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Groups: A Semantic and Metaphysical Examination

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Groups: A Semantic and Metaphysical Examination

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A class…, in one sense at least, is distinct from the whole composed of its terms, for the latter is only and essentially one, while the former, where it has many terms, is… the very kind of object of which many is to be asserted.

-Bertrand Russell[1]

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[1] (1903, 69)

[2] For instance, see Armstrong's (1993) development of *a posteriori* realism for a challenge to the third part of the standard picture. One might challenge the second part of the standard picture by arguing that if the agent both

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Groups: A Semantic and Metaphysical Examination

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Since the linguistic turn, many have taken semantics to guide metaphysics. By examining semantic theories proposed by philosophers and linguists, I argue that the semantics of a true theory in a natural language can serve as only a partial guide to metaphysics. Semantics will not always lead to determinate answers to questions of the form 'Does theory T carry an ontological commitment to Fs?' Further, semantics will never deliver answers to questions regarding the nature of Fs.

If semantics is to be our guide, we must look to our best semantic theories to determine whether a theory carries ontological commitments to Fs. I develop criteria to determine when a semantic treatment is semantically adequate and should be counted amongst our best theories. Given these criteria, there can be more than one empirically adequate semantic treatment of a natural language theory. To determine ontological commitments I appeal to Quine's Criterion, which states that a theory has Fs in its ontology just in case it says or entails that there are Fs. To determine what a theory says and entails, we must appeal to semantic treatments. Since different equally adequate semantic treatments can yield different contents and entailments, Quine's Criterion delivers ontological commitments only relative to a semantic treatment.

I then argue for a supervaluationist principle that delivers unrelativized, but possibly indeterminate, ontological commitments of a theory. Next, I apply my methodology to two case studies which exemplify two kinds of answers the supervalutationist principle might deliver concerning ontological commitments. I argue through an examination of data and formal treatments that plural expressions carry indeterminate ontological commitments to summed entities, while collective nouns carry determinate ontological commitments to group-like entities.

Finally, I undertake an examination of what groups, things like teams, committees and courts, might be that accords with the minimal verdict delivered by the semantics of collective noun—that they exist—but which goes beyond this to examine their nature. I assess and reject the views of groups currently on offer and propose and defend a novel view of groups as realizations of structures.

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Chapter 1:

The Ontological Commitments of Natural Language are Indeterminate

Since the linguistic turn, many have taken semantics to guide metaphysics. According to the standard picture semantics guides metaphysics in three ways. First, the semantics of natural language determines the ontological commitments carried by natural language theories. Second, an agent incurs ontological commitments by accepting theories that carry ontological commitments. So, in a mediated way semantics determines an agent's ontological commitments. Finally, questions of what entities exist are settled by the semantics of the true total theory of the world. One might challenge the connection between the commitments carried by a theory and the commitments of an agent or between the commitments of a theory and ontology in general,[2] but I will not do so here. Instead, I challenge the first and seemingly strongest step in the standard picture. I argue that looking to our best semantic treatments of natural language will not always deliver determinate answers to questions of the form 'Does theory T carry a commitment to Fs?' Since whether semantics determines the ontological commitments of agents or the true ontology of the world depends on semantics determining the ontological commitments of theories, I argue that semantics can, at best, serve as only a partial guide to answering questions of ontology.[3] I argue for this conclusion by presenting a challenge based on a multiplicity of candidate semantic treatments.

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[2] For instance, see Armstrong's (1993) development of *a posteriori* realism for a challenge to the third part of the standard picture. One might challenge the second part of the standard picture by arguing that if the agent both holds the belief that there are no Fs and accepts a theory that, unbeknownst to her, carries a commitment to Fs the agent fails to incur a commitment to Fs.

[3] One might think, following Schaffer (2009), that many interesting metaphysical questions (e.g., questions of what grounds what) cannot be answered by semantics. Here I argue for the stronger and more surprising conclusion that semantics fails even as a guide to the ontological commitments of theories, and so, as a guide to ontology.

Arguments based on multiplicities are familiar. Benacerraf argued against identifying numbers with sets through an appeal to multiple candidates.[4] Quine appealed to multiplicity in arguing for the indeterminacy of translation.[5] Lewis understood vagueness in terms of linguistic indecision between multiple precise referents or properties.[6] Multiplicities have been used in three sorts of arguments—*reductio ad absurdums*, arguments for relativization and arguments for indeterminism.[7] Here, through appeal to a multiplicity of semantic treatments, I argue that the ontological commitments of natural language are indeterminate.

I begin in Section 1.1 by examining classical views of the regimentation of natural language. I focus on the view that the regimentation of natural language involves the discovery of the underlying logical forms of natural language sentences. Particularly I focus on Davidson's version of this view. I also set forth the second part of Davidson's methodology—Quine's Criterion of Ontological Commitment. In Section 1.2 I argue against the view that logical forms are hidden beneath the surface of natural language. I also argue against the view that translation into first-order logic is required to determine the ontological commitments of a theory in a natural language. Next, in Section 1.3 I develop a new methodology to determine whether a theory carries an ontological commitment to Fs. I argue that we should look to our best semantic treatments to determine what a natural language theory says and entails.[8] I develop criteria for the semantic adequacy of a treatment. Given these criteria, there might be more than one semantically adequate treatment of some theory, T. Since two semantically adequate treatments of T might offer different semantic contents and entailments, applications of Quine's Criterion will deliver ontological commitments only relative to a treatment. That is, ontological commitments are delivered

[4] Benacerraf (1965)

[5] Quine (1960) and (1968)

[6] Lewis (1982)

[7] Peter Unger (1980) and Benacerraf (1965) use multiplicities in *reductio* arguments. Unger argues from multiple candidates to the view that there are no objects like clouds, saltshakers or hands. Benacerraf argues that numbers cannot be identified with sets through an appeal to multiple candidates for each number. Moral relativism relies on the multiplicity of distinct cultures and traditions to argue that morality is relative. Quine (1968) uses a multiplicity of languages of translation to argue for indeterminism.

[8] Since semantic theorizing is to deliver what a theory says and entails, the theories semantic treatments take as input cannot be closed under entailment. For, part of the work of semantic theorizing is to determine what entailments hold. So, the natural language theories that are treated are unclosed sets of sentences.

only for a natural language theory as treated by Treatment A and the theory as treated by Treatment B and so on. I argue that holding that all ontological commitments are only relative to a treatment fails to accord with standard appeals to relativization. So, we should seek unrelativized commitments. In Section 1.4 I argue for a principle that delivers the unrelativized, but possibly, although not necessarily, indeterminate, ontological commitments of a theory. Then in Section 1.5, I argue for a way to avoid higher-order indeterminacy. Finally in Section 1.6 I examine the nature of the posited indeterminacy. I argue that whether the ontological indeterminacy is epistemic or metaphysical, semantics is at best an imperfect guide to answering ontological questions.

1.1 CLASSICAL VIEWS OF THE REGIMENTATION OF NATURAL LANGUAGE

There are two classical views on the regimentation of natural language—the revisionary view and the descriptive view.[9] On the revisionary approach natural language is taken to be corrupt, messy and defective. As Jason Stanley puts it according to a proponent of the revisionary view "appeals to logical form are appeals to a kind of linguistic representation which is intended to replace natural language for the purposes of scientific or mathematical investigation."[10] Since natural language is effectively being thrown out in favor of a formal language, appeals might be made to different formal languages for different purposes. Proponents of the revisionary view of logical form include Frege, Russell, Tarski and Quine.

Here we are concerned with whether semantics can serve as an adequate guide to determining the ontological commitments carried by natural language theories. We are interested in formalizing natural language to make its semantics and, thereby, its ontological commitments perspicuous. The revisionary view of logical form goes against this aim.

[9] Stanley (2000)
[10] Stanley (2000, 391)

Throwing out natural language in favor of a formal language will not do. From here, I set aside the revisionary approach to logical form.

The second classical view of the regimentation of natural language is the descriptive view of logical form. On this view the unique logical form of a sentence is taken to be really there "hidden beneath" its surface form.[11] Proponents of the descriptive view take logical forms to be discovered through empirical enterprise. Davidson, Stanley and Gilbert Harman are defenders of the descriptive view of logical form. Since Davidson is the *locus classicus* of the view I focus on his formulation of it. Since here we are concerned only with gaining an understanding of the descriptive view of logical form and its relation to ontological commitment, I will not focus on the details of Davidson's views on, for example, truth theory and radical interpretation.

Davidson departed from the revisionary view of logical form in taking formal regimented languages to be part of a theory of natural language, rather than "an improvement on natural language."[12] He argues that since we know how to give a theory of truth for formal language, such a language can be used as a tool for giving a theory of truth for natural language. He states, if in addition to knowing how to give a theory of truth for formal languages

> we also knew how to transform the sentences of natural language systematically into sentences of the formal language, we would have a theory of truth for the natural language. From this point of view, standard formal languages are intermediate devises to assist us in treating natural languages as more complex formal languages.[13]

Formal theories are intermediate in that natural language is 'transformed' into them so that the truth theory for the formal theory can be applied to the transformed natural language sentences. The transformations from, say, a sentence of English to a sentence of a first-order logic is justified because logical forms are allegedly hidden beneath grammatical forms. Given this, an English sentence is transformed into a sentence of a formal language in the

[11] On this view only ambiguous sentences have more than one underlying logical form.
[12] From 'The Method of Truth in Metaphysics' in Davidson (2001, 203)
[13] ibid.

way the frog in the Brothers Grimm's *The Frog Prince* is transformed. In the story, the frog returns to his true form as a prince after a spell that turned him into a frog is broken. He is transformed from frog to prince, but he was a prince all along. Similarly, on the descriptive view, sentences of natural language are transformed into sentences of a formal language, but the logical forms were there all along.

Davidson takes first-order logic to be the formal language that underlies natural language. Like Quine he holds this because its logic is simple and well understood. Further, he takes it to be an empirical fact that a first-order language captures the logical forms that underlie natural language. Davidson states, "for large stretches of language... variables, quantifiers, and singular terms must be construed as referential."[14] However, "as long as the underlying logic is assumed to be first-order" there is no need to take predicates to be referential.[15] For example, if the underlying logic of sentences like 'Lonely George is a turtle' and 'some dog is brown' is first-order, they fail to require that there is an entity that is the class of turtles or the universal brownness. In contrast, the singular term 'Lonely George' and the quantifier phrase 'some dog' are referential so they are treated as a constant and as a quantifier with a bound variable and a restrictive clause, respectively. In holding that "ontology is forced into the open only where the theory finds quantificational structure," [16] Davidson adopts what is often called Quine's Criterion of Ontological Commitment.[17] It can be formulated as:

> Quine's Criterion of Ontological Commitment: A theory has Fs in its ontology if, and only if, it includes or entails a sentence that says that there are Fs.[18]

One way to understand when a theory formulated in first-order logic says or entails that there are Fs is to check whether Fs are the values of bound variables in sentences in or

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[14] (2001, 209)
[15] ibid.
[16] (2001, 210)
[17] Quine's Criterion has spurred an enormous literature. For examples of authors sympathetic with the Criterion, see van Inwagen (1998), Burgess and Rosen (1997) and Burgess (2008). For examples of some critics of Quine's Criterion see footnote 18 below.
[18] "When I inquire into the ontological commitments of a given doctrine or body of theory, I am merely asking what, according to that theory, there is." Quine (1976, 203-4).

entailed by the theory.[19] However, since some semantic treatments might appeal to non-quantificational referential devices one should utilize the version of Quine's Criterion formulated given above as it allows an attribution of commitments to a theory with or without bound variables.[20]

Davidson applied the methodology of translating sentences of natural language into first-order logic and using Quine's Criterion to discover ontological commitments to action sentences.[21] He argues that sentence 1 entails 2.

1. Bert walked quickly.
2. Bert walked.

To account for the inference from 1 to 2, Davidson argues that the logical forms underlying action sentences include quantification over events. He takes the logical forms underlying 1 and 2 to be:

3. ∃e(walk(e, b) & quick(e))
4. ∃e(walk(e, b))

Here the possible values for 'e' are restricted to events. Since 3 straightforwardly entails 4 by conjunction elimination, the inference from 3 to 4 is valid. Further, since 3 and 4 are taken to be the real logical forms underlying 1 and 2 the inference from 1 to 2 is explained. The ontological commitments of 3 and 4 and thereby of 1 and 2 are determined by applying Quine's Criterion. Since 3 and 4 entail 'there is an event', both carry a commitment to events. Given that 3 and 4 are the logical forms of 1 and 2, they too carry a commitment to events. This will suffice for an explication of Davidson's view of logical form and his

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[19] For example, Quine says "We can very easily involve ourselves in ontological commitments by saying, for example,
that there is something (bound variable) which red houses and sunsets have in common; or that there is something which is a prime number larger than a million. But this is, essentially, the only way we can involve ourselves in ontological commitments: by our use of bound variables" (1948, 12).

[20] Many have argued against the view that uses of quantifiers bring ontological commitment. See for example Sellars (1960), Prior (1971), van Cleve (1994) and Rayo and Yablo (2001). By formulating Quine's Criterion without using quantifiers, this issue can be (at least briefly) sidestepped. A thoroughgoing discussion of interpretations of quantifiers and bound variables is beyond the scope of this paper.

[21] See Davidson (1967)

methodology for determining the ontological commitments of natural language theories. In the next section I challenge the descriptivist view of logical form.

1.2 AGAINST THE DAVIDSONIAN DESCRIPTIVIST

In this section I offer two sorts of against the descriptivist view of logical form. First I argue against the view that a first-order language underlies natural language. Given these arguments, one should reject Davidsonian descriptivism. Next, I argue that natural language sentences do not have unique underlying logical forms. Since descriptivism is the thesis that natural language sentences do have unique underlying logical forms, it should be rejected.

There are fragments of natural language for which a first-order translation does not deliver the best way to understand what a theory in that fragment says and entails. For example, take the fragment of English that includes plural expressions. Linguists and philosophers who work on the semantics of plurals do not use first-order logic. Instead they appeal to lattice-theoretic structures, set-theoretic structures or plural quantifiers. None of these are included in first-order logic. Tensed and modal language provide additional examples of expression types in natural language that are often not treated using ordinary first-order logic. If we are to take the current practices of linguists, logicians and philosophers seriously we should not *require* that the first step to deducing the ontological commitments of plural-involving theories to be regimentation into first-order logic.

In addition to general worries about respecting the way linguistics and logicians really do formalize plurals, there is an, at least prima facie, more decisive reason to think that some sentences cannot be regimented in first-order. Some sentences are not first-orderizable. For example, consider the Geach-Kaplan sentence:

5. Some critics admire only one another.

Kaplan proved that this sentence is not first-orderizable.[22] That is, he proved that the sentence cannot be formalized using only first-order quantifiers that range over individuals.

[22] A sketch of the proof is given in Boolos (1984, 432-433). The proof is attributed to Kaplan, but no citation is given.

So, if we want to determine what a theory containing the Geach-Kaplan sentence is ontologically committed to, following Davidson's method of translating sentences into ordinary first-order logic will not do. So, one might conclude, first-order logical forms do not underlie all natural language sentences. Instead, one must allow that at least some of the logical forms of sentences are in languages other than first-order logic.

A proponent of Davidsonian descriptivism can argue that sentences like the Geach-Kaplan sentence and the practices in the semantics of plurals, modals and tense fail to show that the underlying logical forms of natural language are not first-order. Instead, such a proponent can claim that they show that the domain of quantification over which first-order quantifiers range must be extended to include lattices, sums, sets, worlds or times. While such entities are not *usually* found in first-order domains, this does not mean that they *cannot* be included.

In some cases the Davidsonian descriptivist response is convincing. For example, to treat theories with tense, one might include all times in the domain of first-order models. Since times can be included in first-order models with no change to the logic such an addition is certainly innocent. Alternatively, one might add past, present and future temporal operators or operators for since and until. While adding new operators changes the logic, one might take such an extension to be a proper extension of first-order logic, rather than a replacement of the logic with a new system.

Other cases are more controversial. For example, some semantic treatments of plurals appeal to plural quantifiers. Adding plural quantifiers to first-order logic is a more significant change to the logic than merely adding additional objects to the domain or sentential operators. Other treatments of plurals rely on adding a membership predicate, a join operator and a structured domain of sums. Again, these changes are more substantial. One might question whether first-order logic with these additions is really still first-order logic. Whether such systems are really first-order and, thus, available to the Davidsonian descriptivist is beyond the scope of this paper. There are, however, general problems with the descriptivism thesis that generalize to the Davidsonian descriptivist. I turn to these next. First I argue that there can be distinct logical forms in a single formal language that are

equally good candidates to be the logical form of a natural language sentence. Then, I argue that there are cases in which multiple formal languages might be used to translate a sentence of natural language.

Let's begin by assuming, along with Davidson, that natural language sentences are to be translated into first-order logic. We saw that one way to translate 1 into first-order logic was as 3. However, following Quine,[23] we might eschew using a constant to represent Bert and instead use the predicate 'Bertize.' Then 1 would be represented as

6. ∃e∃y(walking(e, y) & Bertize(y) & quick(e))

Both 3 and 6 are sentences of first-order logic. While one might prefer 3 or 6 depending on one's philosophical views on proper names, both seem to be candidates for the most perspicuous logical form of 'Bert walked quickly.'[24] A defendant of the descriptive view of logical form must give an argument as to why 3, 6 or some other candidate form is *the* most perspicuous logical form of 1. Further, someone like Davidson cannot argue that, say, 3 is *the* logical form of 1 because it captures its semantics correctly, as he aimed to use logical forms to illuminate semantics. Appealing to the semantics of 1 to determine the semantics of 1 is circular. Even in a single language, there are multiple candidate translations of natural language sentences. The descriptivist must give an argument as to why one is the most thorough and perspicuous. Next I return to the case of plurals in natural language to exemplify the possibility of there being multiple formal languages that are equally good candidates for the language of translation.

Semantic treatments of plural expressions have gone in two general directions. Some argue that plural expressions should be treated as sum-, set- or fusion-denoting. Such treatments are sometimes called Singularist treatments,[25] for they treat plural expressions as denoting a single entity which is itself a collection of some things. Others have argued that

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[23] Quine (1948)

[24] I say that both are candidates for the most perspicuous logical form as everyone, including Davidsonian descriptivists, will accept that *a* logical form of 'Bert walked quickly' is *p*. However, if there are multiple candidates for the most perspicuous logical form, a descriptivist must have an argument for why one is *the* most perspicuous logical form.

[25] See for example Link (1983), (1987) & (1991), Schwarzschild (1996), Landman (1989)

plural expressions should be treated as expressions that refer to many individuals. Rather than referring to a set of those individuals, such Pluralist theorists[26] argue that plural expressions plurally pick out many individuals. Take the following sentence:

7. The firefighters surrounded the property and prevented the fire from spreading.

According to a Singularist treatment 'the firefighters' picks out a sum or set while according to a Pluralist treatment it picks out many individuals. So, the logical forms assigned by the Singularist and the Pluralist are different. Further, the logical forms attribute different ontological commitments to 7. If it can be shown that the Singularist and the Pluralist treatments of plural-involving natural language theories are equally adequate, we will have strong reason to hold that the semantics of some sentences might be captured equally well in multiple formal languages. The descriptivist must give an argument as to why one of the apparently equally adequate languages is the language which delivers the underlying logical forms of natural language sentences. In the next section, I argue that Singularist and Pluralist treatments of plural-involving natural language theories are equally adequate. So, we should reject the view that there is a unique formal language that underlies natural language.

1.3 ADEQUACY AND ONTOLOGICAL REVELATION

We began our investigation with the thought that if the semantics of natural language theories is to guide one in the discovery of a theory's ontological commitments, semantics itself must be taken seriously. What does it mean to 'take semantics seriously'? By analogy, suppose that one planned to take physics seriously. It would be natural for one to look to the best theories in physics. Similarly, I argue that if one is to take semantics seriously, one should look to our best semantic treatments.

In the last section I argued, contra descriptivists, that many sentences have multiple equally thorough and perspicuous formalizations within a language and across languages.

[26] See for example Boolos (1984), Oliver and Smiley (2001) & (2005), Yi (2005), McKay (2006)

However, if only one of these is semantically adequate, a true multiplicity of candidates will not exist. In this section I argue that multiple semantic treatments of a natural language theory can be equally semantically adequate. Like Davidson and other proponents of the descriptive view of logical form, I take determining the semantics and, if semantics is to be our guide, the ontological commitments of a natural language theory to require regimentation into a more precise and ontologically illuminating language. After briefly arguing for the view that there might be equally adequate semantic treatments of a theory, I turn to how semantics might guide us in answering questions of ontological commitment. I, like Davidson, appeal to Quine's Criterion to determine the ontological commitments of a theory albeit only relative to a regimenting language. At the end of this section we will be left with a way for semantics to guide us in determining the ontological commitments of a natural language theory relative to a semantic treatment.

Before going further I explicate some terminology and concepts. Semantic data is data in a natural language. Semantic data include (but are not limited to) patterns of use, truth-value judgments, natural language inference judgments[27] and felicity judgments regarding sentences, bits of discourse with anaphoric links and instances of predication.[28] When examining a theory to determine what it says and entails, the theory is composed of

[27] By 'natural language inference judgments' I mean inference judgments that do not rely on knowledge of semantic treatments. These inferences will be like those Davidson pointed to in his (1967) in which a sentence with adverbial modifiers is judged to entail a sentence with fewer adverbial modifiers. Judgments that 'There is an event' can be inferred from 'John buttered the toast' incorporate semantic theorizing, and so are not to be counted as *natural language* inference judgments.

[28] What counts as semantic data depends on where one draws the line between semantics and pragmatics. The line has been drawn in many ways. For example, Carnap explained the distinction thusly "If in an investigation explicit reference is made to the speaker, or, to put it in more general terms, to the user of a language, then we assign it to the field of pragmatics. … If we abstract from the user of the language and analyze only the expressions and their designata, we are in the field of semantics" (1942, p. 9). Stalnaker claimed "semantics studies propositions" while "pragmatics is the study of linguistic acts and the contexts in which they are performed" (1970, p. 383). As a final example, Kent Bach states that "Semantic information is information encoded in what is uttered — these are stable linguistic features of the sentence — together with any extralinguistic information that provides (semantic) values to context-sensitive expressions in what is uttered. Pragmatic information is (extralinguistic) information that arises from an actual act of utterance, and is relevant to the hearer's determination of what the speaker is communicating. Whereas semantic information is encoded in what is uttered, pragmatic information is generated by, or at least made relevant by, the act of uttering it" (2001, p. 154). Here I remain neutral on exactly where to draw the distinction, so I include a fairly broad range of data. One could, however, adopt the methodology argued for here in conjunction with a more (or less) restrictive data set.

the some sentences. The theory (or parts of it) are then assessed to determine data to be captured. For example, we might discover that native English speakers agree that 'John ate an apple' is false in a scenario in which John ate only cereal. This datum will need to be captured by a semantic treatment of a theory that includes 'John ate an apple.' Semantic phenomena are stable and replicable effects or processes that are potential objects of explanation and prediction for scientific theories.[29] For example, we might discover that native English speakers agree that whenever sentences of the form 'S ate a/an F' are true, sentences of the form 'S ate something' are true. This more general entailment pattern is a phenomenon to be captured by a treatment of any theory with sentences of the form 'S ate a/an F.' I argue that semantic theorizing should be carried out in three steps. First, sentences and corpuses should be examined to deliver data. Then, data should be examined to determine what phenomena exist. Finally, semantic treatments should be developed to capture and, ideally, explain the phenomena. To make the discussion of semantic adequacy more concrete, I will use plural expressions as a case study. In this chapter the discussion is sketched. In Chapters 2 and 3 I examine plural-involving data, phenomena and treatments in greater detail.

1.3.1 A Plural-Involving Case Study

Through an examination of plural-involving sentences and the judgments regarding truth values and natural language inferences, we discover that plurals can be predicated in two ways—distributively and collectively. Take the following examples:

8. The astronauts are tall.
9. The astronauts met in 1960.

The predication in 8 is most naturally distributive, that in 9 is most naturally taken to be collective. A distributive predicate applies to a plural expression just in case it applies to each of the things that make up the denotation of the plural expression. In 8, if tallness truly

[29] The distinction between data and phenomena used here was introduced by Bogen and Woodward (1988). Ludlow (2011) also adopts the distinction between data and phenomena.

applies to 'the astronauts' it truly applies to each individual astronaut. Collective predicates apply to plural expressions without applying to the individuals making up the referent of the plural expression. The truth of 9 does not require that each astronaut met in 1960. Distributive and collective predication are two semantic phenomena that any adequate treatment of plurals must handle.

Singularist and Pluralist treatments of plurals can capture distributive and plural predication. Here I sketch how a Singularist lattice-theoretic treatment and a Pluralist plural quantificational treatment capture the semantics of conjunctive plural constructions (e.g., 'Obama, Biden, Romney and Ryan') predicated distributively and collectively.[30] I examine the plural-involving data and the treatments in greater detail in Chapters 2 and 3. Even the sketch I give here will require some technical detail. Readers who would prefer to skip the technical details may wish to proceed directly to the development of conditions on the semantic adequacy of a treatment in Section 1.3.2.

Lattice-theoretic treatments of plurals employ domains of objects structured by the sum operator and individual-part relation. The sum formation operation '+'[31] takes two individuals and yields an "individual sum or plural object."[32] The sum formation operation can take singular individuals (i.e., atoms) or plural individuals (i.e., sums). So, if there are three atomic individuals, Sam, Bob and Mary, the domain closed under sum formation will include seven objects.[33] The individual part (or i-part) relation, symbolized as '$\leq$', satisfies the following biconditional:

$$a \leq b \text{ iff } a + b = b.$$

So, Sam is an i-part of Sam+Bob+Mary if, and only if, Sam+Sam+Bob+Mary is identical to Sam+Bob+Mary. Godehard Link, the founder of the lattice-theoretic treatment of plurals,

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[30] The treatments of plurals used here are static, rather than dynamic. Since here I am concerned with sets of sentences, static treatments can be utilized without many problems. However, to capture more natural discourses with connections between sentences, one could imbed either treatment into a dynamic system. See Kamp and Reyle (1993) for a dynamic semantic approach which includes a Singularist treatment of plurals. See Berger (2002) for a dynamic semantic approach which includes a Pluralist treatment of plurals.

[31] Link (1983) uses a circle-plus (a plus in a circle) to denote this relation.

[32] Link (1983, 307)

[33] In addition to Sam, Bob and Mary, the domain includes Sam+Bob, Sam+Mary, Bob+Mary and Sam+Bob+Mary.

follows set-theoretic practice in assuming that the addition of an element that is already included in an object does not yield a new object. So, the biconditional holds; Sam is an i-part of Sam+Bob+Mary.

In the Singularist language predicates are differentiated according to whether they take both atoms and non-atomic sums or only non-atomic sums. The first accords with distributive predication, the second with collective predication. Take the following examples:

10. Sam, Bob and Mary are tall.
11. Sam, Bob and Mary gathered in the hall.[34]

In 10 the conjunctive plural subject is predicated distributively. In 11 it is predicated collectively. The lattice-theoretic treatment of plurals marks distributive predicates with '*' and collective predicates with '**'. 'Sam, Bob and Mary' is taken to denote a non-atomic sum represented as 's+b+m'. So 10 and 11 are formalized as:

12. *T(s+b+m)
13. **G(s+b+m)

Since *T applies to atomic and non-atomic individuals, it applies to Sam and to Bob and to Mary as well as to the sums they compose. So, the entailment from 10 to 'Sam is tall' holds. **G fails to apply to any atomic individuals, so the truth of 11 fails to entail that Sam gathered in the hall. The lattice-theoretic treatment of plurals is able to capture the predication phenomena associated with plural expressions. Next, I turn to how a Pluralist treatment captures distributive and collective predication of expressions like 'Sam, Bob and Mary.'

