Chapter 10
Conclusion

10.1 What was Discussed

Imagine a pair of florists discussing an arrangement of roses and violets. In the course of the conversation, they might have occasion to use any of the following three noun phrases: the flowers, the roses and the violets, and the arrangement. What is the relation between the referents of these noun phrases? Does the language treat them as referring to objects with the same part-whole structure? Are they coreferent? These kinds of questions have been the focus of the preceding pages. In trying to answer them, we appealed for the most part to four linguistic phenomena. The first was semantic selection, in particular the sortal restrictions imposed by predicates on their noun phrase arguments. The second was distributivity, whereby a speaker names a plurality and attributes a property to parts of that plurality. The third phenomenon was reciprocity whereby a speaker names a plurality and claims that a relation holds between parts of that plurality. The fourth phenomenon had to do with quantification. In natural language, quantification involves a quantifier and a domain over which that quantifier quantifies. We studied cases in which a noun phrase is used to name the domain of quantification. An important theme running through much of the discussion was the difference between an answer to one of the above questions that lies in the realm of pragmatics versus one that is semantic. An example of the former might involve the claim that the part-whole structure enters in as the result of a negotiation between speakers in a conversation, formally represented as a free variable in a semantic representation. An example of the latter would take the part-whole structure to be inherent in the entity referred to.

Most of the discussion involved the phenomena just mentioned and the argument usually took the form of a particular linguistic context that would yield different results when combined in turn with two different but
potentially coreferent noun phrases of the kinds used by our florist friends above. There is one final piece of evidence that doesn’t fit into the above characterization and that wasn’t mentioned so far. This has to do with rules governing understood coreference between noun phrases. It has been observed that a non-pronominal noun phrase generally cannot be coreferent with another noun phrase that c-commands it. The following example illustrates this rule (where coindexation is meant to indicate understood coreference):

(473) a. John; thought that he; would be allowed in the museum.
    b. *John; thought that John; would be allowed in the museum.

We can use this rule to test the noun phrase pairs relevant to us. Imagine a situation in which there is a group of male and female tourists. The men approach the guide and tell him that the auditorium isn’t big enough to hold the whole group. Next, the women approach the guide and they tell him that the auditorium is big enough. These exchanges might be reported with the following:

(474) The men and the women disagreed about whether they would all fit in the auditorium.

It would be strange to say instead:

(475) The men and the women disagreed about whether the tourists would all fit in the auditorium.

The difference between (474) and (475) is explained as follows. The pronoun they in (474) is anaphoric to the phrase the men and the women. As such it refers to the set containing all the men and all the women, which, in the situation described, is just the set of all tourists. In (475), the pronoun is replaced by a coreferring non-pronominal making it strange for the same reason that (473b) above was. This explanation crucially relies on the assumption that the noun phrases the tourists and the men and the women corefer.

10.2 What was Decided

In the Preface, we began by thinking about concepts of set-theory and their relevance to the semantics of natural language. As a means of reviewing the conclusions of this work, I find it again useful to return to the concept of a set of sets. For concreteness, let’s consider the set of sets
Conclusion

A defined below:

\[ A = \{\{a, b\}, \{c, d\}\} \]

The introduction of a set of sets entails the following three notions which played a role in our study:

i. Partition/Structure. A set of sets organizes the urelements. In the set \( A \), the elements \( a, b, c, d \) are divided up in a certain way. We ‘think’ of them in unequal terms: \( a \) goes with \( b \) in a way that it doesn’t go with \( c \).

ii. Iteration. A set of sets entails the notion of embedded membership. It has members that themselves have members. Its parts have parts.

iii. Creation. A set of sets is something different from the urelements it is made up of. In ‘forming’ the set \( A \), we create a set that has two members and hence is not the same as the individual urelements or even the set containing the four of them.

Beginning in chapter 1, two grammars were introduced which allowed us to transpose the concepts of set theory, a mathematical theory, into questions about natural language semantics. Important aspects of the proposals made in this book can be summarized in terms of correlates of the ideas listed in i.–iii. as follows:

i. Partition/Structure. Anytime a plurality is talked about, it is talked about under a given partition of the plurality into parts (chapter 5). This is done on a per conversation basis and it can affect the truth of an utterance, because, to take the set \( A \) above, what is true of \( \{a, b\} \) and of \( \{c, d\} \) may not be true of \( a \), of \( b \), of \( c \) or of \( d \).

ii. Iteration. Pluralities have singularities as members, they never have pluralities as members. This means that the domain of reference for noun phrases has no correlate of a set of sets.

iii. Creation. Since pluralities consist exclusively of singularities, there is no such thing as two different pluralities composed of the same singularities. A plurality with several urelements never has two members (chapter 7). This means that we don’t create new
entities via pluralization, although that doesn’t prevent us from creating new entities altogether. Collectivization creates new entities but they are new singularities. The arrangement that our florists spoke about above is one such example. It is a singularity (chapter 9) and hence differs from the roses and the violets. There is nothing in standard set theory (with one membership relation) that corresponds to collectivization.

