Pluralities. By ROGER SCHWARTZCHILD. (Studies in linguistics and philosophy 61.) Dordrecht: Kluwer, 1996. Pp. xi, 211.

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Part of a burgeoning literature on the syntax and semantics of plural noun phrases and of sentences containing them, this book can profitably be read together with another recently published book in the Studies in linguistics and philosophy series (Lasersohn 1995). The two books complement each other and together provide a comprehensive review of the literature.

Schwartzchild's main goals are to compare two theories of the semantics of plurality, which he calls the SETS theory and the UNION theory, and to argue for the latter. According to both theories, singular NPs (*the cow*) refer to individuals while noncoordinate plural NPs (*the cows*) and coordinate NPs whose members are all singular (*the cow and the pig*) refer to sets of individuals. The theories diverge in their interpretation of coordinate NPs at least one of whose members is plural (*the cow and the pigs*; *the cows and the pig*; *the cows and the pigs*). On the sets theory, such NPs refer to sets of sets; for example *the cows and the pigs* refers to the two-membered set, one of whose members is the set of individual cows and the other is the set of individual pigs. On the union theory, they refer to sets of individuals; in this case to the set made up of the individual cows and pigs.[1]

The book consists of ten chapters, an appendix on 'Quine's innovation' (Quine 1980), which eliminates the distinction between singleton sets and their members and which S assumes holds for natural-language semantics, a list of references, and a very short index. The first three chapters provide an initial formalization and discussion of the two theories, survey the recent literature on plurality, identifying who has argued for each of these theories, and preview the relevant data. Chs. 4–9 constitute the core of the book and contain the main argumentation for the union theory while exploring some related issues, including the analysis of collective nouns (Ch. 9). The final chapter provides a concluding summary.

As S observes, the sets theory is committed to a richer ontology than the union theory, not just to sets of sets, but also to sets of sets of sets, etc. without limit. In several places (see especially 45–53, 155–58), S shows that natural languages do not exploit these riches; there are, for example, no predicates which select arguments which are restricted to particular higher-order sets. Accordingly, there is no need to invest natural-language semantics with the full power of the sets theory. The argument can be strengthened by observing that the syntax of coordination does not provide for the unlimited embedding of coordinate expressions and thus fails to provide even the syntactic means for expressing the full power of the sets theory. For example, a coordinate NP of the form *A and B and C and D*, where *A*, *B*, *C*, and *D* are noncoordinate NPs, may be understood as having no internal structure or as having two binary coordinates as members ([*A and B*] *and* [*C and D*]) but not as having a more deeply embedded structure (e.g. *A and* [*B and* [*C and D*]]) (Langendoen 1998).

Much of the book is taken up with the analysis of examples which have been used to support the sets theory, for example the following from pp. 34–35. Suppose that every woman is either an author or an athlete and that all authors and athletes are women, that the men outnumber the authors and also outnumber the athletes, but that the women outnumber the men. Now consider the sentences 1–3.

(1) the men outnumber the authors and the men outnumber the athletes
(2) the men outnumber the authors and the athletes
(3) the men outnumber the women

In the situation just described, 1 is true, 2 is either true or false depending on its reading (distributive or collective), and 3 is false. However, if the compound NP *the authors and the athletes*

[1] S points out that other theories of plurality are possible, including those based on event semantics, and that Schein 1993 has argued that 'a semantics based on the notion of a plurality, such as the one used in this book, is incoherent' (197). S also does not consider the possibility of plural quantification (197–98).

refers to the set of women, as it must under the union theory, then 2 and 3 should have exactly the same truth value. Therefore, the sets theorist concludes, *the authors and the athletes* must refer to something distinct from the set of women, namely to the set of sets consisting of the authors and the athletes.

S's solution is to deny that from the coreference of *the authors and the athletes* and *the women* one can conclude that the two phrases make the same contribution to the truth values of the sentences containing them. He develops an analysis of the semantics of plural NPs which handles not only cases like these but also cases involving reciprocal predicates, which have up to now constituted the strongest evidence for the sets theory. His analysis of reciprocity in Ch. 6 permits the interpretation of reciprocal sentences to vary depending on contextual factors, much like the STRONGEST MEANING account of Dalrymple et al. 1994.[2]

One of S's central concerns is the relation between DISTRIBUTIVE and CUMULATIVE interpretations of sentences containing plural NPs. Both are interpretations which support inferential relations with other sentences with corresponding NPs of smaller cardinality. For example, if from a sentence of the form 4a we can conclude both 4b and 4c, or their conjunction, we say that 4a has a distributive interpretation.