A Pluralist plural quantificational treatment adds a plural existential and a plural universal quantifier to first-order logic. These can be symbolized as $\exists xx$ and $\forall xx$, respectively. The first is read as 'some things are such that,' the second as 'all things are such that.' They quantify over the same objects as ordinary singular first-order quantifiers. So,

[34] For simplicity, I ignore tense here.

they are plural not because they take new plural objects within their scopes, but instead because they can take multiple individuals as arguments. The Pluralist also add the 'among'-relation to the lexicon. It allows one to say that some thing or things are among some things. For example, 'the *xx*s are among the *yy*s' is formalized as '*xx*A*yy*'. If an *x* is among the *yy*s one writes '*x*A*yy*'.

Collective predication[35] is represented by a monadic predicate whose single argument place "can be satisfied by several individuals together."[36] The Pluralist Thomas McKay adopts the following as a representation of 11:

14. $G[s, b, m]$

Distributive predication can be captured using the 'among'-relation and a quantifier. So that 10 is captured as:

15. $[\forall x\colon xA[s, b, m]]Tx$

This is read as 'for any x, if x is among Sam, Bob and Mary, x is tall.' The collective predication in 14 fails to entail that 'Bob gathered in the hall' for 14 only requires that the individuals together (but not as a single entity!) satisfy the predicate. In contrast, the truth of 15 requires that each of Sam, Bob and Mary is tall.

Here I have shown how a Singularist and a Pluralist treatment of plural expressions can capture distributive and collective predication of conjunctive plural expression. In Chapter 2 I systematize plural-involving data to determine other phenomena that any good treatment of plurals must capture. In Chapter 2 I also examine how Singularist and Pluralist treatments handle a variety of constructions including definite plural constructions (e.g., 'the students'), indefinite plural constructions (e.g., 'some students'), conjunctions (e.g., 'Sam, Bob and Mary'), plural constructions with cardinals (e.g., 'four students') and universally quantified plural constructions (e.g., 'all the students'). I argue that how the Singularist and Pluralist treatments are equally adept at handling these constructions. Next, I move back to a level of greater generality to argue for a view of the semantic adequacy of a treatment. I then

[35] McKay (2006) calls this "non-distributive" predication.
[36] (2006, p. 57)

apply the view to the Singularist and Pluralist treatments to argue that they are offer a concrete case of multiple equally semantically adequate treatments.

1.3.2 Back to Adequacy and Ontological Revelation

Suppose we are examining a natural language theory. We have investigated what patterns exist in the data so as to discover the phenomena it includes. Next, we begin building semantic treatments to determine what the theory says and entails. Perhaps we come up with multiple semantic treatments. We want to determine which of these is semantically adequate. So that we can, we hope, discover what the theory says and entails and, thereby, carries as ontological commitments. To be semantically adequate I argue that a treatment must:

(i) Capture the phenomena in the data,
(ii) Satisfy (i) while respecting patterns in the data,
(iii) Be extendable to a larger set of data,
(iv) Be motivated by the semantic data and phenomena, not ontological or metaphysical views,
(v) Capture (i)-(iv) at least as well as any other candidate semantic treatment.

Each of these requires further comment. To meet (i) a semantic treatment must be able to account for, for example, the varieties of predication, anaphora and agreement behavior that the given semantic data manifests. The second criterion requires that an adequate semantic treatment meet (i) while respecting patterns in the data. This requires treating similar expressions, sentences and other data in similar ways. For example, to meet (ii) a semantic treatment should not posit a separate mechanism for anaphora between 'the boys' and 'they' and 'the girls' and 'they' in 16 and 17:

16. The boys are tall. They are also smart.
17. The girls are tall. They are also smart.

16 and 17 are extremely similar. A treatment that posited a different mechanism to account for the connection between the definite expression and the plural pronoun in 16 and in 17 would be treating similar things differently and, thereby, would posit something theoretically

gratuitous. Such a theory would fail to respect patterns in the data. Given criterion (ii) such a treatment fails to be semantically adequate.

The third criterion for semantic adequacy requires that the treatment be extendable. Since there are currently no semantic treatments that give the semantics for an entire natural language here I take the required extendibility to be limited. An adequate treatment must be able to treat new expressions of the same basic kinds and novel sentences. For example, if a semantic treatment aims to deliver the semantics of plural expressions it must be able to handle the semantics of arbitrary sentences with arbitrary plural expressions. A treatment which can capture the semantics of 'the boys' but which cannot capture the semantics of 'the astronauts' is not semantically adequate. Here I am taking the lexicon and the associated meaning postulates for each entry in the lexicon to be available to any semantic theory. So, for a treatment to be extended to handle 'the astronauts' new material will not need to be added to it, instead it will appeal to further meaning postulates which it already has available to it. Further, to meet (iii) a treatment must be able to treat arbitrary grammatical strings. We are interested in semantic treatments for natural language. Natural languages allow, at least in principle, for a denumerable infinity of sentences. So, adequate semantic treatments for natural language must be able to treat a denumerable infinity of sentences.

Next, an adequate semantic treatment must be motivated by semantic data and phenomena, not ontological or metaphysical views. For example, suppose one holds that one's ontology should be as parsimonious as possible. One might, given these views, argue for a semantic treatment of

18. There is a table.

that fails to appeal to tables, instead appealing to parts arranged table-wise. I argue that such a treatment is semantically inadequate unless it is motivated by the semantic data and phenomena. The study of language should be treated like one treats studies in other science. Data and phenomena are not "paraphrased away" in physics or chemistry unless they are discovered to be the result of experimental errors or can be adequately explained in a way that is motivated by other physical or chemical phenomena. Likewise, without semantic motivations, I contend that semantic data and phenomena should not be paraphrased away.

Criterion (iv) can be further motivated by recalling the general aim of this project. Here we are concerned with the extent to which semantics can guide us in answering ontological and, perhaps, more general metaphysical questions. If one takes one's ontological or metaphysical views as conditions on the adequacy of a semantic treatment, semantics is no longer our guide. Given the general project, (iv) is required for the semantic adequacy of a treatment.

Finally, a semantic treatment is adequate only if no other semantic treatment better handles criteria (i)-(iv). If some treatment, A, captures (i)-(iv) reasonably well, but another treatment, B, is posited which exceeds A's capabilities, B is semantically adequate and A is not. Since the condition only applies if a treatment is better able to capture (i)-(iv) there might be more than one semantically adequate treatment for a natural language theory. In such situations the equally adequate treatments must capture (i)-(iv) equally well. While these remarks on data, phenomena and adequacy have been brief, they will serve for our purposes here.

The sketch of how a Singularist and a Pluralist treatment handle distributive and collective predication of conjunctive noun phrases, like 'Sam, Bob and Mary' is a start to showing that the two treatments are equally semantically adequate. In Chapter 2 I carry out a more extensive examination of the two treatments looking at a variety of cases and sketching how one might argue that the two are variants with different intended interpretations and models. I then argue that the two are equally semantically adequate. In order to continue to exemplify the methodology being developed, here I suppose that it is correct that the Singularist and Pluralist treatments are equally semantically adequate.

Suppose that we have a theory made up of English sentences some of which contain plural expressions. Further, all of the phenomena associated with plural-expressions are instanced in the theory. For example, there is a sentence in which a plural expression is predicated distributively and one in which a plural expression is predicated collectively. Every other phenomenon is also instanced by some sentence or sentences in the theory. Call this theory T. To determine what T says and entails we look to the semantically adequate treatments of T. These treatments involve regimenting T in the language of the semantic treatment. For example, the semantically adequate Singularist treatment involves a

regimentation of T into the Singularist's language. Call the Singularist language L^{Sing}. Similarly, T is regimented in the language of the Pluralist, L^{Plur}, by the Pluralist treatment. T, a theory originally formulated in English, is now regimented into two different formal languages. T as regimented in the two languages might say or entail different things, for it is T as regimented in L^{Sing} by the Singularist treatment and T as regimented in L^{Plur} by the Pluralist for which contents and entailments are delivered.

I argue that to determine the ontological commitments of the theory Quine's Criterion of Ontological Commitment should be applied to the theory regimented in L^{Sing} and to it as regimented in L^{Plur}. So, for example, according to the Singularist T carries a commitment to sums just in case T as regimented in the according to the Singularist treatment (which involves regimentation in the Singularist language) says or entails that there are sums.

Before going further a discussion of the distinction between what a formal treatment uses and what a formal treatment to treat a theory and what it attributes as commitments to a theory it treats is needed. A model-theoretic treatment R of a theory T might use infinite sequences, sets and assignment functions. If T is the theory made up of only the following sentences:

'There is a cat'

'There is a hat'

it certainly seems that T does not carry a commitment to infinite sequences, sets or assignment functions. A model-theoretic treatment of T might nevertheless use infinite sequences, sets or assignment functions without thereby attributing them as commitments to the theory it treats. Fraser MacBride makes a similar point. He states,

> there is a distinction to be drawn between the tools one employs to investigate a given subject matter and the nature of the subject matter itself. One cannot immediately conclude from the fact that one has to employ tools of such and such a sort that the subject matter itself concerns items of that sort.[37]

[37] (2003, 137)

I argue that a theory carries commitments to Fs just in case according to Quine's Criterion it carries commitments to Fs. On my understanding of the Criterion, a theory says or entails that there are Fs relative to a semantic treatment R just in case Fs are the values of referring expressions or bound variables in the logical forms that R assigns to sentences of T or the logical forms of sentences R assigns as entailments of sentences of T.[38] Recall that I took the object language theories under investigation to be sets of sentences that were not closed under an entailment relation. For, if such theories came closed under entailment, many ontological questions would be answered before semantic theorizing began. I argued that to determine the contents and entailments of the object language theory we need to look to the semantically adequate treatments of the theory. These treatments will deliver both the contents of the sentences of the theory and the sentences entailed by the theory as regimented by a treatment. So, T as treated by R is a closed interpreted theory.

On this understanding of Quine's Criterion even if, for example, infinite sequences are appealed to in the semantic treatment, they may not be attributed as commitments to T.[39] For, infinite sequences are carried as ontological commitments of T as regimented by some treatment R only if they are the values of referring expressions or the values of bound variables of T regimented by R.

Recall that Singularists treat plural expressions as requiring summed entities. The Singularist treatment assigns sums as the denotations of referring expressions. Sums are also the values of bound variables of plural-involving theories as treated by the Singularist. So, according to Quine's Criterion it has sums in its ontology.

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[38] Two comments should be made here. First, there might be more than one way for an expression to refer. For example, Pluralists allow for expressions to refer singularly and plurally. Expressions that refer singularly and expressions that refer plurally are referential. In the first case a single entity is the value of the expression, so *it* is something the theory is committed to, according to the regimenting treatment. In the second case, many entities might be referred to by an expression. In such cases *they* are things to which the theory as regimented by the treatment is committed. Second, what counts as a referring expression might vary according to a treatment. This might lead to further indeterminacy. Or, we might settle on an agreed upon definition of referring expressions or perhaps on an agreed upon class of referring expressions. For instance, referring expressions might be only proper names, demonstratives and deictically used pronouns.

[39] Of course, if a treatment makes use of sets, infinite sequences and assignment functions the treatment itself may be committed to sets, infinite sequences and assignment functions. However, the ontological commitments of a treatment do not "trickle down" to the theories that it treats. Instead, the ontological commitments carried by a theory according to a treatment are determined by Quine's Criterion.

Pluralist approaches appeal to plural quantifiers or plural reference relations to treat plural expressions. On this approach many things can be the value of a variable or the referents of a referring expression. It is *those* things that are the commitments of the treatment.[40] The Pluralist treatment does not treat plurals as denoting or quantifying over sums or sets. So, even if the pluralist uses sets or sums, given Quine's Criterion, the theory as regimented in L^{Plur} fails to carry sums or sets as ontological commitments.

We have gotten to the point of saying that relative to some adequate semantic treatment R T's commitments include Fs. Or that relative to semantically adequate treatment R' T fails to carry a commitment to Fs. So, applying Quine's Criterion delivers the ontological commitments of T only relative to a treatment. However, we began our investigation with the aim of determining *the* ontological commitments of a natural language theory. We have yet to meet this aim.[41]

When we began, I gave the three ways multiplicities have been used in arguments. They have been used in *reductio ad absurdums*. They have been used to arguing for relativization. And, they have been used to argue for indeterminacy. At this point, one might argue that our inquiry is finished. We have seen that there can be multiplicities of equally semantically adequate treatments of natural language theories. Further we have seen that such treatments can attribute differing ontological commitments. So, one might argue, natural language theories have ontological commitments only relative to a semantic treatment. However, concluding from the multiplicity of treatments that the best semantics can do is deliver relative commitments would be too hasty. Many natural language theories will have a multiplicity of semantic treatments which all attribute the same ontological commitments. Holding that in such cases the theory carries only relativized ontological

[40] For example see McKay (2006), Oliver and Smiley (2001) and Yi (2005) for arguments that commitments to some things fails to be a commitment to a summed thing. For an argument against this view see Linnebo (2003).

[41] This argument may strike some readers as similar to the argument that model-theoretic semantics does not answer our question 'what are the truth conditions of sentence S?' given that such theories deliver truth only relative to a model and assignment function. To address this worry model-theoretic semanticists often appeal to an intended model. Since both the treatments in which the theory has been formulated are semantically adequate, an appeal to an intended treatment will not help. Both treatments are intended treatments, although plausibly treatments intended by different individuals.

commitments is unnatural. Doing so does not accord with the way we appeal to relativization. To see why, consider an analogous case.

Suppose that we know that relative to context, C, 'Barack Obama' picks out Barack Obama. We then discover that relative to C' 'Barack Obama' picks out Obama. Eventually we learn that relative to every context 'Barack Obama' picks out Obama. Does 'Barack Obama' refer to Obama in a context-relative way? It is quite natural to think that it does not. Since its reference does not vary with context, it seems that its reference *just is* Barack Obama.[42] Similarly, if every adequate semantic treatment of some natural language theory attributes to it an ontological commitment to Fs, it seems that the theory does not merely carry a commitment to Fs relative to treatment 1 and relative to treatment 2 and so on. Instead, the theory *just does* carry a commitment to Fs. The theory's commitment to Fs is not relative.

Since we discovered that in every context 'Barack Obama' picks out Barack Obama we have also discovered that 'Barack Obama' never refers to LeBron James. If it is only relative to a context that 'Obama' fails to refer to James then the question "Does 'Obama' refer to James?" must be answered as "Relative to context 1, 'Obama' does not refer to James" or "Relative to any context, 'Obama' does not refer to James." However, in this case it seems the correct answer is simply "No, it does not." Similarly, suppose that we discover that none of the adequate semantic treatments of a natural language theory attributes to it a commitment to infinite sequences. Is the theory committed to infinite sequences? The correct answer is "No." However, if one holds that semantics can only deliver relative answers to questions of ontological commitment one can only say that "relative to treatment 1 theory T does not carry a commitment to Fs" and so on for every other adequate treatment. We take it that some expressions have a fixed and non-relative content or reference. These are determined by the semantics of such expressions. Similarly, the semantics of a theory can determine the unrelativized ontological commitments it carries. In the next section, I argue for a supervaluationist method that delivers unrelativized, albeit sometimes indeterminate, ontological commitments.

[42] It is natural to think, as Kripke (1980) argued, that 'Obama' and other names are rigid.

1.4 UNRELATIVIZED ONTOLOGICAL COMMITMENTS

We are seeking to determine whether the semantics of a natural language theory can deliver answers to questions of the form 'Does theory T carry a commitment to Fs?' After discovering that there are multiple equally semantically adequate treatments of a theory, we discovered that applications of Quine's Criterion deliver commitments to T only relative to a regimenting language. I argued that there are reasons to think that semantics can deliver unrelativized semantic contents, references and answers to questions of ontological commitments. Here I develop and argue for a principle to deliver unrelativized, albeit sometimes indeterminate, commitments.

I have argued that there are sometimes equally semantically adequate treatments of a natural language theory. Since such treatments are on a par, privileging some over others would be semantically unmotivated. I hold that the following criterion for determining a theory's unrelativized ontological commitments should be upheld:

> *Equal Adequacy*→*Equal Voice:* Equally semantically adequate treatments should have equal voice in determining the ontological commitments carried by a natural language theory.

Given this criterion two prima facie natural principles for delivering unrelativized ontological commitments are ruled out. First, one cannot hold that it is only the most ontologically parsimonious treatment that delivers the ontological commitments of a natural language theory. In taking only the most parsimonious treatment to deliver ontological commitments one silences the other equally adequate semantic treatments. One might argue that ontological parsimony should have been included as a condition for semantic adequacy. If this was correct, the equally adequate semantic treatments will be required to be equally ontologically parsimonious, so appealing to ontological parsimony will not silence the voice of any adequate semantic treatment.

Recall that we began our inquiry by looking for the best (and possibly unique) semantics for natural language. If this response were correct, the semantics for natural

language relies in part on natural language, but also on a condition of parsimony that is over and above the criterion of theoretical parsimony I took to be a condition on semantic adequacy. I took as a requirement for the semantic adequacy of a treatment that it capture the phenomena in the data without positing gratuitous primitives or mechanisms. In addition, do we have reason to think natural language is *ontologically* parsimonious? Language is varied; there are multiple ways to express similar (and perhaps even identical) thoughts. Natural language does not seem particularly parsimonious. Positing that the semantics of natural language carries the most stringent ontological commitments possible does not seem to be motivated by the subject matter we're investigating. For these reasons I did not include ontological parsimony as a necessary condition for semantic adequacy. So, in holding that it is the most ontologically parsimonious treatment that determines the ontological commitments of a treatment, one violates the *Equal Adequacy*→ *Equal Voice* criterion. Further, appealing to ontological parsimony will not always deliver a unique semantic treatment. So, it cannot deliver unrelativized answers to questions of ontological commitment.

Some adequate semantic treatments might attribute different, but equally parsimonious ontologies to a natural language theory. For example, to handle tense some treatment might appeal to events and not times, while another appeals to times and not events. If both treatments are equally adequate and equally parsimonious the methodology under consideration does not deliver an answer to whether the theory carries commitments to times or to events. So, the view that a natural language theory's unrelativized commitments are to only the things attributed to it by the most ontologically parsimonious treatment fails to deliver a unique treatment in some cases. So, it cannot be used as a way to globally determine unrelativized commitments.

Second, one might argue that a natural principle for determining ontological commitments is that a theory carries a commitment to Fs just in case every semantically adequate treatment attributes a commitment to Fs to it. Such a principle would capture our intuitions regarding proper names that I used as an analogy to argue for unrelativized commitments. However, the principle violates the *Equal Adequacy*→ *Equal Voice* criterion.

Given this principle, if any treatments disagree in whether a theory carries a commitment to Fs, the theory does not carry a commitment to Fs. Every treatment that attributes a commitment to Fs is silenced, while all those that fail to attribute a commitment to Fs are privileged even though all of these treatments are equally semantically adequate. A non-semantic fact is being used to determine ontological commitment. Given that we are seeking to determine the extent to which *semantics* can guide ontology, this principle should be rejected. Further, this principle fails to give a satisfactory treatment of cases like that of the tensed theory mentioned above.

In the case of the tensed theory we imagined that it has some equally adequate semantic treatments that attribute to it a commitment to times and not events and others that attributes to it a commitment to events and not times. Suppose that these are its only semantically adequate treatments. So, it cannot be adequately treated without times *and* without events. However, on the view under consideration, the theory is committed to neither times nor events! If the only ways the theory can be adequately treated require times or events, it cannot be correct that the theory carries commitments to neither times nor events. Appeals to either the principle that it is only the most ontologically parsimonious treatment that attributes unrelativized commitments or that it is only when all treatments agree that an unrelativized commitments are delivered are unsuccessful. Next, I suggest a principle that takes the *Equal Adequacy*→*Equal Voice* criterion seriously and delivers unrelativized commitments in every case.

I argue that to move from a theory's commitments relative to a treatment to its unrelativized commitments a supervaluationist principle I call the *Principle of Carrying Commitments* should be followed. It is formulated thusly:

> *Principle of Carrying Commitments (PCC):* A theory, T, (a) determinately carries a commitment to Fs iff all of the adequate semantic treatments attribute an ontological commitment to Fs to T; (b) determinately does not carry a commitment to Fs iff all of the adequate semantic treatments fail to attribute an ontological commitment to Fs to T; (c) neither determinately carries nor determinately does not carry a commitment to Fs iff some adequate semantic treatments

> of T attribute a commitment to Fs to T and some fail to attribute a commitment to Fs to T.

For theories with a privileged treatment only clause (a) and (b) of the PCC are available. If the treatment attributes a commitment to Fs to the theory, it carries a commitment to Fs. If it does not, the theory does not carry a commitment to Fs. Cases like these will deliver ontological commitments based solely on an application of Quine's Criterion.

In many cases in which there is not a unique best semantic theory, the equally adequate semantic theories will deliver the same ontological commitments. So, for example, one adequate semantic treatment might posit an ambiguity in a verb to capture the distinction between a plural expression being predicated distributively or collectively.[43] Some other adequate treatment might capture the difference by positing a distinction between subject expressions.[44] If both treatments take plural-involving natural language data to require summed entities[45] in addition to singular entities and nothing else, then both treatments attribute the same ontological commitments to plural-involving theories. If theories that utilize summed entities in their treatments of a theory involving plural expressions were the only adequate treatments, then we would be in a position handled by clause (a) of the PCC. All the adequate semantic treatments would attribute a commitment to Fs (here, summed entities) to a plural-involving semantic theory, T, so T would determinately carry a commitment to Fs. However, I have sketched and argue more extensively in Chapter 2 that there are adequate Singularist and Pluralist treatments of plural-involving theories. Since the former attribute a commitment to summed entities, while the latter do not, we see that plural-involving theories fall under clause (c) of the PCC. That is, we are in a position in which some adequate semantic treatments of a plural-involving theory, T, attribute a commitment to Fs to T and some fail to attribute a commitment to Fs to T. In such a position it is not determinate whether T carries a commitment to Fs.

The PCC delivers unrelativized commitments. The unrelativized commitments of some theories are indeterminate. I have argued that plural-involving theories have

[43] For example see Link (1983)
[44] For example see Landman (1989)
[45] For example, a summed entity as the denotation of 'the boys'

indeterminate ontological commitments. While a systematic analysis of data and semantic treatments is needed to determine if other natural language expressions bring indeterminate commitments, there are some likely candidates. Theories with modals are indeterminately committed to possible worlds if some adequate treatments attribute to them a commitment to possible worlds and some fail to attribute to them a commitment to possible worlds.[46] Theories involving tense are indeterminately committed to times and indeterminately committed to events if some adequate treatments appeal to times without events and others appeal to events and not times. To summarize, I have argued that to determine the ontological commitments of a natural language theory, one needs to examine its semantically adequate treatments, apply Quine's Criterion to the theory as regimented according to each of the adequate semantic treatments and then apply the PCC to deliver unrelativized commitments.

1.5 HIGHER-ORDER INDETERMINACY?

I have been calling, for example, Singularist and Pluralist approaches to the semantics of plural expressions 'treatments.' One might wonder why I used 'treatment' rather than 'theory.' In part, I use the former to avoid ambiguity. For, in talking of a theory of a theory some obscurity is apt to result. However, there is a more substantial reason for drawing a distinction between what I have called 'theories' and what I have called 'treatments'. To see why, suppose that natural language theories and semantic treatments are of the same kind. They are, we might suppose, both theories. I argued that to determine the ontological commitments of a theory one must regiment it and then apply the PCC to determine the ontological commitments it carries. Since this is the methodology to determine whether a theory is committed to Fs, it should be applied to theories in general. So, the same methodology should be applied to determine the commitments of semantic

[46] Modals have been treated through quantification over possible worlds since Lewis, C.I. and Langford, C.H. (1932). In part of Forbes (1985), a framework is developed in which modals are treated without quantification over possible worlds through the inclusion of an actuality operator. If both treatments are semantically adequate, according to the PCC, modal-involving theories have indeterminate ontological commitments.

theories. In addition, one might hold that if a semantic theory is indeterminately committed to Fs it cannot attribute to a theory it treats a determinate commitment to Fs.[47] If this is the case, determining the commitments of a semantic theory will be a prerequisite for determining what commitments it attributes to natural language theories it treats. So, we are forced to look to the meta-semantic theories of a semantic theory before we can begin an examination of the semantics of natural language theories. Further, since meta-semantic treatments are themselves theories an appeal to their adequate semantic treatments will be needed before we can begin an examination of the semantics of semantic theories. We have begun ascending an infinite hierarchy of theories. The project of determining the ontological commitments of a natural language theory will never get off the ground as it will require discovering the commitments of its semantic treatments and its semantic treatment's treatments and so on. Let's flesh out this argument using the Singularist approach to the semantics of plurals as a case study.

I said that the Singularist attributes to T a commitment to summed entities. Since we are now considering the Singularist position as a theory for this to be the case the Singularist theory itself must carry a commitment to sums. After all, if it attributes a commitment to sums to T, sum are also referred to or quantified over or used in some other way by the semantic theory. However, the Singularist theory, call it 'ST', carries a commitment to sums just in case every adequate treatment of it attributes a commitment to sums. So, we need to look to ST's adequate semantic treatments to determine what commitments they attribute to the Singularist theory. If there is an adequate treatment of ST, TST, that attributes a commitment to sums to ST and an adequate treatment, TST*, that does not attribute a commitment to sums to ST then it is indeterminate whether ST carries a commitment to sums. If it is only indeterminate whether ST carries a commitment to sums, it seems that it

[47] There are reasons one might not hold this view. For example, one might hold that a theorist can attribute a commitment to, say, unicorns to someone or some theory without thereby herself incurring a commitment to unicorns. However, there is still an issue as to whether the commitments a treatment attributes to a theory it treats are apparent. Instead, one might think, the semantic treatment needs to be interpreted to determine what commitments the treatment ascribes to the theories it treats.

cannot deliver to T a determinate commitment to sums. Further, there is no reason why the indeterminacy should move just to the level of ST.

The treatments of ST, TST and TST*, have indeterminate commitments just in case an adequate treatment is available which attributes to TST (or TST*) a commitment to sums and an adequate treatment is available which fails to attribute to TST (or TST*) a commitment to sums. In this way indeterminacy might percolate up so that, even relative to a treatment, a theory does not have determinate ontological commitments.

To begin to dissipate the worry recall how our inquiry into the ontological commitments of natural language started. We held that to determine what a natural language theory says and entails we need to determine its semantics. To do so, we regimented the theory according to its adequate semantic treatments. Discovering the semantics of theories formulated in formal languages is different. The semantics of well-formed formulae in a formal language are explicitly specified. So, a move to the meta-level is not required to determine what a theory formulated in a formal language says and entails. Once we have gotten to a formal language, we know what the theory says and entails.

To block a hierarchy of theories with indeterminate commitments, I take what I have been calling a 'semantic treatment' to be a pair of a system, which is made up of a lexicon and syntactic and semantic rules, and an intended interpretation.[48] For example, a Singularist treatment is a system of rules that is to be interpreted as treating plural expressions in a way that entails the existence of summed objects. Similarly, a Pluralist treatment is a system that is to be interpreted such that it does not entail the existence of summed objects.

By 'intended interpretation' I, of course, mean something that requires more than just theorist intentions. The treatment must be regimentable in such a way that the required

[48] A similar strategy might be used to argue that scientific theories do not have indeterminate ontological commitments. If one holds the syntactic view (made popular by logical positivists including Hempel and Carnap) one holds that a scientific theory is a set of sentences. If those sentences are in a natural language, indeterminacy looms. However, as Chakravartty states, on the syntactic view a theory is "an axiomatic system closed under deduction, expressible in a formal language whose elements are characterized by a syntactic structure" (2001, p. 325). If such systems are paired with an intended interpretation the strategy I outline above can be used to avoid indeterminacy. If one holds the semantic view of scientific theories, one holds that the theory is a set of models. On this view what a theory is is divorced from how one might express a theory. So, the indeterminism of the PCC does not threat. For examples see Suppe (1989), Suppes (1960), van Fraasen (1980).

entailments go through. For example, the Singularist theory must be regimentable so that 'there are summed objects' is entailed.