10.3 What was Not Discussed

This book addresses a basic ontological question in the semantics of plurals. Much of the work in plural semantics that was not touched on, such as research into the relations between plurals and aspect or between plurals and mass terms, can be seen as extending the kind of system set up here. In most cases, a writer will presuppose an answer to the questions raised here about the domain of plural reference. While the full range of topics in plural semantics is beyond the scope of the present work, there are two areas of research that should be mentioned concerning issues which when properly addressed might affect the conclusions drawn here. The first is event semantics and the second is quantificational expressions.

10.3.1 Events

An analysis of the adverb together provides a simple case of the use of events in the semantics of plurals. Recall, in chapter 1, we classified together as a "plurality seeker" since it cannot occur without a plural antecedent of some sort:

(476) *John walked together.

It has often been claimed that the function of this adverb is to indicate a non-distributive reading (by "non-distributive" I mean there is no distribution to singularities). A simple version of this idea would claim that the sentence in (477a) below has a distributive and a non-distributive reading and the addition of together in (477b) disambiguates towards the non-distributive reading. (477a) entails (477c) on its distributive reading but it doesn’t on its non-distributive reading and (477b) doesn’t either. On this view, together behaves like the counterpart of floated each.

(477) a. John and Mary own houses.
    b. John and Mary own houses together.
    c. John owns houses.
Conclusion

The problem with this story is that while together adds something to the meaning of (478a) below, (478b) is not ambiguous in the way that (477a) was. It entails (478c) on any reading.

(478) a. John and Mary walked together.
    b. John and Mary walked.
    c. John walked.

To see where events might come in, notice that intuitively (478b) could be true of a situation which one might describe as a single event in which John and Mary walked and that it could also be true if there is an event in which John walked and a separate event in which Mary walked. One could envisage capturing these two descriptions in terms of distributivity with respect to a predicate of the form:

\[ \lambda x \exists e (\text{event}(e) \land (x \text{ walked in } e)) \]

The separate events description would involve distributivity down to singularities while the single event description would the non-distributive reading. Under this view, we can again describe the use of together in (478a) as disambiguating towards a non-distributive reading.

Krifka (1989), Moltmann (1992), Lasersohn (1995) and Landman (to appear) are examples of some of the recent work on the semantics of plurals using events. Schein (1993) argues that a semantics based on the notion of a plurality, such as the one used in this book, is incoherent and his alternative proposal makes essential use of a Davidsonian event semantics.

10.3.2 Plural Quantification

With the exception of the discussion in section 2.3, we have confined our interest to examples with non-quantificational noun phrases. In the discussion of reciprocals (chapter 6), we considered example (479a) below, but no example like (479b) where the subject is quantificational:

(479) a. The books in the chart below complement each other.
    b. Several books in the chart below complement each other.

This latter type of example raises a number of issues. To begin with, one needs to determine what the domain of quantification for the quantifier in the subject is. In the work reviewed in section 2.3, quantifiers quantify over singularities, however a number of researchers have allowed for quantification over pluralities or "plural quantification". Another issue is
the scopal interactions between a plural quantificational NP and other quantifiers. This would include other quantificational NPs as well as the implicit quantifier over elements of a cover that played a role in our analysis of (479a). Recently, van der Does (1992,1993) has argued against an analysis of distributivity in terms of covers, claiming that it allows for seemingly unavailable readings for sentences with plural quantificational noun phrases. In fact, van der Does assumes existential quantification over covers as opposed to the context dependent analysis argued for in section 5.2.3. For this reason, he appears to test intuitions for the 'unavailable' readings in the absence of a context where the relevant cover would be salient. This is not to say that a pragmatic covers analysis is straightforwardly combined with a semantics that handles quantificational NPs. Such a combination might for example requires us to abandon the assumption that the value for the cover variable is set once and for all as opposed to being dependant on the quantifier in whose scope it lies.

DRT would be an obvious setting in which to study this last mentioned issue and in their introduction to DRT, Kamp and Reyle (1993) have a chapter on the plural. In addition to other work specifically on plurals and plural quantification, there is much that is relevant to this topic in the burgeoning generalized quantifier literature.