(4) a. NP_1 and NP_2 VP
b. NP_1 VP
c. NP_2 VP

Similarly, if from 4b and 4c together, or their conjunction, we can conclude 4a, we say that 4a has a cumulative interpretation. That is, distributivity and cumulativity are converses. The notions were first discussed together by Goodman 1951 in connection with the calculus of individuals and were defined as specific properties of predicates.[3] For example, the predicate *is/are red* is both distributive and cumulative since 5a, an instance of 4a, holds if and only if both 5b and 5c, instances of 4b and 4c, hold.

(5) a. the backpack and the suitcase are red
b. the backpack is red
c. the suitcase is red

However, the predicate *is/are light* (in weight) is distributive but not cumulative and the predicate *is/are heavy* is cumulative but not distributive, since 6a implies both 6b and 6c but not conversely, and 7b and 7c together imply 7a but not conversely.

(6) a. the backpack and the suitcase are light
b. the backpack is light
c. the suitcase is light

(7) a. the backpack and the suitcase are heavy
b. the backpack is heavy
c. the suitcase is heavy

However, both the sentence *the backpack and the suitcase are light* and the sentence *the backpack and the suitcase are heavy* may also be understood both cumulatively and distributively just like the sentence *the backpack and the suitcase are red.*

S follows recent work in obtaining the distributive interpretation of sentences in which the predicate is not inherently distributive by means of a D-OPERATOR (§5.2.2), paraphrasable as *each*, which he further generalizes so as to render the distributive-collective ambiguity a matter of pragmatics rather than of semantics (§§5.2.4 and 5.3; see in particular p. 75). He also follows current tradition by assuming that 'cumulativity is independent of the predicates involved' (60). As he immediately notes, this incorrectly predicts that 8b and 8c together imply 8a (as well as incorrectly predicting that 6b and 6c together imply 6a).

[2] However, S takes issue with certain aspects of the strongest meaning account (130–31).

[3] Goodman used the terms 'dissective' and 'collective' rather than 'distributive' and 'cumulative'.

(8) a. the boys and the girls look alike
b. the boys look alike
c. the girls look alike

One solution would be to obtain the cumulative interpretation by application of the (generalized) D-operator, which combines with predicates which are not inherently cumulative (such as *is/are light* and *look alike*), to yield a cumulative interpretation. In the case of the predicate *look alike*, which appears to be neither cumulative nor distributive, addition of the D-operator renders it simultaneously cumulative and distributive. That is, 8a has either the noncumulative and nondistributive interpretation 9a or the cumulative and distributive interpretation 9b.

(9) a. the boys look like the girls and the girls look like the boys
b. the boys look alike and the girls look alike

An adequate analysis of the cumulative and distributive properties of sentences with reciprocal predicates such as *look alike* requires, however, a further distinction, between what may be called INCREMENTAL and NONINCREMENTAL cumulativity and distributivity[4] The relation between 8a on the one hand and 8b and 8c on the other is nonincremental since plurals and not singulars are put together (cumulated) or taken apart (distributed). However, the relation between 10a on the one hand and 10b, 10c and 10d on the other is incremental since singulars and not plurals are put together or taken apart. (I have modified S's examples on p. 14 by replacing the name *Brutus* with *Bluto*.)

(10) a. Popeye and Bluto and Wimpy were shipmates
b. Popeye and Wimpy were shipmates
c. Popeye and Bluto were shipmates
d. Bluto and Wimpy were shipmates

The reciprocal predicates *were shipmates* and *look alike* are incrementally both cumulative and distributive but are nonincrementally either both cumulative and distributive or neither cumulative nor distributive. Indeed all reciprocal predicates are nonincrementally either both cumulative and distributive or neither cumulative nor distributive. On the other hand, reciprocal predicates may be incrementally both cumulative and distributive (*were shipmates*, *look alike*, *are similar to each other*), distributive but not cumulative (*are similar*), or cumulative but not distributive (*sat next to each other*). Thus the real significance of Leonard and Goodman's (1940) observation concerning the nonequivalence of sentences like *they are similar* and *they are similar to each other*, which S discusses (105, n. 30), is not just that both *are similar* and *are similar to each other* are reciprocal predicates but that the former is incrementally distributive but noncumulative, whereas the latter is incrementally both distributive and cumulative. Reciprocal predicates formed with *each other* are invariably incrementally cumulative, though they may not be incrementally distributive (e.g. *sat next to each other*). Reciprocal predicates lacking an overt anaphor may or may not be incrementally cumulative (*are shipmates* and *look alike* are incrementally cumulative whereas *are similar* and *agree* are not), and they may or may not be incrementally distributive (*look alike* and *are similar* are incrementally distributive whereas *are in equilibrium* and *are five kilometers apart* are not), but they must be one or the other.

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[4] The distinction is not needed for sentences with nonreciprocal predicates, which are incrementally cumulative or dissective if and only if they are respectively nonincrementally cumulative or dissective.

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