An intended interpretation determines a set of models. It specifies a set of models rather than a unique model as multiple models might carry the same commitments. For example, if a commitment to Fs is given in the intended interpretation, all models must include Fs, but models might vary on how many things are Fs or on whether there are any Gs. So, an intended interpretation fixing answers to some ontological questions fails to single out a unique model. If we have the further aim to determine truth without relativizing to a model and an assignment function, we might choose one privileged model to be the intended model.[49]

One might question whether a similar move could be made to block indeterminacy at the level of natural language theories. Such a move is not available. Notice that the intended interpretation appealed to in order to block higher-order indeterminacy is an interpretation of a formal theory that serves to pick out an intended set of models. I have, in arguing against the descriptive view of logical form, argued that natural language theories are not identical to formal theories. Instead, I have argued that to determine what a natural language theory says and entails it is to be translated into a formal language. It is only once we are working with formal theories that an intended interpretation is available. So, indeterminacy is blocked at the level of formal language, but not natural language.

1.6 INDETERMINACY: METAPHYSICAL OR EPISTEMIC?

I have argued that the ontological commitments of some natural language theories are indeterminate. In this section I argue that whether the indeterminism is metaphysical or epistemic, semantics is an imperfect guide to answering ontological questions. I begin by making the views of indeterminism more precise.

[49] But, notice that even with a unique intended model, what a theory, T, says and entails will still be relative to a semantic treatment for different treatments may have different intended models.

One can take the indeterminacy posited by the PCC to accord with either of the following principles:

> *Metaphysical Indeterminacy:* It is metaphysically indeterminate whether a theory, T, is committed to Fs just in case there is no fact that T is committed to Fs and no fact that T fails to be committed to Fs.
>
> *Epistemic Indeterminacy:* It is (merely) epistemically indeterminate whether a theory, T, is committed to Fs just in case there is no epistemically accessible fact that T is committed to Fs and no epistemically accessible fact that T fails to be committed to Fs *and* there is a fact that T is committed to Fs or a fact that T fails to be committed to Fs.[50]

Next, I turn to an examination of metaphysical and epistemic indeterminism, respectively.

Suppose that the indeterminacy attributed by the PCC is metaphysical. Given this, there is no further fact that might tell us, for example, whether plural-involving theories are or are not committed to sums. To see how, given metaphysical indeterminism, semantics fails to be a guide to answering more general questions of ontology, we need to briefly reexamine what I had called the standard picture. The standard picture is composed of three parts.

> Part One: Semantics determines the commitments carried by a theory.
>
> Part Two: An agent incurs the commitments carried by the theories she accepts.
>
> Part Three: Questions of what really exists are settled by the commitments carried by the true theory of the world.

I have argued that our best semantic treatments can fail to deliver determinate ontological commitments. If the indeterminism is metaphysical, does semantics determine the commitments carried by a theory? On a natural understanding of what it is for S to determine the commitments of T, no. To see why, let's examine at an analogous case.

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[50] Notice the Epistemic Indeterminacy is formulated so as to be incompatible with Metaphysical Indeterminacy. If the final disjunctive conjunct in Epistemic Indeterminacy were to be removed, a thesis consistent with Metaphysical Indeterminacy and Epistemic Indeterminacy would result. I assess only the two stronger theses given here.

Suppose that the gravitational field interactions between Jupiter and its moons determine when a volcano will erupt on Io.[51] Given this, it would be inconsistent if given certain gravitational field interactions, it was metaphysically indeterminate whether a volcano on Io will erupt. If such a case were possible, our original supposition would need be a amended to be a claim of, at best, partial determination. That is, it would be the case that the gravitational field interactions between Jupiter and its moons partially determine or sometimes determine when a volcano on Io will erupt. The case of semantics determining ontological commitments is similar.

If the indeterminacy posited by the PCC is metaphysical semantics fails to determine the commitments of a theory, for there are cases in which semantics fails to deliver whether a theory carries a commitment to Fs. Of course, on the view that the indeterminism is metaphysical this is because there is no fact of the matter as to whether such a theory carries a commitment to Fs. So, it is not just that semantics is unable to completely determine the commitments of a theory, but that nothing can do so. Part One of the standard picture states the semantics determines the commitments of a theory. Semantics fails to do so, so Part One is false. Since Part Two and Three of the standard picture rely on Part One, the standard picture fails.[52]

Next, suppose that the ontological indeterminacy posited by cases that satisfy clause (c) of the PCC is merely epistemic. That is, for all we know the commitments of some natural language theories are indeterminate, but there is a fact of the matter as to what the theory's determinate commitments are. A proponent of Epistemic Indeterminism might appeal to one of two sources in determining the determinate commitments of natural

[51] Io is one of Jupiter's moons.

[52] While the understanding of determination I have used here seems to be what is standard in the sciences and in philosophy in the Free Will and Determinism debate, one might propose an alternative understanding. One might argue that semantics does determine the commitments carried by a theory. It determines that a theory, for example, carries determinate commitments to As, Bs and Cs and indeterminately carries commitments of Ds and Es. If one holds this understanding determination, one must hold that the laws of quantum mechanics and the initial state of a system do determine the locations of quantum particles, although the locations are indeterminate. It seems that such a position has is utilizing a definition of 'determine' that is unnatural enough that it is unlikely it is what a proponent of the standard picture had in mind. So, I will not address it further here.

language theories. First, she might hold that there is a true semantics that delivers the determinate commitments of a theory, but we are, in principle, ignorant of it. Alternatively, she might hold that there is some non-semantic fact that determines the ontological commitments carried by a natural language theory. On either way of developing the epistemic view of indeterminacy, semantics is at best a partial guide to ontology. Let's examine these in turn.

Suppose that one holds that there is a true semantics for natural language theories, but that we are ignorant of it. Such a position is akin to the epistemicist view of vagueness. The epistemicist claims that, for example, we are ignorant of the sharp cut-off between the true application of 'bald' and the true application of 'not bald,' but that such a divide does exist.[53] On this position while the true semantics determines the ontological commitments carried by natural language theories, semantics cannot be *our* guide to determining ontological commitments for we are ignorant of the true semantics of natural language. [54] So, given this view semantics can serve only as a partial guide to questions of ontological commitment. Further, if one took the standard picture as part of a methodology to enable *us* to determine the commitments carried by theories and agents and ultimately to discover the ontology of the world, the project cannot even get off the ground. For, as noted above, Parts Two and Three rely on Part One.

Alternatively one might hold that the semantics of natural language delivers only indeterminate commitments, but that there is some non-semantic fact as to whether a theory determinately does or does not carry a commitment to Fs. On this view, some non-semantic fact (at least sometimes) determines the ontological commitments natural language theories.

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[53] See Williamson (1994) for a defense of epistemicism.

[54] One might take epistemicism and this view of indeterminism to differ in the breadth of indeterminism posited. One might argue that given that we understand natural language, it is remarkable that we do not know the semantics of, at least much of, natural language. Even one who holds an epistemicist view of vagueness might argue that we understand the semantics of most of our language. Vagueness, on this view, is a special case of linguistic ignorance. For commentary on the breadth of linguistic ignorance according to the epistemicist see Williamson (1994) especially chapter 8. He argues that we do understand what our utterances mean even when they involve vague expressions. See Sainsbury (1997) for an argument based on externalism which supports the view that epistemicists are not forced to hold that we do not understand our own utterances. See Wright (2001) for an argument that the epistemicist is committed to the view that speakers imperfectly understand what they say when they say, for example, 'That is red' or 'John is tall.'

Part One requires the semantics determines the ontological commitments of such theories. So, Part One of the standard picture fails and Part Two and Three fail with it.

I have argued that for semantics to truly be a guide to determining the ontological commitments of natural language theories one must look to our best semantic treatments. Our best semantic treatments are those that are semantically adequate. Given the criteria for the semantic adequacy of a treatment multiple equally good candidates might exist. I argued that the existence of multiple treatments should not be used to argue that ontological commitments are only relative to a treatment. Instead, I argued that if the treatments attribute divergent commitments to a theory, the theory carries indeterminate ontological commitments. Finally, I argued regardless of whether one takes the indeterminism to be metaphysical or epistemic, semantics can, at best, serve as a partial guide to answering questions of ontological commitment. Ontology can begin, but cannot end, in semantics.

Chapter 2:

Plural-Involving Theories and Their Treatments

Uses of linguistic expressions are often taken to carry ontological commitments. For instance, the truth of 'Bob is male' seems to require that there exists someone, namely, Bob. Following in this vein, one might take plural expressions to require a commitment to groups or summed entities. For instance, one might take the truth of 'the boys laughed' to require the existence of a group or sum of boys. In this chapter I begin by examining plural expressions and the linguistic data involving them to find patterns in the data that must be captured by any adequate semantic treatment. I examine two strategies that have been taken towards plurals. First, one might take a Singularist strategy. On such a position plural expressions are represented as denoting singular thing (e.g., a set or a sum).[55] The second sort of strategy is the Non-Singularist or Pluralist strategy.[56] A Pluralist treats plural expressions as plurally referring to or denoting many things.[57] For instance, on such a view 'John and Mary' plurally denotes John and Mary rather than the sum or set with only John and Mary as members. Here I examine a representative instance of each view—a lattice-theoretic treatment and a plural quantificational treatment. Lattice-theoretic treatments (and other Singularist strategies) dominant the semantic accounts of plurals in linguistics. In philosophical logic and philosophy of language, plural quantificational treatments have been popular. I will begin by examining each for empirical adequacy. Since canvassing all of the relevant linguistic data would go far beyond the means of this chapter, I will focus on five common plural expression types—conjunctions, definite plural expressions, numeral

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55 For a representative sample of lattice and set theoretic theories of plurals see: Link (1983, 1987, 1991), Landman (1989), Schwarzschild (1996), Gillon (1987), Scha (1981), Lasersohn (1995)

56 Oliver & Smiley (2001) introduce the terms 'singularist' and 'non-singularist.'

57 For a representative sample of proponents and formalizations of plural quantification see Boolos (1984, 1985, 1998), Simons (1982), Lewis (1991), Rayo (2007), Oliver & Smiley (2001, 2005), Yi (2005), Uzquiano (2003), Linnebo & Nichols (2008)

expressions, plural-involving 'all' constructions, and plural-involving 'some' constructions. I will show how both theories can adequately handle these cases.

I begin by laying out some preliminary distinctions. First, in Section 2.1, I distinguish and examine two sorts of plural predication. In Section 2.2 I turn to a property of plural predication, the cumulative reference property, which any adequate semantic theory of plurals must capture. Then, in Section 2.3 and Section 2.4 I examine two varieties of truthmaker for which plural-involving sentences seem to allow. Next, in Section 2.5 I turn to an examination of a particular version of a Singularist treatment, lattice theory, and its treatment of conjunctions. I then examine a Pluralist treatment, a plural quantificational treatment, and examine how it handles conjunctions. In Sections 2.6-2.9 I compare how a lattice theoretic treatment and a plural quantificational treatment handle the remaining four expression types. I take care to note how each theory treats the varieties of predication, the cumulative reference property and the varieties of truthmakers a sentence might allow. In Section 2.10 I give a defeasible argument that both treatments are semantically adequate. Then, in Section 2.11 I sketch how one might develop a more general argument. Finally, in 2.12 I apply the PCC to deliver unrelativized commitments of plural-involving theories.

2.1 DISTRIBUTIVE AND COLLECTIVE PREDICATION

Plurals can be predicated in two ways. An application of a predicate is distributive if it applies to each (or, perhaps, most) of the entities referred to in the subject noun phrase. A predicate is collective if it applies to the subjects taken together. Take the following sentences:

1. The boys gathered in the hall.
2. Bert, Albert and Willard carried the table upstairs.
3. The boys fell asleep.
4. Bert, Albert and Willard are tall.

In 1 and 2 the predicate expressions are most naturally taken to apply to the subjects taken together. That is, 1 is true if the boys walked from many rooms to congregate in the hall.

Similarly, 2 is true if the three men each took a side of the table and moved it upstairs. While the most common way of reading the predication in 1 and 2 is collective, one might think that each can also be read as involving distributive predication. However, the predicates in 1 and 2 come apart here. The first fails to have a distributive reading, while the second has such a reading. I will examine these in turn. Suppose instead of 1 we had the following:

1'. *The boy gathered in the hall.

This sentence is clearly marked. Some boy might walk into the hall alone, but this does not count as a gathering in the hall in the sense in question here. The boy might gather papers in the hall, but this is clearly a different way of gathering than the gathering in 1. These senses are distinguished in sentential form as 'gather' in 1 is an intransitive verb, while 'gather' in 'gather papers' is a transitive verb. 'Gather' in the sense utilized in 1 takes only plural (e.g., 'the boys'), mass terms (e.g., 'water') or collective nouns (e.g., 'team') as its subject. This gives us strong evidence that 'gather' only has a collective reading. There are other verb phrases whose only felicitous readings are as collective predicates. For instance phrases like 'are even in number' and 'Φ together.'

Sentence 2 differs from 1 in that is has both a collective and a distributive reading. For 2 to be true when read distributively each of Bert, Albert and Willard must individually carry the table upstairs, perhaps as part of a strength competition.

In contrast to 1 and 2, 3 and 4 are most naturally read as distributive. The former is true if each boy fell asleep, while the latter is true if Bert is tall, Albert is tall and Willard is tall. One might also suppose that these sentences have collective readings. It is, however, difficult to find a context in which these readings might be salient. Such contexts are difficult to find, it seems, because if there is a collective reading of a sentence like 3, it entails the distributive reading of that sentence. That is, it could not be the case that the boys (together) fell asleep without it also being the case that each of the boys fell asleep. This differs from the two readings that are available for 2. Recall that the truth of 2 is ensured if each of the three boys mentioned individually carried a table upstairs *or* if the three together carried a table upstairs. The truth of one of the readings does not guarantee the truth of the other. In fact, it will often be the case that only one of the two readings is true in a given situation. For 3

and 4, such a strong distinction is not available. Instead, if it is the case that the boys collectively fell asleep, it is also the case that the boys each (on his own) fell asleep. Falling asleep is the sort of thing that one might do with company around, but it is ultimately the sort of thing one does individually. One might think that this gives us reason to suppose that 3 and 4 do not have collective readings. Indeed, one might argue that the nature of such verb-phrases requires distributivity. Alternatively, one could hold that such sentences do have two readings, but that an entailment relation holds between them. The information discussed above is summarized in the following table:

Sentence	Collective Reading?	Distributive Reading?	Collective→ Distributive?
1 ('gather')	Yes	No	N/A
2 ('carry')	Yes	Yes	No
3 ('fall asleep') & 4 ('are tall')	?	Yes	If there is a collective reading, Yes If there is no collective reading, N/A

Table 2.1: Collective and Distributive Readings

Plural expressions can be predicated collectively and distributively. Some verbs have only be applied in instances of collective predication, some can be applied in both and some might (depending on one's view) apply in only instances of distributive predication.

2.2 THE CUMULATIVE REFERENCE PROPERTY

Instances of plural predication often have a property we might, following Godehard Link, call the Cumulative Reference Property (CRP).[58] It can be best illuminated through the use of examples. Suppose that Nancy and Molly are female and that Farrah and Linda are female. Then, Nancy and Molly and Farrah and Linda are female. This is a feature plurals share with mass terms. For instance, if the stuff in glass A is water and the stuff in glass B is water, then the stuff in A and B is water. More generally, if some things/stuff have/has property F and some other things/stuff have/has property F, then the things/stuff and the other things/stuff have/has property F.[59]

The CRP usually applies when predication is distributive and fails to apply with collective predication. In the examples above 'being female and 'being water' are distributive predicates. Take the following case of collective property attribution to see how CRP fails to apply. Suppose that it is true that 'the boys are in a circle.' Further, it is true that 'the girls are in a circle.' From this we cannot conclude that 'the boys and the girls are in a circle.' For the truth of the last sentence requires a single circle composed of boys and girls while the previous sentences would be satisfied even if no boy was in a circle with a girl.

Thomas McKay has argued that while the CRP often applies in cases of distributive predication, it does not *always* apply. He cites the following as examples of distributive and non-cumulative predicates: 'being fewer than four in number,' 'being of just one gender,' 'being odd in number.'[60] For instance he takes it that if Sam and John are of one gender and Becca and Annie are of one gender, it does not follow that Sam and John and Becca and Annie are of one gender.

While I take it that he is correct that this inference does not follow, I argue that this is because the predicate is collective. For, in describing Sam and John as being of one gender

[58] He cites Quine (1960, p. 61) as the source of this observation.

[59] There is an issue with whether the CRP applies to context-sensitive predicates. For instance, in context C1 it might be true that Nancy and Molly are tall and in context C2 it might be true that Farrah and Linda are tall. However, if C1 and C2 have different standards for tallness, it might be false that Nancy and Molly and Farrah and Linda are tall. The CRP applies to context-sensitive predicates only when a single context is fixed.

[60] (2006, p. 7)

one is not saying that Sam is one-gendered and that John is one-gendered. Instead, one is saying that the two share a feature, namely, their gender. Saying that some things share a feature is a paradigmatic case of collective predication. While I think that there is a reading of 'being of just one gender' that is distributive, it is a very uncommon reading. One usually assumes that a person is of just one gender, so an assertion that that is the case would seem gratuitous (and perhaps marked). However, in some contexts such a reading is available. Suppose that we are at the National Center for Transgender Equality. We hear someone utter 'John and Annie are of just one gender.' I think that this utterance could be felicitously understood as saying that John is of just one gender and Annie is of just one gender (even if John is male and Annie is female). If 'being of just one gender' is read in this distributive way, the inference above does go through. So, it seems that McKay's example of 'being of just one gender' is not a case of distributive and non-cumulative predication. If the predicate is read as distributive, it is cumulative. If it is read as collective, it is non-cumulative, but that is unsurprising. The other predicates he cites are parallel to case. So, we do not have a reason to think that distributive predication is ever non-cumulative. An adequate semantics of plurals must capture the CRP for distributive predicates.

2.3 MAXIMAL AND NON-MAXIMAL TRUTHMAKERS

There is a difference between a sentence having multiple readings and having multiple ways in which it might be made true. To say that a sentence has multiple readings is to say that it is ambiguous. Two ways of understanding a sentence count as sentential ambiguity only if they allow for a truth conditional difference in understanding. That is, one of the readings must be true of a situation of which the other is false. For instance, take the following:

5. John believes that someone is a spy.

This sentence can be understood in two familiar ways. First, John might believe that some specific person (e.g., Ortcutt) is a spy. Alternatively, John might believe that someone or

other is a spy, but not believe of anyone in particular that he is a spy. The understanding that requires specificity is often called the wide-scope reading while the nonspecific understanding is called the narrow-scope reading. To show that these represent different readings and show that the sentence is ambiguous we must find a situation in which one of the two understandings is true, while the other is false. Suppose that John only has the nonspecific belief. Then, it will be true that he believes someone or other is a spy, while it is false for any person, a, that John believes of a that a is a spy. So, the narrow-scope reading would be true in a situation in which the wide-scope reading is false. It is worth noting that in any situation in which the wide-scope reading is true, the narrow-scope reading is true. Since so-called scope ambiguities are paradigmatic cases of ambiguity, it seems that many hold that ambiguity requires only that one of the readings be such that it can be true in a situation in which the other is false.

The distinction between collective and distributive cases of predication can also be classified as an ambiguity. Take the following sentence:

6. The girls lifted a table.

When understood as involving distributive predication, 6 means that each of the girls lifted a table. On its collective reading, 6 means that together the girls lifted a table. In the following situation these readings come apart in a truth conditional way. Amy, Beth, and Jo each take a side of a large table and lift it. In this situation 6 is true when the predicate is taken to apply to the girls collectively, but false when it is taken to apply to the girls individually. Our first test for sentential ambiguity is met. The collective and distributive distinction elicits multiple readings.

Another way one might test for ambiguity is by looking at what is felicitous when a verb is elided.[61] For instance, take the following:

7. John went to the bank and Jane did too.

An utterance of 7 is only felicitous when 'bank' is disambiguated in the same way in the first conjunct and in the elided occurrence in the second conjunct. That is, 7 can only felicitously

[61] See Zwicky and Sadock (1975) discuss this and other ambiguity tests.

report on a situation in which both John and Jane went to a financial institution or in which both went to the side of a river. There is no felicitous mixed reading in which one went to a financial institution and the other went to a river.

The collective/distributive distinction also passes this test for ambiguity. Take the following sentence:

8. John and Sue lifted a table and Sam and Joe did too.

Like 8 above, this sentence has two readings. On one reading it requires two table liftings, one joint effort by John and Sue and another collective effort by Sam and Joe. On the other reading it requires that John, Sue, Sam and Joe each individually lifted a table. There does not seem to be a mixed three lifting reading in which one of the pairs lifted a table together, while the other two individually carried out some table liftings. This falls in line with sentences with wide and narrow scope readings. For example, take 9.

9. John thinks that someone is a spy and Jane does too.

Here either John and Jane each think that some particular person is a spy or both have a nonspecific belief to the effect that there are spies (i.e., that someone or other is a spy).

I will address one further test for ambiguity that might be called the speaker intention test. The speaker intention test requires that for a sentence (or expression) to count as ambiguous, a speaker must be able to disambiguate her utterance. That is, she must have meant one of the disambiguations. After uttering 7 a speaker, if questioned, must be able to say whether she meant something about a financial institution or the side of a river. The collective/distributive distinction also satisfies this test. For instance, in uttering 6 a speaker will mean either that the girls lifted a table together or that the girls each lifted a table individually. The speaker cannot felicitously answer a question like "Did they lift it together or individually?" with an appeal to ignorance.[62]

[62] This is the case unless the speaker is reporting on a situation that she heard about via testimony or deduced given some other data. For instance, if the speaker heard an utterance of 6 and didn't bother to check which disambiguation of the sentence was meant, she might utter 6 later without knowing which disambiguation was originally meant. This is also the case for sentences involving ambiguous lexical expressions and multiple scope

In addition to multiple readings, a sentence might allow for a variety of truthmakers. A truthmaker is a fact or situation whose existence accounts for the truth of an utterance of a sentence. A sentence having a variety of truthmakers does not entail that the sentence has a multitude of readings. Instead, it shows that a sentence is not wholly particular. For instance, take the following:

10. John has a friend.

Such a sentence might be true in a wide range of situations. For instance, John might have a male friend or a female friend. He might have a tall friend or an old friend or a friend from school. While any truthmaker of an utterance of 10 will be quite specific, 10 does not require anything more specific than that there is an individual to whom John stands in the 'friend'-relation.

One might check to see whether this is an ambiguity by using the three tests given above. First, one might try to find a situation in which 10 is true on some understanding and false on another understanding. For instance, suppose that John has a tall female friend. In this case, an utterance of 10 is true. There is not an understanding of 10 that requires, say, that John have a short friend or a male friend. 10 also fails to count as ambiguous on the elision test. For instance, I can felicitously say that "John has a friend and Sue does too" even if John's friend is short and male and Sue's friend is tall and female. The speaker intention test also fails for sentence 10. A speaker might utter 10 without any further information about the friend's height, gender, weight or age. One would not take her utterance of 10 to be infelicitous if one asked whether John's friend is male or female and the speaker appealed to ignorance. We do not require speakers to be that specific. An utterance might not specify requirements for many features of its truthmakers. Such underspecificity is not a feature of sentential ambiguity. Instead, it is a lack of precision that allows for a multitude of truthmakers. I reserve 'reading' for cases of ambiguity rather than underspecificity. We can now turn to a discussion of distinctions in the sorts of truthmakers plural-involving sentences might have.

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readings. I take such cases to be rather unusual. So, the speaker intention test is useful in many (perhaps most) cases.

The truthmakers of plural-involving sentences have two distinctive features. First, they seem to allow for non-maximality. A case of predication is non-maximal when some of the referents of the subject expression are not required to satisfy or to help satisfy the predicate. So, for example suppose that we are considering sentence 1, 'the boys gathered in the hall'. The relevant boys in this context are a, b, c, d, e, f, and g. Take the following two situations:

A: a, b, c, d, e and f gathered in the hall.

B: a, b, c, d, e, f and g gathered in the hall.

A and B differ with respect to g. In A, g does not take part in the gathering, whereas in B, g does do so. These scenarios represent ways in which sentence we might think 1 could be true. In A the predicate is satisfied non-maximally while in B it is satisfied maximally. While perhaps slightly misleading, we might call a truthmaker non-maximal when it makes a sentence true, but does so without all of the referents of the subject expression in the situation satisfying or helping to satisfy the predicate. In contrast, we might say that a truthmaker is maximal if it makes the sentence in question true and does so in virtue of all of the referents of the subject expression satisfying or helping to satisfy the predicate.

If it is possible for a plural-involving sentence to be true in a situation in which not all of the referents of the plural expression satisfy or help to satisfy the predicate, any adequate semantic treatment of plurals must account for this. A theorist might choose to ally features of maximality with one of the readings of a plural sentence. Such a theorist is treating non-maximality as a semantic feature. There are two natural ways a theorist might do this. First, a theorist (Theorist I) might argue that only collective readings allow for non-maximality. Another theorist (Theorist II) might argue that both distributive and collective readings fail to require maximality. Finally, one might take non-maximality to be a pragmatic, not semantic, feature of plurals. Such a theorist (Theorist III) requires maximality for truth, but will account for the felicity of an utterance of a sentence in a situation in which the predicate fails to be maximally satisfied through an appeal to a looseness in pragmatic requirements.

Clearly these are not the only positions available. However, the other possible positions are not well motivated. For instance, one might hold that only distributive readings allow for non-maximality (Theorist IV). While a collective-only view (like that of Theorist I) seems to have potential, its distributive correlate does not. Theorist I might be motivated in part by her understanding of distribution in logic and mathematics. Given that distribution in those fields requires maximality, one might suppose that distribution in natural language does as well. There is no motivational correlate for Theorist IV. So, to claim that only cases of distributive predication allow for non-maximality is ad hoc.

One might claim that instead of explaining maximality behavior in terms of truthmakers, one should posit a further ambiguity. On such a view, plural-involving sentences are ambiguous between a maximal and a non-maximal reading. To get such a view off the ground, it must be shown that the maximal/non-maximal distinction is an ambiguity. We can utilize the tests explicated earlier to determine whether this is the case. The first test can clearly be met. There is a truth conditional difference between a reading that requires maximality and a reading that fails to require maximality. So far things look good for the proponent of ambiguity. Let us turn to the other two tests to see if the distinction continues to fare well. Suppose that one says:

11. The senators voted on the bill and the representatives did too.

If 'The senators voted on the bill' is ambiguous between a maximal and a non-maximal reading the elided occurrence of 'voted on the bill' must be interpreted in the same way as it is interpreted in the first conjunct. However, it seems clear that 11 would be true in a situation in which all of the senators voted on the bill and only most of the representatives voted on the bill. The maximal/non-maximal distinction does not pass the elision test for ambiguity. Likewise, it fails to pass the speaker intention test.

Suppose that a speaker utters 11. His interlocutor then asks "Do you mean that all of the senators voted on the bill or that only some of the senators voted on the bill?" A speaker might felicitously reply by telling his interlocutor that he does not have information that specific. This seems as reasonable as an utterer of 'John has a friend' replying that she

does not know the age and sex of John's friend. So, the maximality/non-maximality distinction fails to pass two of the three ambiguity tests addressed here. I take this to show that non-maximality is a lack of specificity rather than an ambiguity. Let us now turn to an examination of the three positions first considered.

Recall that Theorist I is likely motivated by an understanding of distribution stemming from logic and mathematics. So, she takes distribution to require maximality. Such a theorist might then take collective predication to be the lack of a requirement for distribution. In collectively predicating, one requires only that taken together the referents of the plural subject expression satisfy the predicate to a high degree.[63] I take this to be the motivation behind Theorist I's method of treating nonmaximality. We can now examine whether this view can handle the range of data adequately.

A theorist who holds that non-maximality stems from collective predication might argue that all predicates have a distributive and collective reading. By so doing, she allows that sentences like 3 and 4 (which involve the predicates 'are tall' and 'fall asleep') can be made true by non-maximal truthmakers. She can hold that on their distributive readings, each requires maximality. When predication is collective, maximality is not required.

On this view it should be noted that the truth of a sentence's collective reading will not entail the truth of its distributive reading. For, a collective reading fails to require a maximal truthmaker, while a distributive reading requires a maximal truthmaker. This need not be taken to be a cost of the view. Instead, Theorist I can contend that we thought that an entailment from the truth of a distributive instance of predication to an instance of collective predication held because we failed to consider maximality. If non-maximality is best treated in the way Theorist I suggests, then we see that such an entailment does not hold. Since there was no reason to be tied to such an entailment holding, it is not a vice of Theorist I's view if it fails to hold.