But what exactly is a "smocceen ind"? Well, that for now. The basis of extensionality of Quine is that case x:

. =. x

singlet{

{x}]

those cases here:
Appendix
Quine's Innovation

In Quine's *Set Theory and Its Logic*, in the vicinity of pages 30-32, he introduces sets as objects that can be quantified over. He assumes, for "smoothness," that variables range over sets as well as over individuals (read "singular individual"). He then introduces the axiom of extensionality:

$$(x)(x \in y .\equiv. x \in z) \rightarrow y = z$$

But what, he wonders, should one say about the sentence "$x \in z$" when "$z$" is an individual. Let's say it is false. This will have the consequence that for any two distinct individuals, $y$ and $z$, the antecedent of the axiom of extension will be true, and it will unfortunately follow that $y = z$. So Quine assumes instead that when $z$ is an individual, $x \in z$ is true just in case $x = z$. With this assumption, for distinct individuals $y$, $z$, $(x)(x \in y .\equiv. x \in z)$ is false and so it no longer follows that $y = z$.

However, now if we apply the axiom of extension to $x$ and the singleton set containing $x$, we find they are equivalent. In fact, $x = \{x\} = \{\{x\}\}$ ... This leads to a definition of individual not as "nonclass" but as those things that are identical with their unit class. I let Quine take over here:

Everything comes to count as a class; still, individuals remain marked off from other classes in being their own sole members.

For I am by no means blurring the distinction between $y$ and its unit class where $y$ is not an individual. If $y$ is a class of several members or of none, certainly $y$ must be distinguished from its unit class, which has one member. If $y$ is the unit class of a class of several members or of none, still $y$ must be distinguished from its unit class since the one member of $y$ is, by the preceding sentence, different from the one member of the unit class of $y$. In general thus the distinction between classes and their unit classes is vital,
and I continue to respect it. But the distinction between individuals and their unit classes serves no discoverable purpose, and the awkwardnesses that attended the law of extensionality can be resolved by abolishing just that distinction.

The adoption of this innovation leads to some welcome departures from what is normally assumed in working with sets. I illustrate some of these below.

Let $D$ be the set whose members are $a, b, c$:

$$D = \{a, b, c\}.$$

$\mathcal{P}(D)$, the power set of $D$, is as follows:

$$\mathcal{P}(D) = \{\emptyset, \{a\}, \{b\}, \{c\}, \{a, b\}, \{a, c\}, \{b, c\}, \{a, b, c\}\}$$

but now contrary to what is normally assumed:

$$\mathcal{P}(D) = \{\emptyset, a, b, c, \{a, b\}, \{a, c\}, \{b, c\}, \{a, b, c\}\}$$

this means that not only is it true that:

$$D \in \mathcal{P}(D)$$

it is also true that:

$$D \subseteq \mathcal{P}(D).$$

and that:

$$\mathcal{P}(D) - D = \{\emptyset, \{a\}, \{a, c\}, \{b, c\}, \{a, b, c\}\}$$

With some degree of obfuscation we could write:

$$D = \{a, b, c\} = \{\{a\}, \{b\}, \{c\}\}$$

And the following statements about $\mathcal{P}(D)$, the power set of $D$ are true:

$$\mathcal{P}(D) = \{\emptyset, \{a\}, \{b\}, \{c\}, \{a, b\}, \{a, c\}, \{b, c\}, \{a, b, c\}\}$$
\[ \mathcal{P}(\mathcal{D}) = \{ \emptyset, \{a\}, \{b\}, \{c\}, \{a,b\}, \{a,c\}, \{b,c\}, \{a,b,c\} \} \]

The following (non-standard) equivalences hold:

\[ \{a, \{a\}, \{a,b\}\} = \{a, \{a,b\}\} = \{a, \{\{a\}, \{b\}\}\} \]

We can now speak sensibly of the intersection and union of an individual and another set. The following are true when \(a,b,c\) are distinct individuals:

\[ a \cap b = \emptyset \quad a \cup b = \{a,b\} \quad a \cap \{a,c\} = \{a\} = a \]

The power set of an individual is the set that contains the individual and the empty set:

\[ \mathcal{P}(a) = \{ a, \emptyset \} \]

If we employ the phrase "the greatest element of \(X\)" to refer to that element of \(X\) such that all elements of \(X\) are subsets of it, then for:

\[ Y = \{a,b, \{a,b\}\}, \text{ the greatest element of } Y \text{ is } \{a,b\}. \]

\[ Z = \{a\}, \text{ the greatest element of } Z \text{ is } a = \{a\} = Z. \]

Notice that while \(D = \{a,b,c\}\) has no greatest element, as would be the case on more familiar versions of set theory, individuals do have greatest elements on the version we are assuming. The greatest element of the individual \(b\) is \(b\) itself.

Finally, if \(D = \{a,b,c\}\) then the closure under union of \(D\) is just:

\[ \{a,b,c, \{a,b\}, \{a,c\}, \{b,c\}, \{a,b,c\}\} \text{ or the power set of } D \text{ minus the empty set.} \]
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