a whole, or a group, but not individually. Now notice that our contention is that the conjoined (or plural) subject "Mary and Susan" has a group-denotation even if it co-occurs with predicate of distributive reading, as indicated in (3).

(3)



Our claim is supported by the following sentence.

(4) John and Mary met in the bar and had a beer.

(from Lasersohn (1989))

Both predicates, "meet in the bar" which is understood as having a collective reading, and "have a beer", understood as having a distributive reading, have a single, common conjoined subject. In the sentence, the predicates are supposed to have the same denotation with respect to the subject; otherwise we would have to assign different denotations to the same single subject with conjoined NP's, which is absurd. It is therefore alleged that the subject of (1), "Mary and Susan", has a group-level denotation as well, independently of the reading assigned to the relevant predicate.

The problem is then how we interpret (5a) in which the conjoined subject with group reading co-occurs with "asleep" with purely distributive reading.

(5) a. John and Bill are asleep.

b. John is asleep and Bill is asleep.

We tentatively suggest that the predicate should hold true of the set X as a whole (X= {j', b'}) iff "asleep'(j') and asleep'(b')" is true as shown in (5b); or every application of the relevant distributive predicate to each individual which belongs to the set denoted by the subject is true. A sentence such as

(2) whose predicate has collective reading is true iff the predicate holds true of the group *per se* denoted by the subject; or iff nice-couple'(X') given the set X where X = {j', m'}. This is supported by the anomaly of "John is a nice couple and Mary is a nice couple".

Secondly, it seems to be necessary that collective predicates should be divided into at least two subclasses. Distributive predicates allow the plural subject to be prefixed by "all" and "every".

(6) a. The students are asleep.
    b. Every student is asleep.
    c. All the students are asleep.

Basically, the NP with "all" in (6c) is interpreted collectively, or the students as a group; while a preferred reading of (6b) prefixed by the determiner "every" is distributive (though it could be understood that it implies a collective reading as well)[4]. Now observe the following:

(7) a. The students collided after the lecture.
    b. *Every student collided after the lecture.
    c. All the students collided after the lecture.

In (7a) "the students" is assigned a status as a group for its interpretation according to our assumption, and the collective predicate, "collided", can take the subject as a group so that (7a) is well-formed. "Every" in (7b) is not compatible with the predicate, "collided"; whereas "all" in (7c) with predicate of collective property. "All" is a determiner which assigns an N/NP collective reading, but not distributive reading. Our assumption is that the subject, "the students", in (7c) has a group denotation and it is collectively understood. Now notice that it is in the same fashion as in (7a) that (7c) is assigned the truth value; then it is very unclear what difference in reading between (7a) and (7c) is. It appears that "all" in (7c) might be redundant, and if so, its semantic contribution to the meaning composition turns out to be vacuous *contra* the idea of compositionality. What we have to do here is to make clear what contribution "all" makes to (7c) in terms of interpretation. To put it another way, what role does the quantifier "all" in this case take in the well-formed formula ("what does it quantify over?" is perhaps another way of expressing the point)?

Our prediction is that "all" in (7c) is not merely prefixed over (7a), but, in some way or another, over "subentailments" of the collective predicate, by which we mean each conjunct, or disjunctive for that matter, of the whole entailed paraphrase; so we will not translate (7c) as (8a).

(8) a. $\forall_X[S_X \rightarrow G_X]$ (S: student; G: collide after the lecture)

b. X's collided after the lecture.

c. X's came together after the lecture.

d. X's moved towards each other after the lecture.

Given the set $X = \{a_1, a_2, a_3\}$ for example, then (8d) could be paraphrased as:

(9) a_1 moved towards a_2 and a_3, a_2 moved towards a_1 and a_3, and a_3 moved towards a_1 and a_2.

If this is the case, we can predict that (7c) is true iff all the propositional conjuncts in the form of (9) are true.

If we go along this line of reasoning, we have another task. Observe the following:

(10) a. The students are a big group.

b. *All the students are a big group.

c. All the students collided after the lecture. (=(7c))

Both (10b) and (10c) have a predicate that implies a collective reading:

however, the judgment of them differs. (10b) is not permissible. We could predict that the predicate of (10c) type has an inherent property of implying individuality, but a predicate such as "be a big group" does not. The latter cannot be paraphrased in terms of reciprocal construction, which has the implication of distributivity; and so "be a big group" cannot be compatible with "all", so that (10b) is ruled out, as desired.

Our tentative conclusion from the above observation is that collective predicates may be subdivided into at least two subclasses:

(i) "pure" collectives, which refers to a full-loaded set *per se* denoted by the subject as a single unit ("be a big group", etc.)[5].