[63] Clearly satisfaction to 'a high degree' is not a precise notion. For instance, one might question whether 1 is true if six of ten boys gathered in the hall. There may be no definitive answer to this questions or the answer might be context dependent.

Alternatively, Theorist I might hold that applications of predicates like 'is tall' and 'fall asleep' fail to have a collective reading. On this view, sentences 3 and 4 will only be made true by maximal truthmakers. For example, if a, b, c, d, e, f and g are all the girls, the truth of 'the girls are tall' will require that a, b, c, d, e, f and g are tall.

We have only looked at sentences like 3 and 4, those that definitely have distributive readings and may or may not have collective readings. Let's now turn to an examination of how Theorist I treats sentences like 1 and 2. Take the following sentence:

12. The students brought apples to their teacher.

On 12's collective reading the students together are said to have brought some apples to the teacher. This could be done by the student each bringing an apple, so that it is only together that they truly brought *apples* to their teacher. Or, the students might have all chipped in on a large bag of apples that they then, together, give to their teacher. On its distributive reading individual students are said to have brought apples to the teacher. Since Theorist I takes non-maximality to be a feature of the truthmakers of only collective predication, the first reading does not require a maximal truthmaker. That is, it might be true on its collective reading even if, say, one of the students did not partake in bringing an apple to the teacher. Theorist I requires that the truthmaker for 12's distributive reading to be maximal. However, this seems empirically inadequate. If 19 of the 20 students individually brought an apple to the teacher, many speakers would take 12 to be true (and certainly felicitous). So, we have some evidence that even on a distributive reading 12 does not require maximality. [64]

To solve this potential problem, Theorist I might propose that there are two collective readings.[65] One of the collective readings requires something *close* to maximality, while the other has looser restrictions. The reading that requires near-maximality would be appealed to in accounting for the felicity of an utterance of 12 when 19 of 20 students individually brought some apples to their teacher. The collective reading that requires a less

[64] Whether sentences with conjunctive subjects (like 8) allow for nonmaximality in either its collective or distributive readings is debatable. Landman (1989) argues that some conjunctions of proper names do allow for non-maximality. This strikes me as somewhat odd, but presumably in some context it is allowed.

[65] I would like to thank Hans Kamp for pointing out that this move is available to such a theorist.

maximal reading could then be used to account for what I originally took to be collective readings. This way, all of our non-maximality intuitions are captured and distributivity remains maximal.

While Theorist I might argue in this way, the way she multiplies readings here seems ad hoc. Further, the utterance of 12 I am envisaging (in which 19 of the 20 students individually brought apples to the teacher) clearly seems to involve distributive predication. Instead of acknowledging this, Theorist I proposes that it is really another *collective* reading. This makes it seem that Theorist I has ceased to capture anything truly collective in her "collective" readings. Instead, collectivity for Theorist I is simply the lack of a requirement for maximality. This move seems misguided. Perhaps more than one collective reading is needed for some case, but it seems much more natural to handle the non-maximality of a use of 12 that seems to clearly involve distributive predication by allowing for non-maximal truthmakers for collective and distributive predication. Theorist II does just that.

Theorist II argues that both distributive and collective readings allow for non-maximal truthmakers. This allows her to hold that no available readings of a predicate applied to a plural expression require maximality.[66] Further, since Theorist II does not take non-maximality to be distinctively a feature of collective predication, she can hold that 3 and 4 only have distributive readings. Since the difference between a distributive and a collective reading of, say, 3 does not appear to amount to anything (unless one holds that non-maximality is tied to collectivity) this is another virtue of Theorist II's position. Theorist II is able to capture more data than Theorist I can without positing extra readings. This gives us sufficient reason to require that if a theory is to account for all non-maximality semantically it must allow for non-maximal truthmakers for sentences involving collective *and* distributive predication. This does not yet rule out the position of Theorist III.

[66] It may be the case that when a subject expression is a short conjunction of names (like in 2 and 4) the truthmaker must be maximal. However, I take it that this is not due to the nature of the predication (i.e., whether it is distributive or collective), but instead on the definitive and directness of the subject expression. Similarly, when a universal is used, this requires maximality. However, it is the universal that forces maximality rather than the reading of the predicate.

Theorist III argues that all readings of plural-involving sentences require maximality to secure truth. However, in many contexts we will take near maximality to be sufficient for an utterance to be acceptable. This is the case for utterances involving either collective or distributive predication. For instance, if one wants to say that 14 out of the 15 relevant boys fell asleep, one will usually chose to utter 'the boys fell asleep'. Such an utterance takes less effort from the speaker and takes the hearer less effort to process than saying that 'All but one of the 15 boys fell asleep' or that '14 of the 15 relevant boys fell asleep.' Unless complete satisfaction of the predicate is relevant in the context (if, for example, one is planning a break-in and needs all witnesses to be asleep before setting the plan in action) near maximality will be sufficient for the felicity of an utterance. However, according to Theorist III, near maximality is not sufficient for truth. This treatment of non-maximality accords with our intuitions while eliminating non-maximal truthmakers for plural-involving sentences.

We have seen that Theorist II and Theorist III are able to capture the data without positing a further collective reading. One might wonder how one is to decide between these two theories. An examination of potential bits of dialogue might prove useful. Take the following two exchanges:

1. A: The boys fell asleep.

   B: Well, Fred didn't.

   A: OK, I guess only most of the boys fell asleep.

2. A: The boys fell asleep.

   B: Right, except Fred, since he never takes naps.

One might conclude from the naturalness of the first exchange that Theorist III is correct. That is, A's utterance can be corrected, so it is not strictly true. That is certainly one way to interpret this exchange. However, a defender of Theory II might argue that the contextual standards shifted with B's utterance. B imposed the requirement for absolute satisfaction of the predicate. Prior to B's utterance, Theorist II might argue, non-maximal satisfaction of the predicate was sufficient for truth. The first exchange does not offer decisive considerations in favor of either theorist.

Theorist II might take the second exchange to be a strong mark in his favor. He might argue that in saying 'Right' B is taking A's utterance to be true. This is the case even though B is in a position to add information that makes it clear that the predicate is not maximally satisfied in the situation. So, it seems, maximal satisfaction of a predicate is not always required, thus vindicating Theory II. Theorist III might contend that B's use of 'right' should not be seen as an acceptance of the semantic content of A's utterance. That content is false and B is in a position to know that. Instead, it is being used to make B's correction of A seem more polite. The second exchange also fails to offer strong considerations in favor of one of the theories. If one prefers to account for our intuitions about non-maximality by loosening the semantic requirements for the truth of a plural-involving sentence, one will favor Theory II. Contrastingly, if one takes truth to require complete satisfaction of a predicate and account for acceptability judgments pragmatically, one will align with Theorist III.[67] Here I will not rule out either theory.

2.4 PARTITIONED AND NON-PARTITIONED TRUTHMAKERS

There is a second distinction to be made between the sorts of truthmakers that might be available to sentences involving plurals only when they are predicated collectively. Take the following example:

13. Three clerks made four sales

This sentence has two readings—a 12-sale reading and a 4-sale reading. The 12-sale reading corresponds with the distributive reading, whereas the 4-sale reading corresponds to the collective reading. Two sorts of truthmakers are available for the 4-sale reading—partitioned and non-partitioned. The truthmaker for the collective reading is non-partitioned if the clerks worked together to make all four sales. The truthmaker is non-partitioned because the

[67] There is a similar debate in the literature on quantifier domain restrictions. One might take there to be implicit syntactic (and thus, semantic) restrictions on a quantifier in a sentence like 'Every plate is dirty.' So, even though there are clean plates in China, it might be strictly true that every plate (in the house) is dirty. If one prefers a minimalist semantics, one might take the truth of 'every plate is dirty' to require that every plate in the universe be dirty. On this view, if some plate somewhere is clean, the utterance is false. One can then appeal to pragmatics to account for the acceptability of an utterance of 'Every plate is dirty.'

referents of the subject expression are not divided in their making of sales. Instead, the subjects together acted to make four sales. An alternative way in which 13 might be true is in a situation in which one clerk made two sales, while each of the others made one. Or, in a situation in which one clerk made three sales and the other two made a fourth sale together. Or, in a situation in which each of the clerks made one sale independently and collaborated to make a fourth sale. And so on. These truthmakers are partitioned because the clerks make some sales as individuals or in pairs. The truthmakers make true a case of collective predication because it is only through the actions of the three clerks together that four sales were made. A speaker reporting on this sort of situation is reporting on a situation that involves the distributive efforts of the partners, but does so by using a report that collects these actions, predicating the subjects using a single instance of collective predication.

In instances of distributive predication all truthmakers are partitioned. For example, if the boys fell asleep then each individual boy fell asleep. The distinction between partitioned and non-partitioned truthmakers is only relevant to instances of collective predication.

The distinction between partitioned and non-partitioned truthmakers is most salient in cases in which there is a quantifier or numeral expression in the subject and in the complement of a plural-involving sentence. The way in which the quantifier or numeral in the complement can be captured allows for the subjects together to carry out the actions described (when the truthmaker is non-partitioned) or for the subjects' individual and collective efforts to jointly yield the instances of the action described (when the truthmaker is partitioned).[68] However, partitioned and non-partitioned truthmakers are also available for other plural-involving sentences.

[68] While I take it to be the case, I will not argue that the partitioned/non-partitioned distinction is a case of underspecificity here. The arguments given above could be repeated to show that this distinction is not a case of sentential ambiguity.

The notion of a partitioned truthmaker is related to the notion of a cover developed by Schwarzschild (1996).[69] Schwarzschild defines a cover as follows. Take P to be the extension of a plural expression. Then C is a cover of P iff:

1. C is a set of subsets of P.
2. Every member of P belongs to some set of C.
3. Ø is not in C.

According to this definition if the extension of a plural expression is Anne, Bob and Scott one cover of that extension is {{Anne}, {Anne, Bob}, {Scott, Bob}}. That particular cover allows for a sentence like 'Anne, Bob and Scott hired three lawyers' to be true in a situation in which Anne hired a lawyer individually, Anne and Bob hired one together and Bob and Scott hired a lawyer together. Schwarzschild builds covers into the semantics of plural-involving sentences. Here, I appeal to a multiplicity of possible truthmakers, those that are partitioned and those that are not, to capture the same range of possible situations in which plural-involving sentences might be made true.

To summarize, the data canvassed in the last four sections, a semantically adequate treatment of plural expressions must capture distributive and collective readings. It must account for the CRP when predication is distributive. Further, it must account for our non-maximality intuitions and allow for partitioned truthmakers when they are available.

2.5 TWO SEMANTIC TREATMENTS OF PLURAL EXPRESSION

In this section I begin an examination of the two most widely held accounts of plurals. The first is a lattice theoretic treatment of plurals developed by Godehard Link. The second is a plural quantificational approach that is historically rooted in the work of George

[69] The notion of a partitioned truthmaker is related to the notion of a cover much more closely than the notion of a partition as developed by Higginbotham (1981). Higginbotham's definition of a partition can be given in terms of Schwarzschild's definition of a cover. A partition is a cover in which every member of P belongs to one and only one set of C. I want to allow partitioned truthmakers to allow for some individuals to partake in actions more than once, so my notion of a partitioned truthmaker diverges from the notion of partition developed by Higginbotham. I use 'partitioned truthmaker' rather than 'covered truthmaker' as the former seems to capture the concept I am using more intuitively.

Boolos and which has recently been further developed by Thomas McKay. I begin with lattice theory.

In developing his lattice theoretic approach to plurals, Link began with ontological considerations in mind. He takes there to be a strong similarity between the behavior of singular expressions like 'the boy' and plural expressions like 'the boys.' Since 'the boy' picks out something concrete, he takes 'the boys' to pick out something concrete as well. He proposes a domain of objects structured through a sum formation operation and an intrinsic ordering relation. The sum formation operation '+'[70] takes two individuals and yields an "individual sum or plural object."[71] The individuals the sum formation operation takes might be singular or plural. If an individual is singular it is called an atom. So, if we have the singular individuals Bert, b, and Sam, s, the sum operation yields a new object b+s. While some of the theoretical tools developed for the lattice theoretic treatment of plurals have been explicated in Chapter 1, they will be explicated in more detail here and some repetition will be necessary.

Link calls his ordering relation the "individual part relation" or the i-part relation, symbolized as '$\leq$' in his models. It satisfies the following biconditional:

$$a \leq b \text{ iff } a + b = b.$$

So, Sam is an i-part of Sam+Bob+Mary if, and only if, Sam+Sam+Bob+Mary is identical to Sam+Bob+Mary. Link follows set theoretic practice in assuming that the addition of an element that is already included in an object does not yield a new object. So, the biconditional holds. Sam is an i-part of Sam+Bob+Mary. The individual part relation is symbolized as '$\sqsubset$' in Link's object language. The sentence '$x \sqsubset y$' means that x is an individual part of y.

The partial ordering relation holds between i-parts of the extension of a predicate. Each predicate generates a complete atomic join semilattice. A semilattice is a structure

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[70] Link (1983) uses a circle-plus (a plus in a circle) to denote this relation. He uses the '+' symbol to denote material fusion, which yields not a plural object, but a singular thing. This is done primarily to develop an ontology that can capture mass terms in addition to plurals. Since here we are dealing with only plurals, I have utilized the simpler '+' to symbolize his summation operation.

[71] (1983, p. 307)

ordered by a 'part of' or subset relation. A structure is a join semilattice if it has a single topmost node. This node is called the join. An element, a, in a semilattice (or a partially ordered set) is an atom if it is greater than 0 and there exists no y such that $0 < y < a$. So, the only i-part of an atom is the atom itself. 'At*a*' is read '*a* is an atom.' In Link's treatment, singular individuals are atoms, while plural individuals are non-atoms. A semilattice is complete (in the sense that Link utilizes) just in case every subset of the domain of discourse possesses a sum.[72] Suppose that the atoms in a lattice are Sam and Bob and Mary. Using the partial ordering function and the sum operation we obtain the following structure:

s+b+m

s+b b+m

s b m

Here each node is connected to the nodes that are i-parts of it.

Predication in Link's lattice-theoretic framework can be singular, plural or mixed. Instances of singular predication take only singular individuals as argument, while instances of plural predication take only plural individuals. Instances of mixed predication take both singular and plural individual as arguments. A predicate P is singular. The '*'-operator can be applied to P yielding a mixed predicate (*P). **P takes only plural individuals as arguments.[73] It can be defined in terms of the '*'-operator as follows:

$$**P a \leftrightarrow *P a \,\&\, \neg At a$$

We are now in a position to see how a lattice theoretic treatment of conjunctive plural expressions would go. Take:

14. Luke, Bert and Farrah gathered in the hall.
15. Luke, Bert and Farrah tripped on the rug.

These are formalized as 16 and 17, respectively:

16. **G(l+b+f)

[72] (1983, p. 306). In lattice theory there are other notions of completeness.
[73] Instead of **P Link (1983) uses a circle-*P.

17. *T(l+b+f)

Since gathering is something that no individual can do, it takes only plural arguments, so is double-starred.[74] Tripping on rugs is a predicate that might apply to a single individual (Luke) or a plural individual (Luke+Bert+Farrah) so it is represented with a single '*'. The subject expressions in 14 and in 15 appear to be the same. Link's theory captures this by utilizing a single representation for what we took to be a single expression.

Link's treatment can also capture cases in which a plural expression is predicated both distributively and collectively as in 18.

18. Luke, Bert and Farrah gathered in the hall and tripped on the rug.

Since distributive and collective predicates do not affect the way in which the subject expression is formalized, this will be symbolized as:

**G(l+b+f) & *T(l+b+f).

Lattice theory can provide treatments of both distributive and collective predication of conjunctive subjects. We can now examine whether the data considered above can be captured.

I argued that the cumulative reference property holds of all instances of distributive predication. The following example from Fred Landman serves to show how lattice theory captures the CRP.[75] Suppose that John is a judge and that Bill is a judge. Then, given the cumulative reference property, John and Bill are judges. The predicate J holds of John (in the sentence Jj) and the predicate J holds of Bill (in the sentence Jb). Since *J is the closure of J under summation, and since J applies to John and to Bill, *J applies to j+b. The cumulative reference property is neatly captured.

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[74] Given that 'gather' has only a collective reading, one might think it odd to star it at all. That is, the role of the '*'-operator is to allow for a predicate to take plural objects as argument. Since 'gather' cannot take singular arguments in its domain the '*'-operator appears to be vacuous here. In later work, Link (1998) does not use the '*'-operator for predicates that are only collective. Instead, they are unstarred. So, like 'fell' in 'John fell,' 'gathered' in (14) is formalized without a star. Here I use '**' for predicates that only ever take plural individuals. If the reader prefers, an unstarred predicate that is described in the lexicon as taking only plural (or mass) arguments might be substituted.

[75] (1989)

Next, let's examine whether lattice theory allows for the varieties of truthmakers we took plural-involving sentences to admit. Non-maximality, while a feature a truthmaker of many plural expressions might exhibit, is rarely (if ever) applicable in cases of conjunctive subjects. For instance, if only Luke and Farrah gathered in the hall an utterance of 14 seems to be clearly false. Why would one mention Bert if he was not involved? The explicitness of a conjunction of proper names makes exclusion (almost) impossible. I will address non-maximality in conjunction with Link's theory in a later section.

The examples examined above also do not allow for partitioned truthmakers. Since this variety of truthmaker is most salient with numeral constructions, I will postpone an examination of it until we reach the section on numerals

Let's now turn to plural quantification. A plural quantificational treatment of plural expressions expands first-order logic to include a plural existential and a plural universal quantifier. These can be symbolized as $\exists xx$ (or $\exists X$) and $\forall xx$ (or $\forall X$), respectively. The first says that *some things are such that*, the second, that *all things are such that*. These quantifiers range over the same objects that are ranged over by ordinary singular first-order quantifiers. They are plural not because they take pluralities within their scopes, but instead because they can take multiple individuals as argument. They *can* take multiple individuals as value, but, formally, they need not. That is, plural variables can be used even in cases when only a single individual is such that it satisfies the predicate.

Plural variables relate to 'they' or 'them' as singular variable relate to 'it.'[76] The case in which the value of the variable is a single individual to be read as 'it.' When more than one individual satisfies *xx* they do the satisfying. If a single individual satisfies *xx*, it is the satisfier of *xx*. The 'X' notation in its use in first-order logic with plural quantifiers says the same thing. That is, if a, b and c are the individuals quantified over, they are the satisfiers of *xx* or X. However, since capitalized variables are often taken to range over sets in second-order logic, it may be misleading to use 'X' notation. So, here I will use the '*xx*' notation to

[76] McKay (200, p. 56) says something like this. He takes himself to be following Boolos (1985).

serve as a reminder that only ordinary singular individuals are being quantified over. Next, I lay out a version of plural quantification theory developed by Thomas McKay.[77]

McKay starts by outlining the terms that his theory will utilize. These include plural variables like *xx* and *yy*,[78] singular variables, and singular constants (e.g., a, b, c…).[79] He introduces the 'among'-relation which is used in formalizing relations between some individuals and some other individuals. When the *xx*s are among the *yy*s, this is formalized as *xx*A*yy*. If an *x* is among the *yy*s one writes *x*A*yy*.[80] Other relations and predicates are symbolized by capital letters. Relations that take more than two argument places are superscripted with the number of argument places. For instance a three-place relation might be written R^3. One-place predicates are written as capital letters without subscripts.

Collective predication[81] is represented by a monadic predicate whose single argument place "can be satisfied by several individuals together."[82] McKay says one might show that a single argument place takes many individuals as referents by listing the individuals vertically. So a representation of 14 would be written:

G l
b
f.[83]

He rightly notes that this is a clumsy formalism, especially as the number of referents a single argument place takes increases. Instead he chooses to adopt the following notation:

$G[l,b,f]$.

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[77] 2006

[78] He uses X and Y, here I will adopt Boolos' xx notation.

[79] Since McKay takes there to be no plural individuals, he holds that all constants are singular. For, he concludes a plural constant would pick out a plural individual. However, as long as one's constants are allowed to be plural referring devices plural constants could be allowed. I won't focus on this issue here, but in the formalisms developed in Appendix I include plural constants in the plural quantificational framework.

[80] However, since plural variables can take one individual as argument, it is not strictly required to use ordinary first order quantifiers and variables. However, they make translations from English into the plural quantificational language more transparent so are used here.

[81] McKay calls this "non-distributive" predication.

[82] (2006, p. 57)

[83] Here I will ignore tense. I will simplify predicates into a single predicate term as in symbolizing 'gathered in the hall' as 'G' to allow for ease of exposition.

Distributive correlates of a collective predicate can be symbolized using the distributive or D-operator. This operator gives an 'involved in' or 'participated in' reading of a collective predicate. For instance if G^D were substituted in the above notation, it would say that each of Luke, Bert and Farrah were involved in gathering in the hall.

Distributive predication might also be treated using a 'D'-operator. To mark the difference between a case of distributive predication and a distributive correlate of a collective predicate, the 'D' might be subscripted and follow the sentence. So, 15 would be written:

$$T\lfloor l,b,f\rceil_{\mathrm{D}}$$

Since some predicates can be read as either distributive or collective, McKay suggests that one might also add a collective operator, 'C.' Suppose that Luke, Bert and Farrah collectively lifted a table and then each lifted that table individually. If one wanted to say this in a linguistic formalism one might write:

$$L\lfloor l,b,f\rceil_{\mathrm{D}} \,\&\, L\lfloor l,b,f\rceil_{\mathrm{C}}$$

While distributivity and collectivity operators might be useful, McKay notes that his framework already has features to capture both varieties of predication. Distributive predication can be captured with the among relation and singular and plural quantifiers. If distributive predication is captured using those devices, collective predication can be handled in the way shown above, without a 'C'-operator. Instead of treating 15 as:

$$T\lfloor l,b,f\rceil_{\mathrm{D}},$$

it can be treated as:

$$[\forall x\colon xA\lfloor l,b,f\rceil]Tx$$

This says that for each object that is among Luke, Bert and Farrah, it tripped on the rug. The objects among Luke, Bert and Farrah are Luke and Bert and Farrah. So, it says that each of these individuals is such that he or she tripped on the rug.

In treating distributive predication as involving universal quantification, McKay fails to allow for non-maximal truthmakers. That is, he cannot align himself with Theorist II's view on non-maximality phenomena. However, it is open for him to take Theorist III's pragmatic view of non-maximality. Presumably this is the strategy for which McKay would

opt. However, one might want to combine Theory II with McKay's general framework. Such a position is available.

One might argue that McKay was correct in showing that 'D'- and 'C'-operators could be prefixed to sentences (or clauses in a sentence). Where he went wrong, one might say, was in thinking that the 'D'-operator could be cashed out in terms of universal quantification. One might take the distributivity operator to be unanalyzable in terms of first-order quantification. Instead, it would be taken as a new, ineliminable operator. Rather than pursuing this view further, I will continue to examine McKay's view in conjunction with Theory III on maximality phenomena.

Mixed cases of predication can also be captured on this account. For instance 18 is formalized as:

$$G\lfloor l,b,f\rceil \,\&\, [\forall x\colon xA\lfloor l,b,f\rceil]Tx.$$

A plural quantificational treatment can capture collective and distributive predication of plural expressions.

McKay's theory can also capture the cumulative reference property. Suppose that we have the following sentences: (i) 'Luke tripped on the rug' and (ii) 'Bert and Farrah tripped on the rug.' If the CRP holds, from these sentences we should be able to conclude that 14 holds. McKay can capture this as follows:

(i') Tl

(ii') $[\forall x\colon xA\lfloor b,f\rceil]Tx$

From (ii') it follows that

(iii) Tb

and

(iv) Tf.

From (i'), (iii), and (iv) and the conjunction introduction rule we can conclude:

(v) $\mathrm{T(l)} \,\&\, \mathrm{T(b)} \,\&\, \mathrm{T(f)}$.

CRP is satisfied. In this way, any case of distributive predication can be shown to uphold the CRP.[84]

2.6 DEFINITE CONSTRUCTIONS

I next turn to how the two treatments handle definite plural expressions. I begin with the lattice theoretic treatment. Link takes an expression of the form 'the ___s' to denote the join of a semilattice. If the semilattice has three atoms (a, b, c), its join is a+b+c, the sum of a, b and c. The join of the semilattice can be denoted by an expression of the form 'σxFx' where 'σ' symbolizes the definite article, which is given Russellian truth conditions, and 'F' is the relevant property. So, for example, 'the boys would be symbolized as σxBx. Such a construction is used when 'the boys' is predicated distributively. The proper sum (that is, the sum to which **P applies) is utilized when a predicate is applied collectively to 'the boys.' It is written σ*xPx. Since this formulation shows that we are dealing with a proper sum, Link does not use the **P notation with it.[85] Instead, an unstarred P is used with such a formula. As shown, Link's semantics formalizes a subject expression depending on the way in which it is predicated. Take the following familiar examples:

19. The boys surrounded the table.[86]
20. The boys fell asleep.

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[84] As long as all of the premises are read as involving distributive predication, the CRP holds. Suppose that one of two premises involves distributive predication and the other collective predication. In such a case, the CRP will fail to hold. Take the following two premises: (1) 'A made 4 sales' and (2) 'B and C made 4 sales.' (1) is distributive (clearly, since only one individual is involved), while (2) is collective. From this, an introductory logic student wants to conclude that (3) 'A and B and C made 4 sales.' When discussing cases like this above, I said that a sentence like (3) has *only* a 4-sale or a 12-sale reading. If inferences like that from (1) and (2) to (3) were valid, we would have an 8-sale reading. Luckily, the CRP only applies to sentences involving distributive predication. Since (2) involves collective predication, one cannot use the CRP in conjunction with (1) to yield (3).

[85] **P notation is reserved for collective predication of plural constructions that are not definite-involving. For example, Link formalizes 'John and Paul are pop stars' as **P(j+p). Since 'are pop stars' does not apply to a singular individual, *P is not utilizable here.

[86] Since here we are primarily concerned with the treatment of the definite plural NP I have not represented 'the table' using a variable. Instead, I have built it into the predicate. If one prefers, the table could be explicitly represented.

These are formalized as 21 and 22, respectively:

21. $\exists y(y = \sigma * xBx \,\&\, Sy)$

22. $\exists y(y = \sigma xBx \,\&\, * Fy)$

While the subject expressions in 19 and 20 appear to be identical, their representations in 21 and 22 differ. This is due to the difference in predication.

One might take this distinction to be unjustified. Link's treatment could be augmented so that it represents all 'the ___s' constructions using 'σxBx'. Predication of such subjects could then be either mixed (*P) or collective (**P), depending on one's choice of predicate. In so doing, one could avoid positing a difference in formalism where there seems to be none in surface grammar. Further, this would allow for one to account for a plural definite sentence that involves both distributive and collective predication. For example take the following:

23. The boys surrounded the table and fell asleep.

While Link does not address such constructions,[87] I take it they would naturally be formalized as:

24. $\exists y(y = \sigma xBx \,\&\, ** Sy \,\&\, * Fy)$.

'The boys' will need to be read as a sum (and not a proper sum) so that the atoms of it are accessible to the second predicate. 'Surrounded the table' will need to be represented with '**' to show that it applies to only the proper sum. This will suffice for an explication of a lattice theoretic treatment of definite plural expressions. We can now turn to a plural quantificational treatment of such expressions.

McKay's treatment of the definite article follows Russell. He takes it to have "the idea of totality at its core."[88] He uses a notation like the following to symbolize "the students":

25. $\iota x x\colon Sxx_{\mathrm{D}}$.

[87] At least not in his (1983) or (1987), the relevant texts that are written in (or translated into) English.
[88] (2006, p. 165)

25 abbreviates the following:

26. $[\iota xx\colon [\forall z\colon zAxx]Sz]$.[89]

So, while the 'D'-operator is used in 25, it is only used as shorthand. This can be further broken down to cash out 'ι' in a way consistent with the Russellian model of the definite article. Using the 'D'-operator for simplicity, 'the students' can be formalized as:

27. $[\exists xx\colon Sxx_{\mathrm{D}}$ & $[\forall yy\colon Syy_{\mathrm{D}}]$ yyAxx].

This says that there are some students *xx* such that for any students *yy* you might select, they are among *xx*. We are now in a position to see how McKay can treat 19, 20 and 23. They would be treated as 28-30:

28. $[\exists xx\colon Bxx_{\mathrm{D}}$ & $[\forall yy\colon Byy_{\mathrm{D}}]$ yyAxx]Sxx

29. $[\exists xx\colon Bxx_{\mathrm{D}}$ & $[\forall yy\colon Byy_{\mathrm{D}}]$ yyAxx]$\mathrm{Fxx_D}$

30. $[\exists xx\colon Bxx_{\mathrm{D}}$ & $[\forall yy\colon Byy_{\mathrm{D}}]$ yyAxx] Sxx & $\mathrm{Fxx_D}$

The 'D'-operator amending 'Fxx' in 29 will allow for 'fall asleep' to apply to the individuals that are among the *xx*s. It could be eliminated in the way shown in the translation of 25 into 26 above. McKay is able to treat case of distributive, collective and mixed cases of distributive and collective predication of definite plural expressions.

2.7 NUMERALS

Next, I examine how the two semantic treatments handle plural numeral constructions. I use the following example:

31. Three adults lifted a piano.

This sentence has three readings. On a collective reading it says that three adults together lifted a piano. On the narrow scope distributive reading it says that three adults are such that

[89] Here too we see that McKay does not allow for non-maximal readings of plural-involving sentences. However, as addressed above, he would be able to account for non-maximality pragmatically.

each lifted some piano. Last, on a wide-scope distributive reading it says that there is a piano, which is such that each of three adults (individually) lifted it.

Link treats numerals as adjectives. He takes an expression like 'three adults' to denote the subset of the set of all i-sums of adults each member of which has exactly three atomic parts. So, if there are four adults, a, b, c and d, 'three adults' denotes the set of i-sums {a+b+c, a+b+d, a+c+d, b+c+d}. While on Link's account numerals are not taken to be quantifiers, he takes it that one might want numeral constructions like 23 to carry an existential quantificational element. To capture this without making the numeral itself a quantifier he adds an existential zero determiner.[90] This is symbolized as $Ø_{EX}$.[91] 'Three adults' is then prefixed with the existential zero determiner. This yields the meaning that there is at least one i-sum of three adults. In Link's formal language the existential zero determiner is omitted. However, it is included in the meaning postulate for a numeral construction. The lattice theoretic framework can capture the three readings of 30. The collective reading of 31 is expressed as:

$$\exists x \exists y[\ (3 * A)(x) \& P(y) \& L(x, y)]$$

Here '*A' denotes a plural property that applies to the i-sum x. The narrow-scope distributive reading of 31 is written:

$$\exists x[(3 * A)(x)\ \ \& \forall u[(u \Pi x\ \&\ ATu) \rightarrow \exists y[P(y) \& L(u, y)\ ]].$$

Recall that 'Π' is read as 'is an i-part of.' So, 'uΠx' is read as u is an i-part of x. The condition that it is only atomic i-parts of x is required to make the above a distributive reading. If that conjunct were not included it would require that every i-part lift a piano. That is, it would be a reading that required that each adult individually lifted a piano and each pair of adults lifted a piano and the three adults together lifted a piano. However, I argued above that such understandings of 31 should be captured by a variety of partitioned truthmakers for 31 rather than by multiplying its readings. Last, the wide-scope distributive reading of 31 is:

$$\exists y[P(y) \& \exists x[(3 * A)(x) \& \forall u[u \Pi x \rightarrow L(u, y)]]$$[92]

[90] 1987, p. 164

[91] He does not use the 'EX' subscript, but instead uses an existential quantifier as a subscript.

The three formalizations of 31 capture the array of readings and allow for the partitioned truthmakers that one might intuitively take to be possible. The first captures the pure collective reading. The second two capture two distributive readings.

Link takes the collective reading to require that "there has been at least one joint lifting with exactly three people involved."[93] His requirement that the lifting be done by exactly three people might seem a bit odd. That is, one might think that 31 would be true (although perhaps pragmatically infelicitous) in a situation in which four adults lifted a piano. When treated in Link's theory, 31 is false in such a situation. This has to do with the lack of distribution of collective properties to parts of the subject. That is, if there is a sum (a+b+c+d) that lifts a piano it is not the case that b lifted the piano. Further, it is not the case that a+b+c lifted the piano, for d may have played a vital part in the lifting. Given this formalism, a collective reading of a sentence with a numeral-involving plural subject like 'n Fs' requires that exactly n Fs be involved. Further examination shows that this is not a vice of the treatment.

Even if one takes it that in many cases a numeral, n, should be read as 'at least n,' one might hold that cases of collective predication are different. Imagine that five people lifted a very large piano. Suppose that one then attempted to report on this situation by saying, "Two people lifted a piano." Since we imagined the piano was extremely large, it might not be feasible for only two people to lift it. It seems that in such a case it is not simply pragmatically infelicitous, but false to assert that two people did the lifting. A case of surrounding might prove to be an even better example. Suppose that 70 people surrounded the state capital building. In such a case one cannot describe this situation by saying "Five people surrounded the state capital building." One might take this to show that collective predication imposes an exactness requirement on numerals that distributive predication does not. Link's theory captures this. Let's now examine how McKay treats numeral expressions.

McKay takes numerals to be quantifiers. He notes that when a numeral is used a paraphrase using 'some' is available. For instance take the following pair:

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[92] These follow the formulations given in Link (1991). Link does not treat cases like this in his 1983 or 1987.
[93] (1987, p. 165)

32. Nine officers met.

33. Some officers that are nine in number met.

33 is a paraphrase of 32. The first would be formalized as:

34. [9*xx*: O*xx*]M*xx*.

The latter would be formalized as:

35. $[\exists xx: Nxx \ \& \ Oxx]Mxx$.

Here 'N*xx*' is read as they the *xx*s are nine in number.

McKay takes the truth conditions of 32 and 33 (and hence of 34 and 35) to be equivalent. While they are clearly similar, one might worry that the truth conditions of the two diverge. That is, it might seem to one that 32 (and 34) would be true in a scenario in which 10 officers met. For, it says that nine *xx*s are officers and met, but this does not require that *only* nine officers met. Instead it only requires that *at least* nine officers attended the meeting. On the other hand, one might take 33 (and 35) to require that there are some *xx*s and that they are nine in number and met. However, as long as there are some *xx*s that are nine in number extra officers meeting will not force the falsity of 33 (or 35). So, the equivalence McKay draws between 31 and 32 is upheld. McKay's theory allows for the 'at least *n*' understanding of numerals when a predicate is applied collectively or distributively.[94] We saw that Link allowed for the 'at least' reading when predication is distributive, but not when predication is collective. The two theories come apart here.

McKay's paraphrase of 32 as 33 captures the way in which Link formalized numerals as adjectives. For McKay, numerals are quantifier phrases that can be unpacked into an existential quantifier and an adjective to be applied to the objects quantified over. McKay treats all quantifier phrases in this way. Link took numerals to be adjectives and not to be quantifiers. However, he prefixed numerals with an existential zero determiner, which functions as a pure quantifier. So, for Link and for McKay, numeral-involving sentences

[94] The way in which McKay's theory allows for the 'at least *n*' reading with distributive predication parallels the above examples exactly.

include a quantifier phrase. The difference between the two theories lies in the semantic value assigned to the numeral itself.

The cases I have examined in conjunction with McKay's account do not allow for partitioned truthmakers. To explore whether his theory can be amended to handle any partitioned truthmakers I will look at its treatment of 31, repeated as 35 for convenience:

36. Three adults lifted a piano.[95]

The following three formalizations capture the three readings that Link was shown to have captured—the collective, the narrow-scope distributive and the wide-scope distributive. Here 'D' denotes 'adult.'

Collective $[\exists y: Py[3xx: [\forall z: zAxx]Dz]L(xx, y)]$

N-S Distributive $[3xx: [[\forall z: zAxx]Dz \,\&[\exists y: Py]\, L(z, y)]]$

W-S Distributive $[\exists y: Py[[3xx: [\forall z: zAxx]Dz\ ]\ L(z, y)]$.

2.8 'ALL'

In discussing 'all,' Link says that one might suppose that it forces distributivity. However, he takes it that there are examples of collective predication which allow for the addition of 'all.'[96] For instance

37. The men held a reunion

and

38. All the men held a reunion

are both felicitous. So, it seems, 'all' does not force distributivity. However, Link takes the addition of 'all' in 38 to be redundant. That is, he takes the truth conditions of 38 to be identical to those of 37.[97] Perhaps this is because he takes holding a reunion to be something

[95] For simplicity I, again, ignore tense here.
[96] See also Brisson (2003)
[97] (1987, p. 169)

that no individual can do. That is, alone in my office I cannot hold a high school reunion. Some other people from my high school need to be there for it to count as the holding of a reunion. This fits nicely with the way in which I cannot reunite alone.

There are other cases in which he takes 'all' to contribute something to the truth conditions. Take his:

39. The men were in serious trouble.

40. All the men were in serious trouble.

He says that 40 forces "totality."[98] That is, it requires that every one of the men are in serious trouble. Contrastingly, 39, Link says, might be true even if "not every man finds himself troubled individually."[99] 'All' requires that every one of the individuals in the i-sum satisfy the predicate. So, we see Link draws a distinction between the use of 'all'-constructions with collective predication and those with distributive predication.

Link's discussion of 'all' gives us a glimpse into his view of maximality. He seems to think that plural-involving sentences with distributive predication allow for non-maximal truthmakers. He explicitly says that this is the case for 39. However, he defines distributive predication in terms of universal quantification. That is if *T(σxMx) is true, then for all x, if x is a man, then x is in trouble. This says that if 'are in serious trouble' applies to the men, then for anything that is a man, it is in serious trouble. Clearly this is a requirement for maximality. Given this, what Link takes to be the difference between 39 and 40 is mysterious. Perhaps he takes the difference to be that 37 forces totality pragmatically. That is, he might think that 39 is felicitous, but false in a situation in which some man is not in serious trouble, while 40 is infelicitous and false in such a situation. If Link wants to explain our intuitions, he must do so via a pragmatic story about maximality like that of Theorist III.

Link captures the behavior of 'all' as shown in the following simple sentences:

41. All the soldiers died

42. $\exists y(y = \sigma x S x \;\&\; *Dy \leftrightarrow \forall u[S(u) \rightarrow D(u)])$

[98] Ibid.
[99] Ibid.

43. All the soldiers gathered

44. $\exists y(y = \sigma * xSx \,\&\, Gy) \leftrightarrow \forall u(u \sqcap y \rightarrow {}^{D}{*}\, G(u)]$

42 says that there is an object that is the sum of the soldiers and the mixed predicate 'died' applies to it if, and only if, anything that is a soldier, is such that it died. This makes explicit that total satisfaction of the predicate is necessary for the truth of 41. However, as we saw above, he formalizes a sentence like 'The soldiers died' in the same way. So, 'all' does not make a truth conditional (or formal) difference. 44 says that there is a proper sum of the soldiers and it gathered if, and only if, anything that is an i-part of it, partook in the gathering. Here I introduce '^{D}*G(u)' to symbolize the mixed distributive correlate of 'gather.' It is read as 'u partook in gathering.' Here 'u' might be either an atom or a non-atomic i-part of y.[100] This will serve for a brief explication of a lattice theoretic treatment of plural-involving 'all' expressions. I will next examine how a plural quantificational theory can account for these cases.

McKay introduces two universal quantifiers. The first is the ordinary universal quantifier, ∀, which is equivalent to ¬∃¬. The other universal quantifier, Λ, cannot be so defined. Instead it allows for the truth of a universal claim about some *xx*s in conjunction with the claim that some of the *xx*s fail to satisfy the predicate. To see why the second universal quantifier is needed take the following pair of sentences:

45. All (of the) students are surrounding the building.

46. Some students are not surrounding the building.[101]

If the building in question is large, it might be the case that together the, say, 100 students are surrounding the building, while still false concerning three students who are standing near one another that they are surrounding the building. Both of 45 and 46 might be truly used to report on such a situation. If 45 were to be formalized using the ordinary universal

[100] Link does not (in any English translation available) formalize a sentence like 35. The formalization in 36 is my own. However, it follows the spirit of his theory closely.

[101] These are from McKay (2006, p. 74)

quantifier the negation of 46 would be entailed. Since 45 and 46 are consistent, the other universal quantifier must be employed in a formalization of 45. Such a formalization follows:

47. $[\Lambda xx\colon Sxx_{\mathrm{D}}]Bxx$.

Here 'B*xx*' says that they (the *xx*s) surrounded the building. That is, it says that many individuals are such that they surrounded the building. In referring to these individuals using 'they' a sum is not formed. Instead, 'they' picks out the many individuals.

The two universal quantifiers are equivalent when predication is distributive.[102] In McKay's theory distributive predication is required to be maximal. When a predicate is said to apply to each of the *xx*s it is not consistent to then assert that it fails to apply to one (or more) of the *xx*s. So, any application of a distributive predicate (p) to some *xx*s is a case in which there can be no *z* which is among the *xx*s but which does not satisfy p. No exceptions are allowed for in cases of distributive predication, so our ordinary universal quantifier serves our purposes.

Recall that I had been taking McKay to require a pragmatic treatment of maximality (given his treatment of distributive predication and some subject expressions). However, one will notice that by adding a second universal quantifier, he might allow for some non-maximality. He explicitly states that it might be (and often is) the case that a predicate will apply to many individuals collectively, but not to any of the individuals individually. One might also use 'Λ' to say that while it is the case that a collective predicate applies to some things, it may also be the case that the distributive correlate of that predicate fails to apply to some of those things. For instance it might be the case that the students are surrounding the building even if there are some (relevant) students who are not among the students surrounding the building. In addition, one might redefine distributive quantification using 'Λ' rather than the ordinary universal quantifier. In so doing the two quantifiers would fail to be equivalent even in cases of distributive predication. While McKay does not chose to do either of these things, a proponent of his overall theory who is a friend of a semantic

[102] Since predication of a singular thing is akin to distributive predication (in that it must satisfy the predicate to ensure that truth of the sentence), showing that the two universal quantifiers are equivalent in cases of distributive predication will serve to show that the two are equivalent when predicating a single thing.

account of non-maximality might do so by altering McKay's theory in some (fairly) minor ways.

In addition, Link's lattice-theoretic account might be amended to include 'Λ' as an additional universal quantifier. The lattice theoretic account could then capture the failure of the inference from 45 to 46. Further, then it too could be combined with a semantic account of non-maximality.

2.9 'SOME'

In this section I turn to the last expression type examined here—plural-involving 'some' constructions. By now it should be fairly clear how the two theories function, so the discussion will be brief. Again, I examine the lattice theoretic treatment first before turning to the plural quantificational treatment.

Let's examine a sentence in which the predicate might be read as distributive or collective. Link uses an example like the following:[103]

48. Some men carried a table.

On its distributive reading, 48 says that some men individually carried a table. On a collective reading, it requires that together as part of a joint effort some men carried a table. These are represented in the lattice theoretic framework as 49 and 50, respectively:

49. $\exists x[* M(x) \,\&\, \forall u[(u \sqcap x \,\&\, ATu) \rightarrow C(u)]]$

50. $\exists x[* M(x) \,\&\, ** C(x)]$.

Here 'C' stands for 'carried a table'. It is unstarred in 49 as, being the distributive reading, it is only atomic individuals that are required to carry the table. In 50 'C' is single starred as it is the sum of men that are carrying the table.

In a plural quantification treatment 48 is represented with its distributive reading in 51 and its collective reading in 52:

[103] (1991, p. 437). His notation in his 1991 differs slightly from that in his 1984 and 1987. For continuity, in the formalisms given here I, when possible, use the notation explicated in his 1984.

51. $[\exists xx\colon [\forall z\colon zAxx]Mz]$ & $[\forall z\colon zAxx]\ Cz]$

52. $[\exists xx\colon [[\forall z\colon zAxx]Mz]$ Cxx]

Cases of mixed distributive and collective predication can be handled in the same way as the cases discussed above.

I have shown how two semantic treatments of plurals compare in their treatments of five sorts of plural-involving expressions. While this investigation has certainly not been thorough enough to show that all of the linguistic data can be handled, it has, I hope, given the reader a feel for how each treatment can handle some primary examples of plural expressions. We saw that the two treatments are extremely similar in many cases. For example, they both appeal to Russellian truth conditions for plural definite descriptions. They do, however, have some differences in the ways they handle plural constructions. Most importantly, the lattice theoretic treatment takes plural expressions to denote summed entities, while the plural quantificational approach takes plurals to refer multiply to many ordinary individuals. Other differences between the two are particular to the frameworks developed by Link and McKay. For instance, Link takes numerals to be adjectives that come with an existential zero determiner. McKay, treats numerals as quantifiers that are equivalent to expressions with an existential quantifier and a numeral predicate (e.g., 'are three in number'). While these accounts are slightly different, a Singularist account could be developed that took numerals to be quantifiers. Similarly, a Pluralist account could take numerals to be adjectives that come with a hidden existential zero determiner. The differences come down to particularities in systems developed by two semantic theorists. They do not point to a general distinction between Singularist and Pluralist treatments.

The examination in this Chapter thus far gets us part of the way towards the view that Singularist and Pluralist treatments of plural expressions are both semantically adequate. In the next section I sketch how the examination in this Chapter shows how the two treatments capture some of the criteria for semantic adequacy. I then sketch (and further develop in an appendix) how a more general account for the semantic adequacy of both

treatments might be carried out. Finally, I apply the PCC to argue that plural-involving theories carry indeterminate ontological commitments.

2.10 TREATMENTS OF PLURALS AND SEMANTIC ADEQUACY

I have shown how a Singularist and a Pluralist handle phenomena involving a variety of plural expressions including conjunctions, definite plural expressions, numerals, 'all'-involving expressions and 'some'-involving expressions. In this section I assess the extent to which the Singularist and Pluralist treatments can be seen to capture the criteria for semantic adequacy given this case-by-case examination.

Recall that I argued that to be semantically adequate a treatment must:

(i) Capture the phenomena in the data,
(ii) Satisfy (i) while respecting patterns in the data,
(iii) Be extendable to a larger set of data,
(iv) Be motivated by the semantic data and phenomena, not ontological or metaphysical views,
(v) Capture (i)-(iv) at least as well as any other candidate semantic treatment.

Let's assess how the Singularist and Pluralist meet these in turn.

Both treatments are able to capture the variety of plural expressions canvassed. They both assign the intuitive truth-values to actual occurrences of sentences. For example, in a situation in which Anne is asleep, Bob is asleep and Scott is asleep the sentence 'Anne, Bob and Scott are asleep' is assigned 'True' by the proponent of a lattice theoretic treatment of plurals and the proponent of a plural quantificational treatment of plurals. Further, we saw how both capture the distinction between collective and distributive predication, the cumulative reference property and allow for a variety of truthmakers. However, one might argue that since not *all* plural-involving data has been examined, there could be a case that only one of the treatments can handle. While it is certainly not the case that I've covered all of the possible data, I have examined a fairly broad range of expression types and phenomena. Both treatments were able to handle all of these well. So, we can defeasibly conclude that both meet (i).

Given the data that has been canvassed, the Singularist and Pluralist both satisfy (ii). We saw how each treats all conjunctions similarly, and all definite plural expressions similarly and so on. Further, we saw that each treatment treats like phenomena (e.g., collective predication) in the same way regardless of what plural expression an instance of the phenomena involves. For example, the predication in 'some of the students gathered in the hall' and 'all of the boys gathered in the hall' and 'the girls gathered in the hall' is treated identically. It is natural to suppose that in general both treatments will treat like phenomena in like ways. So we can, again defeasibly, conclude that both meet (ii).

Both treatments are systematic. While I have not given a full formal specification of either treatment, one could. In so doing, one would see how the treatments handle predicates, terms, conjunctions and so on more generally. So, it seems that both meet (iii).

There is however a potential worry as to whether both treatments can capture (iii). One might argue that the Pluralist treatment can and the Singularist treatment cannot handle sentences like 'There are some sets that are all and only the non-self-membered sets.' However, so long as the Singularist appeals to sums, as in the lattice-theoretic treatment given above, both Pluralist and Singularist treatments can treat the sentence. The Singularist takes 'some sets' to denote a sum of sets, while the Pluralist takes it to plurally pick out many sets. No paradox arises on either construal. Further, since all sums have themselves as individual parts an analogous puzzle for the sentence 'There are some sums that are all and only the sums that are not i-parts of themselves' does not arise. That sentence, unlike the sentence about sets, is unproblematically false. So, if a general systematic account is given for each treatment both can be taken to meet (iii).

How the two treatments capture the fourth criterion, that any semantically adequate treatment must be motivated by the semantic data and phenomena, not ontological or metaphysical views, requires a bit of explanation. One might argue that the Pluralist fails to satisfy (iv) as she is motivated by parsimony. The Pluralist does, after all, hold a more parsimonious account than the Singularist. There are two responses to this argument.

First, one might appeal to intuitions to argue that the data is as parsimonious as the Pluralist claims. For example, Boolos famously said, "It is haywire to think that when you

have some Cheerios, you are eating a *set*."[104] He claimed that we do not take plurals to require new entities, whether sums or sets. It is not, according to this line of thought, that the Pluralist is paraphrasing away entities that seem to be referred by our expressions, but that the Pluralist is refraining from adding additional entities.

Second, I argue that both the Pluralist and the Singularist treatments are motivated by semantic phenomena. However, the two differ in which phenomena they take as their primary motivation. The Pluralist is motivated primarily by distributive predication, while the Singularist is chiefly motivated by collective predication. Pluralists take cases in which plurals are used to say of many things that each one is F to be their principal motivator. They then handle collective predication by allowing plural reference and plural satisfaction by many individuals. Singularists, on the other hand, prioritize cases in which some things *together* satisfy a predicate. Distributive predication is then handled through structuring the domain so that plural subjects have a privileged decomposition into atomic parts. Pluralists and Singularists are both motivated by semantic data and phenomena.

Finally, so long as systematic specifications can be given for the Pluralist and Singularist treatments that show that they are treat like phenomena in like ways and are extendable, criterion (v) is met. We have defeasible evidence that the two treatments both meet the criteria for semantic adequacy. So, we might (again defeasibly) conclude that the two are equally semantically adequate and that both should have a voice in delivering the ontological commitments of natural language theories. However, one might hope for a more general account that does not rely on a case-by-case examination and which proves that the two meet the criteria equally well. In the next section I sketch how one might go about setting up such an argument.

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[104] (1984, p. 448–9)

2.11 SKETCHING A MORE GENERAL ARGUMENT

To show more generally that the two treatments are equally good on semantic grounds I sketch how one might argue that the two are variants of a sort. Further, I sketch how one might go about proving that the two treatments differ merely in terms of ontology.

In Chapter 1 I stated that a treatment is a system, which is made up of a lexicon and syntactic and semantic rules, plus an intended interpretation. The intended interpretations deliver the class of intended models, thereby fixing whether a treatment attributes to theories it treats commitments to, for example, sums.

Giving an interpretation of a system involves a move to a meta-level. For, the system is taken as the object that the interpretation interprets. Further, since the systems that are being interpreted are used to treat natural language sentences, these too are at a level above the object level. So, the picture we have involves three levels. First, there are object level theories composed of natural language sentences. Second, there are systems that are at a meta-level. Third, there are interpretations of systems at the meta-meta-level. The semantic treatments discussed in the preceding chapters include intended interpretations. By including intended interpretations in a treatment the meta-level is informed by the meta-meta-level, without a move to successively higher meta-levels. Further, including intended interpretations settles questions of the ontological commitments a treatment attributes to the theories it treats. For example, Singularist treatments attribute to plural-involving theories a commitment to summed entities while Pluralist treatments fail to attribute such commitments.

In this section I set up the combinations of systems and interpretations that are available. Further, I argue that if the following claims are true, a general argument for the equal semantic adequacy of the two treatments can be made:

> Claim 1: Both systems have an available interpretation that delivers treatments that attribute to plural-involving object language theories a commitment to summed entities.

Claim 2: Both systems have an available interpretation that delivers treatments that fail to attribute to plural-involving object language theories a commitment to summed entities.

The treatments delivered according to Claim 1 will be the Singularist treatment that has been under discussion and a treatment that uses the language of the Pluralist (e.g., that uses the 'among'-relation), but which also attributes an ontological commitment to sums to plural-involving theories. The second treatment can be called the Pluralist+Commitment treatment. The treatments delivered by Claim 2 will be the Pluralist treatment and a treatment that uses the language of the Singularist (e.g., that uses '+' between constants), but which fails to include any sums in its models. The latter treatment can be called the SingularistNoCommitment treatment. A table summarizes how the variety of systems, interpretations and treatments interacts.

	Singularist Interpretation	**Pluralist Interpretation**
Singularist System	Singularist Treatment	SingularistNoCommitment Treatment
Pluralist System	Pluralist+Commitment Treatment	Pluralist Treatment

Table 2.2: Systems and Interpretations

The treatments in the column headed by 'Singularist Interpretation' would be used in justifying Claim 1. Those in the column headed 'Pluralist Interpretation' would be used to justify Claim 2.

In the Appendix I give some justification for each claim. I do so by laying out the treatments with some formal detail. I also sketch how one might argue for the view that the Singularist Treatment and the Pluralist+Commitment Treatment are notational variants with isomorphic models and that the Pluralist and SingularistNoCommitment Treatments are notational variants with isomorphic models. If these sketches can be expanded to complete

proofs, then the two treatments in the first pair are equally semantically adequate and similarly for the two in the second pair. However, we still would not yet have a sketch of a general argument that the Singularist and the Pluralist treatments are equally semantically adequate. It is this conclusion that was sought.

While the arguments sketched in the Appendix do not show that the Singularist and the Pluralist treatments are equally semantically adequate, they point in that general direction. The domains in the intended models for the Singularist and Pluralist differ in whether they are closed under the join operation. The Singularist's models domains are closed, while the Pluralist's are not. The differences in assignment functions are based on using only 1-1 functions or by allowing 1-1 and one-many functions. Variations in the two treatments truth theoretic definitions follow from the differences in the treatments' models. Either sums are referred to and quantified over or individuals can be referred to and quantified over plurally. These changes are focused on purely ontological considerations rather than on considerations about semantic data or phenomena.

Recall that ontological considerations that go beyond theoretical parsimony have been excluded from the conditions on semantic adequacy. For, here we are investigating the extent to which semantics might guide us in answering ontological questions. If ontological views are made requirements for semantic adequacy, semantics cannot guide us in ontological inquiry. So, if, as it seems, it is correct that the differences in the interpretation that is part of the Singularist treatment and the interpretation that is part of the Pluralist treatment are based purely on differing ontological views, the two treatments fail to differ in any ways that are relevant to semantic adequacy. Here, I have given a sketch of how an argument for the general conclusion that the two treatments are equally semantically adequate might go. Next, I apply to PCC to deliver the unrelativized commitments of plural-involving natural language theories.

2.12 INDETERMINATE ONTOLOGICAL COMMITMENTS

In Chapter 1 I argued that equally semantically adequate semantic treatments should be given equal weight in determining the ontological commitments of the theories they treat. I have given an argument based on a case-by-case examination that Singularist and Pluralist treatments of plural-involving theories are equally semantically adequate. I have also sketched how a more general argument might be made. So, I conclude that there are two equally semantically adequate treatments of plural-involving theories. Further, the treatments differ in the ontological commitments attributed to plural-involving theories. The Singularist treats plural-involving theories as carrying commitments to summed entities, while Pluralists fail to do so. I argued in Chapter 1 for the Principle of Carrying Commitments. The PCC delivers unrelativized commitments when multiple equally adequate semantic treatments exist. I repeat the principle here.

> *Principle of Carrying Commitments (PCC):* A theory, T, (a) determinately carries a commitment to Fs iff all of the adequate semantic treatments attribute an ontological commitment to Fs to T; (b) determinately does not carry a commitment to Fs iff all of the adequate semantic treatments fail to attribute an ontological commitment to Fs to T; (c) neither determinately carries nor determinately does not carry a commitment to Fs iff some adequate semantic treatments of T attribute a commitment to Fs to T and some fail to attribute a commitment to Fs to T.