(ii) collectives with subetailments such as predicates of group formation (like "collide", "gather", etc.), those of group dissolution (like "disperse", etc.), and those of comparison for that matter (like "be alike", "be similar", etc.).

There remains to be made a more detailed analysis of subclassification if we adopt the approach that conjoined NP's in subject positions could be always understood to be a group-forming unit.

Notes

1) Semantics does not take into account word orders in local trees, but functor-argument relations indeed. The latter will be dealt with in terms of "type-driven" application of a function in what follows.

2) It seems to be reasonable to treat "be" in that way in that it does not appear to make any semantic contribution to the interpretation.

3) Owing to the vacuous contribution to semantic interpretation, as we mentioned above, it may be that "be" is treated as an identity function such that $f(a)=a$.

4) Huddleston and Pullum (2002) provides us with examples in which "every" co-occurs with numerals, showing that "every" has a strong preference of distributive reading.

(i) All the students had handed in only five essays.

(ii) Every student handed in only five essays.

A preferred interpretation of (i) is distributive, with five essays handed in per student, but (i) does not explicitly exclude non-distributive, joint reading, with a total of five essays handed in. They observe that (ii) is understood nothing but distributive, suggesting that "if there were the case, fifty essays were handed in: it can't be that the students as a group handed in only five."

5) It seems somehow appropriate that a set-theoretic notion "cardinality" should be taken advantage of to describe the relevant "pure collectives" here, which is far beyond the scope of the present tentative survey.

References

Barwise, J. and R. Cooper (1980), 'Generalized Quantifiers and Natural Language', *Linguistics and Philosophy* 4, pp. 159-219.

Bennett, P., (1995), *A Course in Generalized Phrase Structure Grammar.* London, UCL Press.

Borsley, R. (1999), *Syntactic Theory (2nd edition).* London, Arnold.

Dougherty, R. C. (1970), 'A Grammar of Coordinate Conjoined Structures, I', *Language* 46. 4. pp. 850-98.

Dougherty, R. C. (1971), 'A Grammar of Coordinate Conjoined Structures, II', *Language* 47. 2. pp. 298-339.

Dowty, D. (1978), *A Guide to Montague's PTQ:* reproduced by Indiana University Linguistic Club, Bloomington, Indiana.

Dowty, D. (1979), *Word Meaning and Montague Grammar.* Dordrecht, Reidel.

Dowty, D., R. Wall and S. Peters (1981), *Introduction to Montague Semantics.* Dordrecht, Reidel.

Gamut, L. T. F., (1991), *Logic, Language, and Meaning.* Chicago, The University of Chicago Press.

Gazdar, G., E. Klein, G. K. Pullum and I. A. Sag (1985) *Generalized Phrase Structure Grammar.* Oxford, Basil Blackwell.

Hoeksema, J. (1983), 'Plurality and Conjunction', in Alice ter Meulen (eds.), *Studies in Model-Theoretic Semantics* (*Groningen-Amsterdam Studies in Semantics, vol. 1*). Foris Publication: Dordrecht, pp. 63-84.

Huddleston, H. and G. Pullum (2002), *The Cambridge Grammar of the English Language.* Cambridge University Press.

Lakoff, G. and S. Peters (1969), 'Phrasal Conjunction and Symmetric Predicates', in D. Reibel and S. Schane (eds.), *Modern Studies in English,* Eaglewood Cliffs, NJ: Prentice-Hall, pp. 113-42.

Lepore, E., (2003), *Meaning and Argument,* Oxford, Basil Blackwell.

Lasersohn, P. (1987), 'On the Readings of Plural Noun Phrases' in *Linguistic Inquiry* 20. 1. pp. 130-34.

Massey, Gerald J., (1976), 'Tom, Dick and Harry, and All the King's Men', *American Philosophical Quarterly* 13, pp. 89-107.

Partee, B. (1986), 'Noun Phrase Interpretation and Type-Shifting Principles,' in J. Groenendjik, D. de Jongh and M. Stokhof (eds.), *Studies in Discourse Representation Theory and the Theory of Generalized Quantifiers,* Foris Publications, pp. 115-43.

Partee, B. and M. Rooth (1983), 'Generalized Conjunction and Type Ambiguity', in Rainer Bauerle, Christoph Schwarze and Armin von Stechow (eds.), *Meaning, Use and the Interpretation of Language,* Walter and Gruyter & Co., pp. 361-93.

Schmerling, S. F. (1975), 'Asymmetric Conjunction and Rules of Conversation', in P. Cole and J. Morgan (eds.), *Syntax and Semantics 3: Speech Acts,* New York, Academic Press, pp. 211-32.

Seki, Setsuya (1959), *Shyuugoo-Ron Nyuumon,* Baifuukan, Tokyo.

van Oirsouw, R. R. (1987), *The Syntax of Coordination.* Croom Helm.