Plural-involving theories fall under clause (c) of the PCC. There are adequate semantic treatments of such theories that attribute to them a commitment to summed entities and adequate semantic treatments that fail to attribute to them a commitment to summed entities. So, plural-involving theories neither determinately carry nor determinately fail to carry commitments to summed entities. The semantics of any plural-involving theory, T, fails to deliver a determinate answer to the question 'What are the ontological commitments of T?'

Chapter 3:

Collective Nouns—Data & Phenomena

Collective nouns seem to denote things which seem to be both one and many. For instance, the army is a unit and is made up of soldiers. A family is one and we are a family. In this chapter I examine the linguistic behavior of collective nouns. I begin by canvassing and organizing collective noun involving data. Then, I turn to ways in which the data might be understood. Here I examine and argue against only a pragmatic treatment of the data. In the next chapter I turn to examinations of semantic treatments of the data.

I begin in Section 3.1, by examining definitions and defining features that have been proposed for collective nouns. In 3.2 and 3.3, I investigate the ways in which collective nouns can be predicated and their numerical agreement behavior, respectively. Then, in Section 3.4 I discuss a general cross-linguistic hierarchical pattern—the Agreement Hierarchy. I explain how it relates to the agreement behavior of collective nouns. Finally, in Section 3.5 I explicate a pragmatic treatment of the behavior of collective nouns. I argue that a pragmatic treatment cannot handle the range of data, so should be rejected.

3.1 Features and Potential Definitions of Collective Nouns

Collective nouns have been defined according to syntactic and semantic features. Syntactic definitions appeal to the behavior of collective nouns in terms of agreement and complement clauses. It has been noted that they allow for both singular and plural verb and pronoun agreement. For instance, one might utter

1. The group trusts their leader.

Here 'their' is a plural possessive pronoun. It is related to the denotation of 'the group.' Even though 'the group' is singular and takes a singular verb it allows for the use of a plural possessive pronoun. Juul (1975) and Crystal (1997) give syntactic definitions of collective

nouns. Their definitions appeal to the agreement behavior of collective nouns. Both take collective nouns to be the class of nouns that can co-occur with a singular or a plural verb. Quirk et al (1985) have a broader definition of collective nouns. They take them to be nouns that can co-occur with a singular or a plural verb or singular or plural pronoun. Since agreement behavior is found in grammar, such definitions are called syntactic definitions. In Section 3.3 I examine the agreement behavior of collective nouns more closely. We will see that Juul and Crystal's definitions of collective nouns are too strict. For, in American English what is often thought to be a paradigmatic case of a collective noun (e.g., 'team') might not be acceptably combined with a plural verb. Defining collective nouns as those expressions which allow for singular or plural agreement with verbs or pronouns better captures a class of expressions in British and American English.

Barker (1990) gives a syntactic definition of collective nouns[105] that does not appeal to agreement. He takes something to be a collective noun if it can take an 'of'-phrase with a plural complement. For example:

2. the group of armchairs
3. a committee of journalists

He takes it that collective nouns cannot take singular 'of'-complements as in:

4. *the group of armchair
5. *a committee of journalist

While taking of-phrases with plural complement phrases is a necessary condition for collective noun, it is not sufficient. To see why take:

6. a picture of horses
7. a barrel of monkeys

'Picture' and 'barrel' can take plural 'of'-phrases even though they are not thought to be collective nouns. Barker takes such phrases to differ from collective nouns in their ability to take of-phrases with singular complements as in 9 and 10.

[105] He calls these 'group terms'

9. a picture of a horse

10. a barrel of water

So, according to Barker, some expression is a collective noun if, and only if, it can take an of-phrase with a plural complement and cannot take an of-phrase with a singular complement.

One might argue that Barker's distinction does not cut across collective nouns and non-collective nouns perfectly. In at least British English, and possibly in American English, the following phrases are acceptable.

11. a pride of lion[106]

12. a flock of pheasant.

Since both 11 and 12 employ collective nouns with singular 'of'-phrases one might argue that Barker's claim is mistaken. However, it seems that collective nouns can only be combined with singular count noun complements which include terms for animals which are or were hunted. So, perhaps Barker's claim could be weakened to the following: something is a collective noun, if, and only if, it can take an of-phrase with a plural complement and can take an of-phrase with a singular count noun complement only if the singular complement refers to an animal which is or was hunted. Clearly this is a weaker criterion than Barker sought. Further, the criterion appears ad hoc and not like the sort of thing that would be definitional. In addition, such a criterion is no longer purely syntactic. Instead, the meanings of of-phrases which are combined with a candidate collective noun must be considered. So, such a move is not available to someone whose aim is to give a purely syntactic definition of collective nouns. Next let's examine definitions which are semantic in nature.

Semantic definitions tend to focus on the sorts of things denoted by collective nouns. Collective nouns are usually taken to denote collections that are singular and are composed of individuals. The collections have a privileged decomposition usually into things of the same basic kind (e.g., judges or lions). The class of collective nouns is then defined in

[106] Mark Sainsbury gave me this example in conversation and suggested the point to which I put it to use here.

terms of a sort of denotation. If the denotation specified above is correct, collective nouns are the sorts of expressions that denote collections composed of individuals.

A semantic definition like that above fails to specify exactly what counts as a collection which is both singular and made up of individuals. For example, it seems that a book is singular. We do say things like 'A book is on the table.' Here we are treating a book as a singular entity. We also know that books are made up of pages. That is, there are many individual sheets of paper that make up a book. So, a book is the sort of thing that is singular and made up of individuals. Without specifying what counts as an individual and what counts as composing a collection, a definition of collective nouns based on denotations will be too broad. For without definitions of what sorts of individuals form the collections that collective nouns purportedly refer to words like 'book' and 'person' will be collective nouns in the same way as 'pride,' 'fleet' and 'team.' However the former expressions display patterns of behavior that differ quite significantly from the latter expressions. A definition of collective nouns should be able to draw a line between them. Since attempting to define individuals and composition relations is notoriously difficult,[107] a definition based on precise definitions of these concepts seems ill fated.

Other varieties of semantic definitions divide collective nouns according to other semantic features they possess. By dividing the class of potential collective nouns we might hope to avoid the need for broad definitions of individuals and composition. Collective nouns can be split into subclasses based on features that appear to capture interesting division in the expressions' behavior.

Whether a collective noun denotes a collection of animate or inanimate things has been linked to the noun's agreement behavior. For instance, 'army' denotes a collection of

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[107] For example, the special composition question, the question as to when some entities together compose a further object, would need to be grappled with. There is an extensive literature on ways to answer that question. See, for instance, van Inwagen (1987) and (1990), Sanford (1993), Horgan (1993), Merricks (2001), or Markosian (2008). One would hope that answering the special composition question could be avoided in understanding what it takes to be a collective noun. For, speakers do seem to agree as to what expressions are and are not collective nouns, and there is significant disagreement about answers to the special composition question.

humans and 'forest' denotes a collection of trees. Corpus studies[108] have shown that collective nouns denoting human groups allow plural agreement most often, followed by those denoting non-human animate groups and last, by those denoting inanimate groups, which rarely or never allow plural agreement. For example, we saw that sentence 1, repeated below, was natural.

1. The group trusts their leader.

The naturalness of plural agreement has been explained through an appeal to the animacy and humanity of the members of the group. Cases in which an inanimate collective is denoted differ from 1. Suppose that I see that a group of loggers has come into a nearby forest. I utter:

13. The forest has been infiltrated by their enemy.

Here 'their' cannot be understood as anaphoric on 'the forest.' However, substituting 'the army' for 'the forest' as in 14 yields a grammatical and easily interpretable sentence.

14. The army has been infiltrated by their enemy.

Animate non-human collections fall in the middle. For example take:

15. The pride follows their leader.

15 might be a bit unnatural, but far less so than 13. These "naturalness" judgments fit with the spread of plural and singular agreement found with human animate, non-human animate and inanimate collections in corpus studies.

Persson (1989) advocates dividing collective nouns into subclasses based on two additional features—volition and mobility. He takes these to capture features that animacy, as a single feature, might run together. A collection has the feature of volition if its members can join or leave the group. It has the property of mobility if the group can move. The

[108] See Levin (2001) for an example of such a study and for references to other studies.

following table represents the variety of categories of collective nouns according to these two features with example for each.[109]

Features	**Collective Noun**	**Constituents**
+Volition +Mobility	club	members
+/-Volition +Mobility	army	soldiers
-Volition +Mobility	litter	kittens
-Volition -Mobility	forest	trees

Table 3.1: Volition and Mobility

Persson argues that plural agreement does not occur with collectives that lack both volition and mobility.

Collective nouns have properties in common with plural count nouns and with mass nouns. Like plural count nouns, they have a privileged decomposition into parts. For example, a committee has a privileged decomposition into committee-members. Similarly, the boys denoted by 'the boys' has a privileged decomposition into individual boys. The denotations of both mass nouns and collective nouns are agglomerative.[110] In adding more stuff or more members to a mass or a collection, one does not thereby get another mass or another collection. For instance, if there is gold on the scale, adding more gold still means that there is gold on the scale. Similarly, if there is a committee, adding more committee-members still means that there is a committee. One does not get more golds or more committees by adding to a mass of a substance or by adding members to a group.

[109] (1989, p. 182)
[110] Rijkhoff (2000, 232)

To review we have seen that collective nouns have at least the following behavioral patterns and features. They:

(1) Can take singular or plural verb or pronoun agreement

(2) Can take 'of'-phrases with plural complements and usually fail to take 'of'-phrases with singular count noun complements

(3) Seem to denote collections with members

(4) Behave differently when the collection denoted is made up of humans, non-human animates, things that are mobile or things that have volition.

(5) Have privileged decomposition into members

(6) Are agglomerative in that they can gain new members without thereby creating another collection.

Some of these characteristics are less clearly definitional than others, but together they serve to give a characterization of the sort of expressions upon which our investigation is focused. Next, I turn to a more thorough examination of the behavior of collective nouns.

3.2 COLLECTIVE NOUNS AND PREDICATION

In Chapter 2 I discussed how plural expressions might be predicated distributively or collectively. One might assume that collective nouns are nouns that are always predicated collectively. However, there are two notions of collective at play here. The first has to do with a predicate applying to some things together rather than applying to each of those things individually. The second has to do with how things make up the denotation of an expression. The denotation of 'team' is collective in apparently being a collection of things, in this case, a collection of players. This notion of collective is distinct from the notion of an action or an instance of predication being true of or carried out by some individuals together. Instead, it is collective in the sense of composition. A collection is made up of many things. These things often do act together, but they might also act individually and

predicates might truly apply to the group in virtue of them truly applying to the many individuals in the group.

To further emphasize the difference between these two notions let's examine the ways in which collective nouns can be predicated. The following sentences show a range of predicates applied to collective nouns.

16. The team surrounds the building
17. The team surround the building.
18. The committee voted yesterday.
19. The court put on robes before the hearing.

Here the predicates in 16 and 17 are most naturally taken to be collective. It is some many things that surround the building, not each individual that does so. At least one of 16 and 17 and possibly both are acceptable. American English speakers are likely to take 16 to be correct, while British English speakers are likely to take both to be acceptable. Either way we see that collective nouns can be predicated collectively.

The predicates in 18 and 19 are naturally although not necessarily read as distributive. In some cases a committee has only a single vote. In a report of such a case 'voted' would apply to the committee collectively. 18 might be uttered to describe such a situation. However, it is more common for the members of a committee to each have a vote. In such cases, 'voted' applies to the committee distributively. It is the individuals that make up the committee that voted. 19 is a clearer case. In it the court is said to put on robes. Putting on a robe is not something that is generally done collectively. That is, we do not usually put a robe around multiple people or require many people to put a robe on some one person. So, the most natural way to understand 19 is as involving distributive predication. It is to be understood as saying that the members of the court each put on a robe before the hearing. These examples show that collective nouns can be predicated collectively and distributively. In the next section I turn to the agreement behavior of collective nouns.

3.3 COLLECTIVE NOUNS AND AGREEMENT

The following sentences are all judged to be acceptable by British English speakers.

20. The committee was late to the event.
21. The committee were all in attendance.
22. The group plans to have a benefit in June.
23. The group plan to have a benefit in June.

American English speakers take the even numbered sentences to be acceptable, while many take 21 and 23 to be somewhat odd or ungrammatical. British English speakers allow for singular collective nouns to be predicated with singular or plural verb phrases. For example in 22, 'to plan' is singular while in 23, it is plural. If one aims to capture all dialects of English with a single semantic treatment of collective nouns, the ability for collective nouns to allow for singular and plural verb agreement must be captured.

All English dialects allow for what appears to be agreement shifting by unbound pronouns. Take the following:

24. The Supreme Court is in session. They are deliberating today.

Here 'they' in the second sentence refers to the Supreme Court justices. Even though the justices have not been explicitly mentioned, one might take this use of they to be an anaphoric rather than deictic use. In anaphoric uses of pronouns, the pronoun "picks up on" the referent of a previous expression. In deictic uses, the pronoun refers to something in the context that has not been mentioned. A deictic pronoun might do so given some extra-linguistic demonstration. In other cases some element of the context is salient enough to be picked out without previous mention or demonstration.

Since there is a likely interpretation of 24 in which 'they' refers to the justices and no demonstration is made, it is plausible that 'they' can be anaphorically dependent on 'the Supreme Court.' This is the case even though the one use of 'the Supreme Court' took singular verb agreement in the first sentence. Example 24 is acceptable in British and

American English, thereby giving evidence that agreement shifting is possible in both dialects. However, since the use of 'they' in 24 is unbound alternative explanations might be offered as uses of unbound pronouns are flexible. To find more solid evidence of agreement shifts we might look for a bound use of a pronoun with a numerical feature that contrasts with that of the verb. Cases of possessive and reflexive pronouns offer such evidence. The following sentences have occurrences of bound possessive pronouns:

25. After every win, the team dumps Gatorade on their coach.

26. After every win, the team dumps Gatorade on its coach.

In 25 the pronoun is plural, in 26 the pronoun is singular. In both the verb is singular. Since (a) the verb is singular and (b) the pronoun is contained within the same clause as the verb and (c) the collective noun on which both are dependent is singular, one would expect 26 to be acceptable and 25 to be unacceptable. However, in an informal poll of native American English speakers 25 was taken to be as good or better than 26. So, we see that shifts in agreement in a single clause are possible with possessive pronouns.

When collective nouns are embedded in conditionals agreement shifts are also possible. For example:

27. If a team has the worst record, their MVP isn't helping enough.

28. Inspections may come sooner if a department indicates that they are ready for evaluation.[111]

29. If a team is large, it might help to break them down into smaller discussion groups.[112]

Three different types of plural pronouns are used in 27-29. In 27 a possessive pronoun is used, in 28, a personal pronoun and in 29, an indirect objective pronoun. Since the extensions of the plural pronouns in the consequents vary with the choice of a particular team or department in the antecedent, there must be a connection between the collection as one and as many. Perhaps we should take the pronouns in the consequent to be *semantically*

[111] Found on the website of Wayne Goodwin, State Fire Marshal of North Carolina (http://www.ncdoi.com/OSFM/RI/ri_faq.asp)

[112] From the website 'Growing a Team' (http://www.nwlink.com/~donclark/leader/leadtem.html)

bound by the antecedent even though they are not syntactically bound. At the very least we see that a strong connection is required between the collective nouns and the plural pronouns. So, again, shifting in the numerical agreement features of verbs and pronouns that agree with a collective noun is possible.

Last I want to briefly consider whether shifts from singular to plural agreement are preferred over shifts from plural to singular agreement. Consider the following sentences.

30. The team is winning and are excited to end the season at Lantz Arena.
31. *The team put on its shoes and jerseys.
32. The committee recused itself. They do so often.
33. *The committee recused themselves. It does so often.

30 and 32 are felicitous, while 31 and 33 are marginal at best. Sentences 31 and 32 include shifts from singular to plural agreement, while the shifts in 31 and 33 are from plural to singular agreement. While an examination of these cases does not show that in general shifts from singular to plural are more acceptable than shifts from plural to singular, they do give us some evidence. Further, corpus data shows that this is a much more general trend.

Levin (2001) examined written and spoken corpuses in American, British and Australian English. He found that shifts from singular to plural are fairly common, while shifts from plural to singular agreement are extremely rare. The table below shows the results he found.

	The New York Times		The Independent		Sydney Morning Herald		LSAC		BNC	
	N	%	N	%	N	%	N	%	N	%
Singular Verb + Plural Pronoun	104	18	106	17	69	19	67	77	103	22
Plural Verb + Singular Pronoun	0	0	3	0	0	0	0	0	3	1

Table 3.2: Levin Corpus Data

The corpuses represented here are the American newspaper, *The New York Times*, the British newspaper, *The Independent*, the Australian newspaper, *Sydney Morning Herald*, the Longman Spoken American Corpus (LSAC) and the British National Corpus (BNC). In the table the column labeled 'N' shows the number of shifts from singular or plural or from plural to singular found in the corpus. There are four possibilities for patterns of agreement when a collective noun controls the number features of both a verb and a pronoun. The table above shows only the cases in which the verb and pronoun show different agreement features as we are interested in agreement shifts. The percentages are out of all of the patterns of verb + pronoun agreement found in the corpus, so these include singular verb + singular pronoun and plural verb + plural pronoun patterns.

The table shows that singular to plural shifts are fairly common. In the spoken American English corpus they represent 77% of the verb + pronoun agreement patterns with collective nouns. In written corpuses they represent slightly less than 20% of such patterns. On the other hand, plural to singular shifts are nearly nonexistent. Most of the corpuses showed no such patterns. The corpus data examined here shows that English speakers are very unlikely to accept or use bits of discourse which include shifts from plural to singular agreement, while using and accepting bits of discourse with shifts from singular to plural agreement is possible and even likely in some populations of speakers.

To summarize, collective nouns allow both collective and distributive predication. Collective nouns allow for singular and plural agreement with verbs (at least in British English) and pronouns. Patterns of agreement with shifts from singular to plural are strongly preferred to patterns with shifts from plural to singular. An adequate treatment of collective nouns must account for the data we have discovered. Since much of the data discussed here relates to agreement behavior, a brief examination of a cross-linguistic pattern in agreement behavior will help to inform our analysis. I turn to this next.

3.4 THE AGREEMENT HIERARCHY

Through cross-linguistic studies, linguistic typologists discover patterns that hold across languages. The Agreement Hierarchy is a cross-linguistic pattern that holds for the agreement behavior between parts of language.

Before discussing the Agreement Hierarchy, I introduce some terminology. A controller is the linguistic element that determines agreement. In examples 30-33 'the committee' and 'the team' are the relevant controllers. A target is a linguistic element whose form is determined by some feature of the controller. There are two ways in which a target might agree with a controller. First, it might agree with the controller's syntactic or formal features. Syntactic matching is agreement with the grammatical form of the controller. For example, 'the team' is singular so targets that syntactically agree with it are singular.

Second, controllers have what Corbett (1979) has called semantic or notional features. Such features have to do with the meaning of the controller. For example, 'the team' picks out or refers to a collection of individuals. We might take the semantic number of the expression to be many, one or both many and one. Corbett has argued that mismatches between controller and target arise from a mismatch between the formal and semantic features of the controller. He writes, "the controller may have the semantics

expected of a particular number but a form which is normally associated with a different [numerical] specification."[113] So, a controller may have more than one agreement possibility.

Corbett formulated a hierarchy to capture agreement patterns across languages. The Agreement Hierarchy compares types of targets including attributives, verbs, relative pronouns and personal pronouns. Attributives are determiners like 'the,' 'a,' 'these,' 'those.' Attributives in English can be singular or plural. We have already seen that verbs can be singular and plural. While relative pronouns like 'which' and 'who' might not be thought to mark number features, examining their behavior with collective nouns shows that they do seem to represent a number distinction between one and many. A collective noun followed by 'which' is taken to mark singular agreement while one followed by 'who' marks plural agreement. Last, personal pronouns[114] might be singular or plural. 'It' is singular; 'they' is plural.

The Agreement Hierarchy is meant to capture agreement behavior between different sorts of targets. The Hierarchy is as follows:

The Agreement Hierarchy[115]

Attributive > Predicate > Relative pronoun > Personal pronoun

As one moves to the left along the Hierarchy the chance of syntactic matching increases. Moving right along the Hierarchy increases the chance of notional matching. Since the collective nouns we are examining are grammatically singular (e.g., 'team' is singular), syntactic matching is singular. According to Corbett, notional matching is plural, but, as we'll see in the next Chapter not everyone agrees.

The Hierarchy is monotonic increasing. This means that once a notional matching is possible at a position, it is possible at all positions above it (i.e., to the right of it). For

[113] Corbett (2000, p. 187)
[114] Other pronouns also are marked for number. The Agreement Hierarchy as Corbett originally formulated it includes only personal pronouns, so I include only personal pronouns in the discussion here. Other pronouns also seem to fall near personal pronouns.
[115] Corbett (1979)

example, since collective nouns can take either singular or plural relative pronouns, it is predicted that they can also take personal pronouns of either number. We saw that this is the case. Corbett and others have examined large corpuses to confirm the Agreement Hierarchy. It has been shown to hold for many languages including non-European languages like Paumari, Kabardia and Samoan.[116] It is hypothesized that it holds for all possible human languages. A treatment of collective nouns should capture and, ideally, explain why the Agreement Hierarchy holds. In the next section I address how to best capture the data canvassed above by examining three strategies one might take in formulating a treatment of collective nouns.

3.5 A PRAGMATIC EXPLANATION OF THE DATA?

We saw that in both British and American English some shifting between singular and plural agreement occurs. In this section I address whether such behavior needs to be captured by a semantic theory. For, one might argue that the agreement shifts and mismatches should be captured pragmatically. On such a view a collective noun allows only for either singular or plural agreement. That is, a collective noun has one core meaning. Following Klein and Murphy (2001), I call this the Core Meaning View. On this view determiners, verbs or pronouns which do not match the number feature of the collective noun are explained pragmatically.

One might take shifts in agreement to be a pragmatic phenomenon. To see how one might develop a pragmatic explanation let's examine 24, repeated below.

24. The Supreme Court is in session. They are deliberating today.

On a pragmatic account, shifts in agreement are likened to cases of deferred reference. In cases of deferred reference first an utterance is made. For example, take 34:

34. The ham sandwich wants his check.

[116] Corbett (2006, 191)

The utterance involves either an agreement mismatch between an expression (like 'the ham sandwich') and another part of the proposition (like 'his') or no antecedent is directly recoverable from the discourse. The audience is forced to interpret or reevaluate what entity is or what entities are at issue. In 34 the interpreter rejects a sandwich as the topic of conversation because sandwiches are not the sorts of things that have desires and sandwiches are not male. The interpreter then looks for an interpretation that could make sense of the speaker's utterance. In this case, the interpreter concludes that the customer who ordered the ham sandwich wants his check.

A proponent of a pragmatic explanation of the behavior of collective nouns might take 'they' to refer to the judges on the court in the same way that 'the ham sandwich' in 34 might refer to the person who ordered the ham sandwich. A plural pronoun is used after only a seemingly singular entity has been introduced. The interpreter must deduce an interpretation of 'they' perhaps by appealing to common knowledge about the composition of the Supreme Court.

Nunberg (1979) is a proponent of the view that all words that are not ambiguous, but seem to have multiple meanings (expressions that are often called "polysemous") actually have a single meaning. He offers a pragmatic analysis which relies on deferred reference to account for the apparently multiple meanings purportedly had by polysemous expressions. To support his position, he gives two arguments against the view that purported polysemes have many distinct meanings each of which is governed by a separate linguistic convention.

First he argues that since the same patterns of relations show up in many other languages, it is natural to think that the patterns are conventional and do not require separate linguistic conventions. However, it seems that this data gives equal weight to an alternative explanation: namely, that the cross-linguistic pattern attests to the fact that the relations between polysemous meanings are deeply built into human thought, and thus, into human language. Nunberg's first reason for the Core Meaning View is not strong.

Second, Nunberg argues that the patterns of relations are similar to those at work in cases of deferred reference. For instance, one can point to a copy of Bleak House and say 'He is from my hometown' to mean that Dickens is from one's hometown. This case has a striking similarity to a case in which one references a copy of a newspaper to refer to the publisher of the paper. Nunberg argues that in cases of deferred reference we cannot appeal to linguistic convention due to the massive variation in cases. Instead, to explain deferred reference we must appeal to pragmatic processes. Since polysemy is similar, we should appeal to a pragmatic explanation of it as well.

While Nunberg is correct to note a similarity between some such cases, it is not clear how deep the similarity runs. In pointing at a newspaper to refer to a publisher, one certainly is appealing to deferred reference. So, at least some words which we take to be polysemous can also be utilized in instances of deferred reference. However, take:

a. The newspaper is poorly run.

b. This newspaper is from last Sunday.

It is less clear how similar a and b are to cases of deferred reference. Both a and b seem to be sentences which involve the literal meanings of their words. However, 'newspaper' in a refers to a publisher, while 'newspaper' in b refers to a copy of a publication. If 'newspaper' has only a single meaning, one of a or b must involved deferred reference. Yet, it seems that deferred reference fails to be involved in either. Nunberg's second reason for the Core Meaning View is also weak. Nevertheless, let's examine the details of how the view is meant to function.

Nunberg appeals to deferred reference to determine what a use of a polyseme refers to or means on a given occasion. Multiple referents or meanings for an expression will be available, for deferred reference is meant to be a strategy that allows words to have a wide range of referents or meanings. An interpreter takes that which seems to be the most probable given common knowledge to be the referent or meaning. When a demonstration is made, the most salient referent is the demonstratum. It is the referent with the highest probability. So, if there is no reason to think that it is not the referent (e.g., due to a

mismatch in agreement) he argues that it must be the referent. Likewise, when the core meaning of the expression is available, it must be the meaning of the expression.

For the Core Meaning View to get off the ground, a core meaning for each polysemous expression must be determined. Generally, Nunberg thinks this can be accomplished by comparing how probable deriving one meaning from another meaning is. For example, suppose that a polyseme has two candidate meanings, a and b. If it is more probable that a is derived from b than that b is derived from a, then b is taken to be the core meaning. For example, Nunberg takes it that it is more likely that the meaning of 'chicken' is the animal than its meat. He takes deriving the stuff/meat meaning from the animal meaning to be a more probable inference than deriving the animal meaning from the stuff/meat meaning.

While it may be fairly easy to settle on a core meaning for 'chicken,' some cases will be much more difficult. Nunberg notes that 'game' is of this sort. It is not clear whether the meaning of 'game' as activity or as a set of rules should be taken to be its core meaning. One might wonder whether 'tree' should be taken to have a core meaning which picks out a type or a token. In such cases Nunberg takes the probability that one candidate meaning, a, is derived from another candidate meaning, b, to be equal to the probability that b is derived from a. Nunberg concludes that in such cases we cannot give the meaning of the expression in question while being assured that we are correct in taking it, rather than another suitable candidate meaning, to be the meaning.[117] So, he concludes, meaning is often indeterminate. He takes it that "we may know what somebody is referring to without knowing the linguistic conventions governing the uses of terms to refer."[118] Communication may be successful, even though we fail to know what the words we use literally mean.

Nunberg has led us to a somewhat extreme position. He began by noting a similarity between deferred reference and polysemy. He concluded that we, perhaps often, do not know the meanings of the words we use. However, it is the, now epistemically unavailable, core meaning of a polyseme which is used to determine the meaning or reference of the

[117] (1979, 174)
[118] (1979, 177)

expression in a context. Without access to the core meaning, it is not clear how we are to derive other meanings in a context. We are left with a rather mysterious view of polysemy.

One might argue that we often fail to know information about the language we speak. For example, most speakers of English do not know the syntactic structures that their sentences are thought by linguistics to possess. Many speakers might not see the distinction between wide and narrow scope readings of their sentences. Nevertheless, philosophers and linguists hold that such an ambiguity does exist. One might try to assuage the worries I've argued Nunberg's view has by appealing to the same sort of reasoning. One might argue that while we don't always know what our words mean, we are still able to use them. This is simply another place where ignorance about our language fails to impede us in our use of language. However, such a response is not available to a proponent of the pragmatic account of the behavior of collective nouns and other, seemingly, polysemous expressions.

The existence of the syntactic structures of our sentences and their potential for scope ambiguities are not argued for in terms of a cognitive process. That is, we do not think a sentence has a certain syntactic structure due to some occurrent cognitive reasoning carried out by a speaker. In contrast, appeals to deferred reference do rely on cognitive processes. We are meant to appeal to deferred reference when we notice that the core meaning of an expression is unavailable. We are then meant to determine which of the potential referents or meanings is most likely in the given context. These are occurrent cognitive processes. Appealing to linguistic ignorance is not plausible for such processes.

A Core Meaning theorist might accept Nunberg's arguments up until the point at which he claims that some (or many) polysemes fail to have a single determinate meaning. Instead, one might argue that all polysemes do have a core meaning. In some cases it is difficult to discern which candidate meaning is the meaning, but there is one to discover. Such a theorist must still give an explanation as to how one might calculate alternative meanings in a context if one fails to have epistemic access to an expression's context-invariant meaning. It is not clear to me how such a story would go, but perhaps there is something to say. However, even if a proponent of the core meaning pragmatic strategy can

overcome these theoretical details, she cannot accommodate the range of collective noun-involving data canvassed above.

Appealing to pragmatics to explain the shifty behavior in some cases is not implausible. However, a process of deferred reference and audience reinterpretation is not available for the array of cases canvassed above. Agreement behavior is intertwined with grammar. Pragmatic phenomena are not usually taken to interact with grammar. So, it is not clear how a pragmatic explanation would account for shifts in, for example, possessive pronoun agreement or verb number. So, while appealing to pragmatics might allow one to explain and treat a subset of the behavioral patterns of collective nouns, it cannot deliver a full explanation of the range of phenomena.

Further, we saw that mixed agreement with collective nouns is possible. In particular, shifts from singular to plural agreement are felicitous. In instances of deferred reference, both referents are not available in this way. For example, take the following:

35. *The ham sandwich is our most popular menu item and wants his check.

36. *The ham sandwich wants his check. It is our most popular menu item.

37. *The ham sandwich is our most popular menu item. He wants his check.

Interpretations in which 'the ham sandwich' is used to refer both to the ham sandwich and to the customer who ordered the ham sandwich are strained. This is the case whether the clauses are combined in a single sentence or are divided by a sentence boundary. The bits of discourse are infelicitous whether the deferred referent is appealed to first or second. Deferred reference phenomena fail to manifest behavior that patterns with the behavior of collective nouns discussed above. So, the behavior of collective nouns cannot be explained in terms of deferred reference. Further, a pragmatic account has trouble capturing the Agreement Hierarchy.

We saw that the Agreement Hierarchy encodes a general pattern across human languages. The pragmatic treatment of agreement behavior took cases of agreement mismatch to have a pragmatic explanation. However, to account for the same pattern

holding across many linguistic communities, one must hypothesize that the same pragmatic phenomenon occurs cross-linguistically. Further, the phenomenon is tied to expression type. An explanation that requires the audience to find an interpretation that makes sense of number mismatching pragmatically, as in the ham sandwich case, fails to capture a distinction between the expressions on the Hierarchy. For example, it fails to capture that determiners usually have syntactic agreement features while pronouns often allow for syntactic or notional agreement. Expression type must be appealed to in order to capture the Agreement Hierarchy. A pragmatic explanation comes up short. The semantics of collective nouns must be complicated in order to account for the range of data canvassed earlier in this chapter. In the next chapter I turn to treatments that are semantic in nature.

Chapter 4:

Collective Nouns—Semantic Treatments and Ontology

In this chapter I examine semantic treatments of collective nouns that treat agreement patterns in terms of the semantics of collective nouns. Such accounts can be divided quite broadly into those that take collective nouns to be homonymous and those that take collective nouns to be polysemous. According to the first a single word has only a group as one or a group as many as its referent. If it has a group as one, it allows for only singular agreement, while if it has a group as many it allows for only plural agreement. On such an account, apparent mismatches are accounted for in terms of an ambiguity. So, for example, one would posit a word 'team' with a group as one as denotation and singular agreement features and a distinct word 'team' with a group as many as denotation and plural agreement features. In cases of singular agreement the first word is used, while in cases with plural agreement the second is used. On this view agreement is wholly explained in terms of grammatical or syntactic matching. Alternatively, one might take collective nouns to be polysemous. On such a view a collective noun is a single word with denotations for a group as one and a group as many. It, the one collective noun, is then argued to allow for both singular and plural agreement. Given this view a distinction might be made in the semantics of the term or in both the semantics and syntax of the term.

Before examining the merits and faults of these approaches, a more general categorization of homonymy and polysemy is needed. Such an investigation will make the differences between views that collective nouns are homonymous and views that collective nouns are polysemous more apparent. In Section 4.1, I examine where the distinction between polysemy and homonymy should be drawn. In Section 4.2, I turn to an examination of views that the behavior of collective nouns should be accounted for in terms of homonymy. I motivate and then reject such accounts. Next, in Section 4.3, I turn to an examination of views that collective nouns are polysemes. I distinguish five views one might take. I argue that the behavior of collective nouns is best understood if collective nouns are

syntactically singular and semantically have a denotation with a group as many and a group as one aspect. Last, in Section 4.4 I apply the PCC to the treatments of collective noun involving theories. I argue that such theories carry determinate commitments to groups (as one) and are indeterminately committed to summed entities which are groups as many.

4.1 CATEGORIZING HOMONYMY AND POLYSEMY

'Bank' is taken to be ambiguous between a financial institution and the slope of land abutting a body of water. One might think 'newspaper' is ambiguous between a material object (e.g., that newspaper lying on the desk) and an institution (e.g., The New York Times). While each of these cases involves a distinction in meaning or what has sometimes been called 'an ambiguity,' they seem different. The two senses of 'bank' are not closely related. In contrast, the senses of 'newspaper' are closely related. To capture this difference, the first case might be taken to be a case of homonymy, while the second is a case of polysemy. Of course, for adding labels to be helpful, there must be a distinction between what counts as a case of homonymy and what counts as a case of polysemy.

Homonyms are words that are written and pronounced identically (i.e., words that are both homographs and homophones), but which differ in meaning. Polysemy might be characterized in two general ways. First it might be taken to be a case of homonymy in which the homonyms have closely related meanings. On this view there is no substantial difference between homonymy and polysemy. Second, polysemy might be understood as involving a single word with more than one meaning. Given this view, homonymy and polysemy are differentiated by the number of words involved and the number of meanings assigned to a word.

Polysemy, however it is understood, requires that a polyseme's meanings be closely related. Pustejovsky (1995) has classified a number of ways in which distinct polysemous meanings might be related. The following is a partial list of ways in which meanings might be related:

Animal/Meat
a. John bought a pet lamb
b. Sam ordered lamb for dinner[119]

Object/Stuff
a. There is an apple on the table
b. There is apple in the pie.

Container/Contents
a. Sam bought a bottle of wine.
b. He drank two bottles

Producer/Product
a. The newspaper is poorly run.
b. This newspaper is from last Sunday.

Ground/Figure
a. The door is open
b. The door made of wood

The meaning relations between, for example, animal and meat are fairly, but not wholly, general. That is, while 'lamb' can mean either animal or meat, 'cow' has only the animal meaning. However, even given the normal meaning of 'cow,' utterances involving 'cow' that seem to require the meat reading are intelligible. For example take the following:

1. The wolves broke through the fence surrounding the ranch. They feasted on cow that night.

While the second sentence in 1 might be somewhat odd, it is clear from context what a speaker of 1 means. So, even though not every word that has a meaning that fits one of the pair of meanings in the list above will also have the other meaning in the pair, such an understanding can be generated in a specific context.

To begin to see whether one of the two views on the difference between polysemy and homonymy is superior, let's examine how clear cases of homonymy and of polysemy

[119] These related meanings hold for many but not all words. For example, while 'lamb' can shift between an animal and a meat reading, 'cow' cannot. 'Cow' only has the animal reading. These patterns are meant to be somewhat general, but not wholly general.

perform on ambiguity tests. If the two sorts of cases perform differently, we may gain insight into how they differ.

Here I examine two[120] ambiguity tests discussed by Zwicky and Sadock (1975). They are the Contradiction Test and the Identity Test. I discuss each in turn.

The Contradiction Test appeals to examples roughly of the form 'that's a p, not a p.' If the sentence has a reading on which it is not contradictory, 'p' tests positive for ambiguity. If the only reading is contradictory, 'p' does not test positive for ambiguity. Let's apply this to a case of homonymy and a case of polysemy.

2. That's a bank, not a bank.

3. That's a bat, not a bat.

4. *That's a newspaper, not a newspaper.

5. *That's a window, not a window.

6. *That's a bottle, not a bottle.

Here 2 and 3 are cases of homonymy. 4-6 are cases of polysemy, which may, given our investigation thus far, be a subclass of homonymy. Non-contradictory readings of 2 and 3 are fairly salient, especially with the right tonal emphasis. However, it seems difficult (if not impossible) to read 4-6 as non-contradictory. If this is correct and general, this is a mark that differentiates non-polysemous homonymy and polysemy. Homonyms test positive for ambiguity on the Contradiction Test, while polysemes do not.

While the test as introduced by Zwicky and Sadock (1975) always appeals to constructions like those in 2-6, one might try altering the construction slightly to see if different results might be obtained. To modify the test no restriction on construction type will be demanded except that 'p' appears in one clause or conjunct of a sentence and 'not-p' appears in one immediately preceding or following it. Sentences like 7 and 8 follow this pattern.

7. No, he went to the bank, not the bank.

[120] While Zwicky and Sadock (1975) go through more tests, the two I discuss here seem most applicable and seem to draw out the distinction between homonymy and polysemy best.

8. He bought a newspaper, he didn't buy a newspaper.

There is a non-contradictory reading of 7 that can be drawn out by building up a context in which it would be natural for it to be uttered. Suppose that two thieves, A and B, are discussing where their accomplice stored the money from their most recent heist. A says, "He brought it to the bank." B responds, "Isn't that risky? The bills might be marked!" A then utters 7. In this scenario, it would be natural for B to interpret the first use of 'bank' as referring the shore abutting a body of water.

Likewise, there is a reading of 8 that is not contradictory. Suppose that Warren Buffett bought The New York Times. John tells his partner, "Buffett bought a newspaper today," to which his partner responds, "Doesn't he have a subscription?" John might then respond by uttering 8. Here the first use of 'newspaper' will be interpreted as a newspaper publishing company, rather than as a copy of a daily periodical. By building cases and modifying the constructions slightly, similar examples could be given for at least some other polysemous cases. However, others do seem to be quite stubborn. For example, try to build a context in which 'a bottle' and 'not a bottle' can be conjoined in a sentence that is not contradictory. While it seems that some example might be available, straining is necessary.

For example, suppose that John bought an empty bottle. In such a case perhaps it is correct to say that 'he bought a bottle, but not a bottle.' However, even this strikes the ear as unacceptable and possibly contradictory. So, while both homonymous and polysemous cases may test positive for ambiguity on the Contradiction Test, homonyms do so more easily than polysemes.

Identity Tests rely on a sentence in which a single use of a potentially ambiguous term is used only once. It is then predicated in two ways or of two things or said to have been carried out by two parties. If the term is ambiguous the term will not allow for "mixed" readings. Take the following:

9. I saw her duck and so did Bert.
10. The bank is where I keep my money and go to relax.
11. The newspaper's format was changed when it was taken over.
12. We are safe! The door is closed and made of solid oak.

9 and 10 include instances of 'duck' and 'bank,' signs that are taken to encode homonyms. 11 and 12 include instances of 'newspaper' and 'door,' words that are taken to be polysemous. In 9 and 10 only one understanding or disambiguation of 'duck' and 'bank' is possible. For example, it is not possible to understand 10 as meaning that I keep my money in a financial institution and go to the side of the Colorado River to relax. Instead, it must mean either that I relax and keep my money at a financial institution or that I do both at the side of a body of water. On the other hand, 11 and 12 rely on mixed understandings of 'newspaper' and 'door.' In 11 a published product has been reformatted and the publishing company is now run by new ownership. 'Newspaper' is used to refer to the publication and to the publishing company. In 12, 'door' is used to refer to an aperture and to the piece of material that covers such an aperture.

Cases involving homonyms and those involving polysemes behave differently on the Identity Test. It is possible to get mixed readings of a single use of a polyseme, while it is impossible to get a (non-comedic) mixed reading of a single use of a homonym. The behavior of the two sorts of expressions is clearer on the Identity Test than it was on the Contradiction Test. Homonyms often test positive for ambiguity on the Identity Test, while polysemes do not. We saw that there are some differences in the ways homonyms and polysemes behave in ambiguity tests. This gives us some reason to reject the view that polysemy is merely a special case of homonymy. Next I turn to two other features that mark a difference between homonyms and polysemes. I then examine some experimental evidence that marks a difference between the two.

The relations between the meanings of polysemous words are general both within a language and across languages. In English the container/contents distinction applies to bottles, baskets, cups, bowls, and so on. That is, it applies to containers quite generally. Other relations between the meanings of polysemes also hold in a general way. Homonyms are not general within languages.

Polysemous words in one natural language are overwhelmingly likely to be polysemous in other natural languages. This is not the case for ambiguous expressions. For example, in many languages the name of an animal that is often eaten, can be used to name

its meat. Likewise the title of a book can be used to refer to either a physical (or electronic) copy of the book or the informational content of the book.

The relations that hold between meanings of polysemous terms can be used to produce or interpret novel uses of a word. For instance, 'chair' is not normally understood as chair-stuff or chair-material. However, suppose that I am telling you about a nasty fight between two individuals at a bar. Things were thrown and broken. I then utter the following:

13. After the fight there was chair all over the floor.

Here, 'chair' would be most naturally understood as meaning chair-stuff/material. That is, it would be most natural to interpret 'chair' in that context as a mass term. [121] Further in such a context an utterance of 13 would be acceptable. So, we see that novel meanings of familiar words might be produced following the patterns of relations between the meanings of polysemous terms.

Productive behavior is also available for words which were previously unfamiliar. Suppose you just learned a new word—'regaldon.' You have learned that a regaldon is a vessel in which one carries cooked vegetables. In reading more about such vessels you come across the following sentences.

14. A regaldon might be made of glass.

15. If one is on a diet, one should eat a regaldon of vegetables each day.

In interpreting these sentences, you come to think that in 14 'regaldon' means vessel. The use of 'regaldon' in 15 might be interpreted as vessel, but this is not the most natural understanding. For, on the vessel understanding it is being recommended that one eat a vessel made out of vegetables. More naturally, you'll interpret 15 as saying that one should eat a vessel-full of vegetables. That is, one should eat a certain quantity of vegetables. The latter interpretation of 15 is more natural, even if you only know 'regaldon' to mean vessel to carry cooked vegetables.

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[121] Pelletier (1975) describes the ability for terms that are usually classified as count nouns, like 'chair', to be converted into mass nouns (like in the use of 'chair' in 13) the universal grinder. There has been a debate about how universal the universal grinder is. See, for example, Cheng (2008).

In contrast, homonymy is not productive. Even with the knowledge that the inscription 'bank' might mean financial institution or side of a body of water, we are not able to produce or understand novel meanings for other terms that we know to have one of these meanings. We cannot, for example, get a financial-institution reading of 16.

16. John works at the shore.

Similarly, upon learning that 'banca' means financial institution in Italian, we cannot infer that it means the edge of a body of water.

The final difference between polysemes and homonyms I examine is based experimental evidence from priming experiments. In a priming experiment a sentence is shown on a screen. After a short while the sentence disappears. A target word then appears. Participants are then asked to determine whether the target is or is not a word.

Seidenberg, et al. (1982) carried out priming experiments using homonyms. In the relevant trials sentences like 17 and 18 were used.

17. The man deposited his money in the bank

18. The man swam up to the bank.

After a pause of varying lengths a target is displayed. Some targets relate to the meaning that was most salient for the last word in the displayed sentence (here 'bank'), some relate to the less salient meaning for that word, some do not relate to that word at all and others are not words. For example after 18 one of the following targets might be displayed: 'SHORE,' 'FINANCIAL INSTITUTION,' 'BARK,' 'ABLENE.'[122] The participant must then judge whether or not the target word is a word or not. When a subject has recently read something with information relevant to the meaning of the word her response time is faster. In such cases a subject is said to be primed. When a sentence includes a homonym, there is a priming effect for both its salient and non-salient meaning. For example, following 17 with 'SHORE' or with 'FINANCIAL INSTITUTION' generally elicits faster judgments than following it with 'BARK.' However, the length of the pause between the sentence and the target matters.

[122] The example used here is my own, but the methodology is from Seidenberg et al., (1982). Particularly, I think they would have used only one word targets, but that is not relevant to the explanation of the way the experiment runs.

The priming from non-salient meanings lasts for less than 200ms. That is, if the target is shown after 200ms, a target which is synonymous with the non- salient meaning is judged no more quickly than a target which is unrelated to the word whatsoever. Priming from the salient meaning of the word lasts over a much longer pause (over 850ms). So, while the salient and non-salient meanings of homonyms are activated in language processing, the non- salient meaning is activated for only a very short time.

Williams (1992) carried out similar experiments using polysemes rather than homonyms. In his experiments a sentence like 19 might be given.

19. The schoolteacher was criticized for not being firm

It would then be followed by one of the following targets: 'STRICT,' 'SOLID,' 'EMBARRASSING,' or 'BERG.' Participants then judge whether the target is a word. Williams found that priming occurred with targets that were synonyms for salient and non-salient meanings of 'firm'. So far, there does not appear to be a difference between homonyms and polysemes. However, in Williams's experiments priming increased judgment speed for synonyms of the non-salient meaning of a polyseme even after 850ms. The priming effects of synonyms of a term's non-salient meaning last much longer than those of homonyms.

Williams argues that this evidences a distinction between homonyms and polysemes. While homonyms might be thought to have distinct mental representations for their distinct meanings, the meanings of polysemes are more mentally connected. This gives reason to think that the meanings of polysemes should be linked to a single word rather than to multiple words as is the case with homonyms.

We have seen evidence that polysemy and homonymy are different phenomena. The Contradiction Test and Identity Test gave some evidence that there the two were distinct. Polysemy was shown to have features of generality and productivity which homonymy lacks. Last, we saw that experiments involving judgment times evidence the view that the meanings of polysemes and homonyms are psychologically represented in different ways. Any adequate view of polysemy must capture this data. Next, I turn to ways in which polysemy

might be understood given the way we now understand the distinction between it and homonymy.

I began with two views one might have of polysemy. Either polysemy is homonymy with closely related meanings or polysemy is a single word which has (or might be interpreted as having) many meanings. We have seen that there are reasons to reject the view that cases of polysemy form a proper class of the cases of homonymy. So, we should conclude that polysemy involves a single word with more than one meaning.

The distinction between polysemes and homonyms can be drawn by classifying the meanings of a polyseme under a single lemma (or in mental terms under a single representation, concept or mental file) and the meanings of homonyms under distinct lemmas (or representations, concepts or files).

Polysemous expressions are expressions with multiple related meanings. These meanings must be represented in a way that is distinct from cases of homonymy. There is more than one way to do this. For instance, in the lexicon under the entry for a polyseme its several meanings might be given as separate meanings entries. Chomsky (1972) proposes such a view. On this view the lexical entry for 'chicken' includes the meaning *a species of fowl* and the meaning *meat from a particular species of fowl*. Alternatively, one might propose that a polyseme has a single disjunction as a meaning. So, instead of two meanings being assigned to 'chicken' a disjunction of its meanings would be assigned. While these two views elicit some differences in the metaphysics of a lexicon,[123] they do not differ in the information they encode or the cases which they can handle. So, I will not consider them separately.

Proponents of polysemy must determine how many meanings are represented under a lexical item in the lexicon and in mental representations. Many have taken it that some reasonable number of meanings are represented, but not that every possible meaning is represented.[124] We are left with a question as to which meanings are represented. Perhaps only the most common meanings are represented or lexicalized, while those that are less common (like the meat meaning of 'hamster') are calculated in something like the way

[123] For instance, on the former view we must hold that a single lexical item can have more than one meaning. On the later we complicate meanings, but might hold the view that a single lexical item has only one meaning.
[124] Langendon (1969), McCawley (1968), Chomsky (1972), Postal (1969), Borkin (1972), Green (1974)

Nunberg suggested. It seems that at least the most common meanings are conventionalized in a way that they should be included as lexicalized meanings. So, for example, both container and contents readings should be lexically encoded for 'cup' and both animal and meat meanings should be encoded for 'duck.' This discussion will serve to draw a distinction between homonymy and polysemy. In the next section, I turn to homonymic accounts of the behavior of collective nouns.

4.2 HOMONYMY ACCOUNTS

Homonymic explanations of agreement behavior can explain apparent agreement "mismatches" with a single token of a collective noun. On such accounts "mismatches" occur when we mistake two distinct lexical items for a single word. By positing a collective noun 'team' with singular number features and a collective noun 'team' with plural number features agreement "mismatches" can be explained in terms of a failure to recognize an ambiguity.

Bock and Eberhard (1993) and Bock, Butterfield, et al. (2006) carry out experiments and give arguments against explanations of mixed agreement which require a semantic difference in a term. Instead, they posit a lexical ambiguity in collective nouns. Here I examine their arguments for lexical ambiguity and the experimental evidence they utilize.

Bock and Eberhard begin by conducting an experiment to see if English speakers take collective nouns to denote many things. It seems natural that collective nouns are more likely to be thought of as denoting many things than non-collective singular nouns. To test this hypothesis, Bock and Eberhard carried out the following experiment, which I will call 'Denotation Experiment.' In it participants were asked to answer the question "If you were thinking about the _____, would you be thinking about one thing or more than one thing?"[125] They found that collective singular nouns (e.g., 'the team') were judged to represent more than one thing four times more often than singular non-collective nouns (e.g. 'the player'). Collective nouns were taken to denote more than one thing in about 40%

[125] (1993, 86)

of the responses, while non-collective singular terms were taken to denote more than one thing in only 10% of responses.

Next, Bock and Eberhard appeal to an experiment involving attraction behavior to argue that agreement is not semantic. Attraction occurs when a verb or pronoun agrees with the local noun rather the head noun in a noun phrase. In 'the box of daggers,' 'box' is the head noun and 'daggers' is the local noun. An attraction error occurs if one conjugates the verb following the noun phrase to match the local noun rather than the head noun. If one completed the head noun phrase as follows one would commit an attraction error:

20. The box of daggers are on the table.

Here 'are' agrees with 'daggers' (the local noun) rather than with 'box' (the head noun). Bock and Eberhard argue that if agreement is determined by the number of the denotation of an expression, there will be more attraction errors with local nouns which are notionally many than those which are notionally singular.

To test whether attraction is sensitive to notional number, Bock and Eberhard ran an experiment I call 'Attraction Experiment.'[126] In Attraction Experiment, native American English speakers were given sets of preambles (like 'the box of…') with a variety of local nouns. The local nouns included singular nouns that are not collective (e.g., 'ship'), singular nouns that are collective (e.g., 'fleet'), plurals which are not collective (e.g., 'ships') and plurals which are collective (e.g. 'fleets'). After being given a preamble the participant was asked to repeat it and use it in a sentence. Attraction errors occurred almost exclusively (98%) with plural local nouns. Of the three errors with singular local nouns one occurred after a collective noun and two occurred after non-collective nouns. From these results, Bock and Eberhard conclude that attraction is not stronger after collective nouns than it is after singular nouns. So, while collective nouns are often taken to denote many things, as was shown in Denotation Experiment, this does not affect their attraction behavior. Bock and Eberhard argue that this shows that agreement is not semantic. Instead, they argue that agreement is syntactic and based only on lexical specification.

[126] (1993, 81-88)

We saw in Chapter 3 that British and American English speakers differ in their judgments on acceptable agreement behavior with collective nouns. British English speakers took plural verb agreement to be more acceptable than did American English speakers. Bock, Butterfield, et al. (2006) tested to see if British English speakers committed more attraction errors with collective nouns than American English speakers. Since they take it that attraction is not based on notional number, given the findings in Attraction Experiment, they argue that finding that British English speakers commit more collective noun attraction errors would provide evidence that collective nouns are ambiguous. They carried out a test like Attraction Experiment, which I call 'Br-Am Attraction Experiment.'

In Br-Am Attraction Experiment two groups of participants, one composed of native British English speakers, the other composed of native American English speakers, were given preambles like those used in the Attraction Experiment (e.g., 'the box of…'). They found that British speakers were more likely than American speakers to exhibit attraction to collective local nouns. From this, they conclude that collective nouns are ambiguous. Collective nouns are ambiguous between a word with singular syntactic features and a word with plural syntactic features.

To summarize their experiments and conclusions, it was argued given data from Denotation Experiment that collective nouns are often thought of as denoting more than one thing. Bock and Eberhard argue that if agreement was determined semantically the denotation of the expression would be that which determined agreement. Given their findings in Attraction Experiment they argued attraction errors were correlated with a plural syntactic number feature of a local noun, rather than whether the denotation is one or many. Last, they argued that collective nouns are lexically ambiguous in Br-Am Attraction Experiment by showing that British speakers commit more attraction errors with collective local noun than do American speakers.

The attraction experiments carried out by Bock and Eberhard and by Bock, Butterfield, et al. apply only to verb agreement. Since the experiments do not examine pronouns they have not ruled out some agreement being determined by denotation number. Bock, Butterfield, et al. acknowledge this point. They take the experiments discussed here

and experiments testing pronoun use to "point to mechanisms that operate differently for verbs than for pronouns."[127] Pronoun use experiments show that British and American English speakers use plural pronouns with about equal frequency. So, pronoun usage cannot be explained by positing distinct lexical items in British and American English. Other experiments give evidence that "the number features of pronouns are determined in a way that is not sensitive to the structural locations of their antecedents, and separately from binding constraints."[128] If the number features of pronouns are not determined by structure or binding, they are not determined syntactically. For these reasons, they argue that agreement should be explained in one way for verbs and in another for pronouns.

I develop four problems with the account argued for by Bock, Eberhard, Butterfield, et al. First, one might take positing unrelated mechanisms to account for verb and pronoun agreement to be unsatisfactory. Corbett argues that splitting agreement into two phenomena does not explain "the distribution of agreement options," i.e., the Agreement Hierarchy.[129] That is, by supposing that agreement is not a uniform phenomenon, the unification of distinct phenomena in the Agreement Hierarchy is left unexplained. However, we saw that the Agreement Hierarchy is monotonic and holds cross-linguistically. This gives us some reason to look for a unified account of verb and pronoun agreement.

Second, if collective nouns in British English are syntactically plural, we should expect British English speaker to accept sentences like 21 or 22.

21. *These committee are meeting.

22. *These committee is meeting.

However, 21 and 22 are ungrammatical in all dialects of English. Taking collective nouns in British English to be syntactically plural does not account for the consistent use of singular determiners with collective nouns.

Third, the lexical ambiguity account cannot take any cases of mixed verb agreement to be grammatical. If a verb is singular, the collective noun it agrees with is a singular word (or an error has occurred). If a verb is plural, the collective noun it agrees with is

[127] (2006, 101)
[128] (2006, 84)
[129] (2006, 229)

syntactically plural (or an error has occurred). The lexical ambiguity account cannot take cases like the following to be felicitous:

23. The team is winning and are excited to end out the season at home.

In 23 'the team' is predicated singularly and plurally. The lexical ambiguity account can treat only one of the verbs as agreeing with the noun phrase. The other will result in a failure. However, sentences like 23 are uttered and understood. Further, 23 does not seem to include a grammatical error like that in 21 or 22. An account that cannot handle sentences like 23 is inadequate.

Fourth, the number of the verb can have semantic relevance. For example British American speakers take 24 and 25 to convey different information.

24. The committee is large.

25. The committee are large.

In 24 the committee is said to be large in that it includes many members. 25, on the other hand, says that the committee members are large. Given that verb number can convey different information, verb agreement cannot be purely syntactic. The lexical ambiguity should be rejected for these reasons.

4.3 POLYSEMY ACCOUNTS

We have seen that there are reasons to reject pragmatic and homonymic explanations of the behavior of collective nouns. Many[130] have argued that a grammatical difference between singular and plural agreement reveals a semantic difference. They argue that grammatical choice is guided by a difference in the way a speaker or writer is conceptualizing the denotation of the expression. A use of a plural verb or pronoun stresses the individuals that make up the collection, while a singular verb or pronoun emphasizes the group as a whole. In this section I investigate approaches that appeal to an at least partially semantic explanation of the behavior of collective nouns.

[130] Levin (2001), Zandvoort (1975), Hudson (1999), Quirk et al (1985)

I examine five semantic approaches to the agreement behavior of collective nouns. First, a collective noun might be taken to be syntactically singular, but semantically plural. On such an account singular agreement is syntactic while plural agreement is semantic. Since collective nouns have only one meaning on this view, they would not be classified as polysemous on this view. However, since on this view collective nouns do have both singular and plural number features, it is worth considering here.

The other four views are views on which collective nouns are polysemous. The second view takes collective nouns to be syntactically singular and semantically to have both referent that is many and a referent that is one. To account for singular and plural agreement options a sort-shifting operator might be incorporated into the semantics. Alternatively, both denotations might be available with context determining which of the available denotations is to be preferred. Third, collective nouns might be taken to be syntactically singular and plural (or neutral in number features) and semantically have a plural and a singular denotation. Fourth, collective nouns might be syntactically singular and semantically have a denotation that is one and many. So, for example 'the team' is syntactically plural and singular and its denotation is many and one. Fifth, collective nouns might be taken to be syntactically plural and singular (or number neutral) and semantically both many and one. The following chart shows the semantic views I assess here.

	Syntactic Number	**Denotation Number**
View 1	Singular	Plural
View 2	Singular	Singular denotation and plural denotation determined via a semantic shift operator or via context
View 3	Singular and Plural or Neutral/None	Singular denotation and plural denotation determined via a semantic shift operator or via context
View 4	Singular	A denotation which is both singular and plural
View 5	Singular and Plural or Neutral/None	A denotation which is both singular and plural

Table 4.1: Five Views

The table above might include more views. However, issues I address with Views 1-5 above will apply to variants of these views. For example, problems with View 1, 3 and 5 would extend to a view that collective nouns are syntactically number neutral and semantically plural. So, I consider only the five semantic views given in the table.

Let's begin with View 1. On this view collective nouns are like other count nouns in having singular syntactic marking. 'Team' and 'tree' are both syntactically singular. However, while the denotation of 'tree' is singular, i.e., 'tree' is semantically singular, the denotation of 'team' is semantically plural. View 1 seems to be held by Corbett. In discussing the Agreement Hierarchy he takes singular agreement with collective nouns to be syntactic and plural agreement to be semantic.

There are three main problems with View 1. First, on it collective nouns are unambiguously taken to have denotations that are many. However an experiment and an examination of data reveal that this cannot be correct. Recall the study from Bock and Eberhard (1993) in which participants were asked "If you think about _____ are you thinking about one thing or more than one thing?" Participants responded 60% of the time saying that they were thinking of one thing. View 1 takes collective nouns to be only semantically plural, which does not fit with speakers' conceptions of the denotations of collective noun. A proponent of View 1 might argue that this worry relies on speaker judgments being a reliable guide to number features of an expressions denotation. While such judgments should be taken into consideration when formulating a semantic theory, one need not take them to be an absolute guide. The other problems with View 1 rely on only non-judgmental data.

If collective nouns and plural expressions are both semantically plural, the expressions should be intersubstitutable salva veritate. Examples like the following show that they are not intersubstitutable salva veritate:

24. The men are Polish.
25. The committee is Polish.
26. The men first met last year.
27. The committee first met last year.[131]

Suppose that the men are Bob, Chris and Charles and that Bob, Chris and Charles are all and only the members of the relevant committee. If 'the men' and 'the committee' are both taken to have the denotation Bob, Chris and Charles, 24 and 25 have the same truth conditions. However, 24 and 25 do not have the same truth conditions. Bob, Chris and Charles might all be Polish without the committee being Polish. Alternatively, the committee might be Polish, without all of its members being Polish. For example, perhaps the Polish government has sent the committee to the UN. Such a committee might include someone who is not Polish. So, 24 and 25 are not truth conditionally equivalent.

[131] Barker (1990) uses examples 26 and 27 to argue that collective nouns and plural expression are not intersubstitutable.

The second pair of sentences provides an even clearer example. Suppose that Bob, Chris and Charles first met in June of 2012. Some months later, in February of 2013, the committee was formed. Now, in 2013, it is true that the men first met last year, but false that the committee first met last year. In assigning a plural denotation to collective nouns, View 1 incorrectly entails that sentence pairs 24 and 25 and 26 and 27 are equivalent.

Last, View 1 does not include a transparent method of treating sentences with singular anaphora. Consider the following:

> 28. The committee voted on two referendums. It passed both unanimously.

In the second sentence of 28 'it' seems to be anaphoric on 'the committee.' 'It' is singular. 'The committee' is syntactically singular and semantically plural. Since the agreement of the target is singular, it is postulated by View 1 that it syntactically agrees with the controller. However, 'it' needs a denotation. If 'it' is truly anaphoric on 'the committee' it will pick up on its denotation. Yet, the only denotation of 'the committee' according to View 1 is many individuals. View 1 cannot account for singular anaphora. Due to the three major problems with View 1, it should be rejected. Next, I turn to View 2.

A proponent of View 2 holds that collective nouns are syntactically singular and have the potential to refer to a group as one or a group as many. The view that collective nouns can denote *either* a group as one or a group as many sounds close to the view that collective nouns are homonymous. The difference between the polysemy view under scrutiny here and the homonymy views I argued against earlier can be represented pictorially.

Homonymy View		**Two Referents Polysemy View**	
$Team_1$	$Team_2$	Team	
↓	↓	↓	↓
group as one	group as many	group as one	group as many

Table 4.2: Homonymy versus Two Referents

On the view that collective nouns are homonymous, there are two words which when tokened appear to be identical. One of these words refers to a group as one, the other to a group as many. In contrast, on the two referents polysemy view a single word can have different referents on different tokenings. Which of the two possible referents the expression has might be fixed through a semantic shift operator. The shift operator might be thought of as a function that takes singular denotations to the many members making them up and vice versa.

Alternatively, one might suggest that a referent is determined by general principles for deriving meanings in a context. For example, there might be a rule that allows a meat meaning for 'chicken' to be derived from an animal meaning (and vice versa). Similarly there might be a rule that allows a contents meanings to be derived from a use of a container meaning (and vice versa). Exactly how different such an approach is from utilizing a shift operator is not transparent. It might be that context is used to determine which of the possible referents or meanings an expression has and that a shift operator is used as a formal device in the semantic treatment of such expressions. Exactly how the mechanism might work can be postponed until after we assess whether the two referents polysemy view of collective nouns can handle the data canvassed in the last chapter.

View 2 can account for singular and plural agreement. Singular agreement could be accounted for either syntactically or semantically, while plural agreement is always to be explained in terms of semantics. Whenever an agreement "mismatch" arises, the shift operator or a derivational rule can be utilized to deliver a denotation that agrees with the verb or pronoun. In this way, View 2 is able to capture a variety of agreement data. Further, View 2 fits fairly well with the explanation of the Agreement Hierarchy given by Corbett. Recall that Corbett took singular agreement to be syntactic and plural agreement to be semantic. A proponent of View 2 can hold that singular agreement aligns with syntax. Plural agreement matches with (possibly shifted) semantic values. If the shift operator or derivational rules are restricted, View 2 may also account for the Hierarchy being monotonic increasing.

There are three problems with View 2. The first has to do with unrestricted shift operators or derivational rules. It is ungrammatical for a collective noun in the singular, like 'team,' to be combined with a plural determiner. An unconstrained shift operator or unrestricted derivational rule will give an interpretation of the following:

29. * These team are putting on their uniforms.

Given the mismatch in syntactic and (unshifted/derived) semantic agreement, the shift operator or derivational rule kicks in, delivering a plural denotation that is the decomposition of the team into its members. The noun phrase "these team" will be interpreted without a mark of infelicity remaining.

There are two ways one might address this. First, one might accept a theory that gives a semantic interpretation of 29 even though we take it to be infelicitous in some way. However, if 29 is infelicitous, it must be due to factors that are neither syntactic nor semantic. So, it seems one would need to argue that the infelicity is pragmatic. The infelicity in 29 does not appear to be pragmatic. It seems grammatical. So, this route does not seem promising.

Alternatively, one might restrict the shift operator or derivational rules to operate only in cases of verb or pronoun mismatch. On this view, determiners would always require syntactic agreement, while other targets might require shifting or the application of a derivational rule to yield agreement. Taking this route does not yield that 29 is grammatically correct. The noun phrase in subject position in 29 would not be interpreted given that there is an agreement mismatch to which the shift operator or derivational rule does not apply.

View 2 also has problems with anaphora. Shifts must be possible for both tokens of collective nouns and for pronouns that are seemingly anaphoric on those tokens. To see why, consider the following example:

30. The team is losing. They know their coach will be mad.

In 30 there is a single token of the collective noun expression 'the team.' It is combined with a singular verb phrase 'is losing.' So, on View 2 we can suppose that the collective noun refers to a group as one. However, in the second conjunct 'they' is used to mean something like *the players* or *the group as many*. If 'they' were simply anaphoric on the token of 'the team,'

it would refer to the group as one. To account for cases like this, a proponent of View 2 will need to allow pronouns to look back to the expression upon which they are anaphoric and if there is no "mismatch" refer to the referent of that expression or if there is a "mismatch" shift to an alternative meaning for the expression. The proponent of View 2 must greatly complicate the semantics of pronouns. A view that can capture anaphora in a more straightforward way is to be preferred.

Finally, View 2 must deliver a single referent for each token of a collective noun (and each pronoun anaphoric on a collective noun). In some cases context, including predicate meaning and number features, will fail to make clear whether the expression refers to a group as one or a group as many. Take, for example

31. The chess club used to play on Tuesdays.

In 31 'the chess club' might refer to a group as one and say of *it* that it used to have a feature of playing chess on Tuesdays. Alternatively, 'the chess club' might refer to a group as many and say of *them* that they used to have a feature of playing chess on Tuesdays. A proponent of View 2 must argue for a particular referent in this case. Arguing that 31 is about either just a group as one or just a group as many seems ad hoc. A view that avoids having to make such claims would be superior. We have seen that View 2 must be combined with a complicated theory of the semantics of pronouns and must tackle an arbitrariness problem. These give us reason to reject View 2. Next, I turn to View 3.

A proponent of View 3 argues that collective nouns are syntactically both singular and plural (or number neutral) and semantically both singular and plural with shift operators or derivational rules to allow one to move from one meaning to the other. Since syntactically collective nouns have both number features (or neither number feature), there are no agreement mismatches. A given target agrees with either the singular or plural syntactic feature or has nothing to agree with. Some cases might also involve semantic agreement. Here too both options are available so there will be no agreement mismatches.

View 3 has the same problems as View 2 with sentences like 29.

29. *These team are putting on their uniforms.

Since on View 3 collective nouns have either both number features or no number features, 29 is acceptable. Further, this is a greater problem for View 3 than it was for View 2. A proponent of View 2 could appeal to the univocally singular syntactic number feature of a collective noun to account for the infelicity of 29. A proponent of View 3 on which 'team' has both singular and plural syntactic features has no way to explain the infelicity of 29. A proponent of View 3 who takes collective nouns to be syntactically number neutral must argue that the semantic denotation cannot be transformed to a plural denotation in cases where there is a mismatch between collective noun and determiner. So, a semantic rule is being restricted by an expression type. A semantic shift rule restricted by expression type seems to straddle an even somewhat uncontroversial divide between syntax and semantics.

Similarly, View 3 has a harder time explaining the Agreement Hierarchy than View 2. Recall that a proponent of View 2 might appeal to the distinction between syntactic and semantic number features to account for the Hierarchy. While I have not yet developed such an argument, we see that a proponent of View 3 has fewer resources. She either has both number features syntactically and semantically or she has neither number feature syntactically and both semantically. Either way, her resources for explaining the Hierarchy are slim. Finally, View 3 has the same problems with anaphora and ad hoc denotations as View 2. View 3 is in worse shape than View 2. It too should be rejected.

Views 4 and 5 are similar to Views 2 and 3. They differ only in the dentations assigned to collective nouns. View 4 takes collective nouns to be syntactically singular and semantically both singular and plural. View 5 takes collective nouns to be syntactically singular and plural or number neutral and semantically both singular and plural.

Since the same syntactic options are represented in 2 and 4 and in 3 and 5, worries for one are worries for the other. We saw that View 2 faired better than View 3 in terms of capturing the infelicity of 29 and containing resources to capture the Agreement Hierarchy. So, View 4 fairs better than View 5 given these same worries. So, we need only examine View 4 here.

On View 4 collective nouns are taken to be syntactically singular and semantically to have denotations that are both many and one. A shift or derivational rule is not employed.

Instead the denotation is both singular and plural. First I show how View 4 is able to solve the problems associated with View 2. Then I turn to a discussion of what it is for a denotation to be both one and many.

View 4 can straightforwardly capture the ungrammaticality of 29. On this view, collective nouns are syntactically singular. One can argue that determiners always agree according to syntactic number features. So, determiners with collective nouns in the singular (e.g., 'committee' rather than 'committees') will have singular number features. This response also hints at how a proponent of View 4 can capture the Agreement Hierarchy.

The Agreement Hierarchy can be explained in terms of syntactic and semantic matching. I repeat the Hierarchy here for ease of exposition.

The Agreement Hierarchy

Attributive > Predicate > Relative pronoun > Personal pronoun

One might argue that attributives (or determiners) are most likely to have syntactic matching, verbs are second most likely to involve syntactic matching and so on. Similarly, one might argue that personal pronouns are most likely to involve semantic matching, relative pronouns are second most likely to involve semantic matching and so on. Going a bit further, one might argue that attributive agreement is always syntactic, while personal pronoun agreement is always semantic. On this view, only predicates and relative pronouns (and perhaps other pronouns not included in the Hierarchy) can agree with syntactic and semantic number features.

Given this view, attributives will always show singular agreement with collective nouns. Predicates will show mixed agreement. Although, given the singular agreement options are available both syntactically and semantically, while a plural agreement option is only available semantically, more agreement should be predicted to be singular. Last, relative and personal pronouns should show both agreement possibilities. View 4 accords with patterns in the data canvassed in Chapter 3.

View 4 is also able to avoid problems with anaphora and ad hoc denotations. On View 4 pronouns that are anaphoric on collective nouns have either singular or plural number features as the denotations of collective nouns are one and many. There will not be agreement mismatches on either construal.

View 4 does not appeal to multiple denotations so there is no worry about needing to choose one denotation or the other in every case. Instead, collective nouns consistently have a denotation that is both many and one.

I have argued that View 4 can avoid problems that other views stumbled over. Further, I have sketched how a proponent of View 4 can explain the pattern the Agreement Hierarchy shows to hold for English. There is a further datum discussed in the last chapter that I haven't addressed yet here. I argued using felicity and grammaticality judgments and corpus studies that shifts in agreement from singular to plural are more felicitous and more common than shifts in agreement from plural to singular. Here I argue for a two-fold strategy that a proponent of View 4 can use to accommodate this data.

First, View 4 includes a syntactic and semantic position on the numerical features of collective nouns. Since collective nouns are taken to be syntactically singular, determiners, which take syntactic agreement, are always singular. Determiners in English appear before nouns in the noun phrases they help to compose. They are usually followed by verbs and then, possibly, by relative and personal pronouns. If syntactic agreement is always singular and semantic agreement is either singular or plural, we should expect shifts from singular to plural agreement to be more common. For, expressions that appear earlier in a sentence are more likely to be singular than those that appear later in a sentence (or pair of sentences). Given this, one should expect singular to plural shifts to be more common than shifts from plural to singular. The proponent of View 4 can also adopt another complementary strategy.

We know that when an object is or some objects are made salient in a context, it or they can be referred to more easily. We saw that once a collective noun is used to mean collection-as-many, a shift to a collection-as-one meaning is unacceptable. Before examining why this is so, let's examine a case that is similar. Take the following exchange:

A: Bryan and Sarah are having a baby!

B: Oh, I bet it will adorable.

A: They just found out that they're having a boy. They want to name him Benjamin.

B: *It/He will do well with such a strong name.

B's first use of 'it' is acceptable. However, after B knows the sex of the baby (and knows that A knows the sex of the baby) a use of 'it' is infelicitous. We do not use 'it' to refer to a person if we have knowledge of the individual's gender. Doing so would seem to de-humanize the individual, degrading him or her to the level of an inanimate object. Once one thinks of a person as a man or as a woman one does not regress to thinking of the person as lacking gender features.

Similarly, once one thinks of a team or committee or other referent of a collective noun as many one continues to do so. One does not think of a team as many and then regress to thinking of the team as an inanimate whole. Once the team as many is salient, a shift to thinking of *them* as one is infelicitous. A proponent of View 4 can appeal her explanation of the word order and syntactic and semantic number features *and* to the salience of entities in a discourse context to explain the preference for some shifts over others. By appealing both to syntactically and semantically encoded number features and salience, she is able to capture two sources of these patterns. One source is grammatical. This helps explain why sentences like 'Before each game, the team put on jerseys at its coach's request' sound off. They can be explained as being ungrammatical. The second source is semantic and pragmatic. When certain entities are salient in a discourse, they are likely to be the referents for expression rather than some entity they might compose. This, perhaps in conjunction with a grammaticality explanation, can explain why bits of discourse like 'The team congratulated their coach and themselves. It had won the championship!' are unacceptable. By using 'their' and 'themselves' the players are salient. So, the players not the team they compose, are the entities that can be easily referred to in the context. Next, I turn to a worry one might have with View 4.

One might think that a referent can be one thing or many things but not both. If one holds this view, View 4 will be rejected. However, recall the methodology with which we are working. I took it that an adequate semantic theory of an expression type to be one which accommodates the range of linguistic data. View 4 can accommodate the range of collective noun involving data canvassed in Chapter 3. So, it should not be rejected according to any non-linguistic metaphysical view unless it really is inconsistent. If View 4 is logically inconsistent, then it too should be rejected and more views must be assessed.

I argue that there is an understanding of a denotation being one and many that is consistent. It seems that a single denotation might have an aspect as one and as aspect as many. Perhaps in thinking of the thing we think of it as either one or as many and not both. Yet, this fails to reveal that the particular does not have both a one and a many aspect. I think the notion of a dot object, first introduced by Pustejovsky (1994), is useful here.

Pustejovsky introduced dot objects as part of his theory of a generative lexicon. He argued that polysemous expressions should have both of their meanings as a part of a dotted type. Here types are more fine-grained than the types in, for example, Montague grammar. In Montague grammar types include 'e' for entity and 't' for truth-value and other types made up from those types. In Pustejovsky's generative lexicon types include, for example, 'phys_obj' for physical objects and 'info' for informational content. Some expressions have complex or dotted types. For example, 'book' might be taken to be polysemous having both a physical object and an informational content meaning. This would be represented by the complex type 'phys_obj•info'. These complex types refer to or are had by dot objects.

While here is not the place to survey the details of the generative lexicon, if dot objects are to be of any use, more needs to be said about what they are. Asher and Pustejovsky (2006) and Asher (2011) argue that dot objects are bare objects with several aspects.[132] For example, 'book' refers to a dot object, which is a bare object with two aspects. One of the aspects is the physical object aspect, the other is the informational content aspect. The bare objects are not the sum of the aspects under which it can be

[132] Asher (2011) argues against other views of dot objects including that they are pairs of types, intersections between types, mereological fusions and pluralities.

conceptualized, for each aspect includes both the bare object and some properties it has. The bare object ties the objects together in that the bare object is a part of each aspect.

Pustejovsky and Asher argue that predication usually "involves the attribution of a property to an object considered under a certain conceptualization, which is what an aspect is."[133] For instance, a predicate might apply to the book as physical object without it applying to the book as informational content. For example, a book might physically weigh a lot making it true that the book is heavy without it being true that the book as informational content is heavy.

Pronouns can also be anaphoric on an object considered under a conceptualization (i.e., a bare object with one of its aspects). For instance, it can be true that Dickens wrote *A Christmas Carol* in 1843 without it being the case that Dickens penned or typed the words in the physical copy of *A Christmas Carol* that is on my bookshelf in 1843.

Finally, Asher argues aspects are relevant to the way we quantify over objects. He states that "in ordinary language we count and quantify over objects with respect to some property—i.e., it is the aspects that determine our quantification and counting."[134] When there are objects with two or more aspects, there are two or more ways of quantifying or counting them. So, for instance, a stack of four bibles might be said to be made up of four books or one book depending on whether the physical object aspect or the informational content aspect is being considered.

Dot objects are useful in making sense of the view that the denotations of collective nouns are both many and one. On this view the denotation of a collective nouns is a bare object with an aspect of a group as many and an aspect of a group as one. Predicates might select for one or the other aspect of the object denoted by the collective noun. Similarly, pronouns might apply to the object under one or the other conceptualization. Nevertheless, both aspects are available for later attributions of predicates or for reference by pronouns for there is no shifting or deferred reference involved. While View 4 need not be combined with the analysis of dot objects given here, I take the sketch I've given to show that the view that

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[133] Asher (2011, 149)
[134] (2011, 150)

the denotations of collective nouns are objects which are both many and one is logically consistent. I argued that View 4 is best able to capture the captures the patterns in collective noun involving data and cannot be ruled out due to logical inconsistency. So, semantic treatments that are variations of View 4 are the semantically adequate treatments of collective nouns. Next, I turn to applying the Principle of Carrying Commitments to the semantically adequate treatments of collective nouns.

4.4 THE ONTOLOGICAL COMMITMENTS OF COLLECTIVE NOUNS

In the this chapter and that previous I argued that the behavior of collective noun expressions can only be adequately semantically captured by treatments that take collective nouns to be polysemous. They might denote a group as one or a group as many. So, any set of sentences (e.g., any natural language theory) which includes instances of every behavioral pattern that collective nouns display (e.g., an instance of singular and an instance of plural agreement) will say or entail that there are groups-as-one and groups-as-many. Given this, one might suppose that an application of the Principle of Carrying Commitments delivers the verdict that there are groups-as-one and groups-as-many. It certainly appears as if that is what the commitments of such theories would be according to the PCC. However, before concluding thusly, we should consider whether groups-as-many are entities that are distinct from some many individuals. To make the discussion more concrete let's consider an example.

Suppose there is a team called the Betas. Dan, Irene, Emma, Matt, Lance and Edna are all and only the players on the Betas (at least at a time and world). So, the Betas as one is the group as one. That entity can be referred to by 'it'. It can be predicated singularly. It has a losing record. Dan, Irene, Emma, Matt, Lance and Edna are the group as many. They can be referred to by 'they.' They can be predicated plurally when their names are listed in British and American English and when referred to by 'the Betas' in at least British English. Are the Betas as many, that is, are Dan, Irene, Emma, Matt, Lance and Edna, a further entity to be

added to the ontology of a theory that includes sentences about the Betas as many? Whether they are a further entity depends on one's treatments of plural expressions. If the group as many is understood according to a Singularist treatment of plurals it does carry a further commitment. In this case it carries a commitment to the summed entity Dan+Irene+Emma+Matt+Lance+Edna. However, if the group as many is understood according a Pluralist treatment of plurals it fails to carry a further commitment. For, on such treatments "manys" are taken to be just many things without thereby being a further summed entity. Given this our application of the PCC must be more careful.

An application of the PCC to semantic treatments of collective nouns delivers the verdict that collective noun involving theories are determinately committed to groups-as-one for every semantically adequate treatment attributes to such theories a commitment to groups-as-one. The PCC delivers that collective noun involving theories are only indeterminately committed to summed entities that are identified with groups-as-many, for groups-as-many can be treated equally well by Singularist and Pluralist treatments.

The examination of collective nouns in this chapter and the last has shown that while the semantics of natural language cannot always deliver determinate answers to questions of the form 'Does theory T carry a commitment to Fs?' it is possible for it to deliver determinate answers to such questions. For, I have argued, collective noun involving theories determinately carry a commitment to groups-as-one. Further, the semantically adequate treatments of collective nouns delivered the information that groups and their members (or groups-as-one and groups-as-many) are intimately related. So, the semantics of collective nouns has delivered some ontological and metaphysical results. In the final chapter I depart from semantics to develop a view of the metaphysics of groups which accords with the verdicts delivered by the semantics of collective nouns, while going beyond them.

Chapter 5:

The Metaphysics of Groups

In the preceding four chapters I argued that the semantics of natural language can fail to determine the ontological commitments of natural language theories, but that it does not always fail to do so. For, I argued, that the semantics of collective noun involving theories delivers the verdict that such theories determinately carry a commitment to groups. Further, we might think that common sense and the practices of governments, sports fans, biologists and sociologists give us reason to think that social groups, things like clubs, committees and teams, exist. Here, I will not canvass further evidence in favor of the existence of groups. Instead, I undertake the task of examining the nature of groups. I restrict my examination to structured social groups, things like teams, committees and clubs. I do so for two primary reasons. First, restricting the inquiry will make things simpler. Instead of trying to find a unified account of fleets, packs of wolves and committees, I keep the account more focused. Ideally, the account that is delivered will be able to be applied (perhaps with some modifications) to groups that are not social. Second, there has been increased interest in group deliberation, group action and group agency in recent years.[135] Since social groups are the sorts of groups that are of interest in these debates, the metaphysics of social groups are particularly relevant.

I begin in Section 5.1 by formulating a list of criteria that any adequate theory of groups must capture. Then in Sections 5.2-5.5, I turn to views of groups which have been proposed. These include the view that groups are non-singular pluralities, fusions, aggregates and sets.[136] I argue that each fails to capture one or more of the criteria. Last, I

[135] See, for example, Searle (1995), Gilbert (2008) and (1992), Bratman (2010), May (1998), List and Petit (2011) and Tuomela (2007).

[136] Gabriel Uzquiano (2004) has argued that groups are sui generis entities. For reasons of space I will not address his view here. The four views I examine and the view I develop here all take it upon themselves to give a substantive answer to the question regarding the nature of groups. If a view which gives a substantive answer to that question can be given, I take that to be a mark in favor of it over the view that groups are sui generis.

develop a novel view of groups as realizations of structures, which can capture all of the criteria while offering a substantive answer to the question, "What are groups?". Further we saw that the semantics of collective nouns deliver reason to think that a group as one and a group as many are distinct, but also related. Groups as one have members. Given this, we might hope that a view of groups as one deliver a way to determine a group as many.[137] The view of groups I propose delivers a view of groups as one and a view of groups as many.

5.1 FEATURES OF GROUPS

Before examining any view of groups, it will be useful to set forth features all groups seem to have in common. Any adequate view of groups must allow for groups to have all of these features. First, groups can have different members at different times. For instance, a team might grow (when a new player is acquired) or shrink (when a player is traded). Second, groups can have different members across worlds. In the actual world, Edolphus Towns is a member of the Committee on Oversight and Government Reform, but in another possible world the Committee might fail to have Towns as a member. Third, groups, like other objects, can exist at one time without existing at every time. For example, before basketball was invented there were no basketball teams, so no basketball team has existed at every time. Groups are not (or at least need not be) eternal beings. Fourth, groups, like other ordinary objects, might exist at one world without existing at every world. That is to say, groups are not necessary beings. For instance, in the actual world the Committee on Oversight and Government Reform exists, but in a world without any formally organized governments it fails to exist. Fifth, as well as being located in time, groups are (or can be) located in space.[138] A Committee might be meeting in Washington, while a chess

[137] At least relative to a time and world.

[138] In some video games one can form teams. Depending on what one says about the metaphysics of virtual characters, one might not take such a team to be located in space. However, the most common examples of teams and other groups are located in space.

club might be meeting at a high school in Minneapolis. Last, there can be coincident groups of the same basic kind. For instance, the same individuals might make up the chess club and the nature club. However, even with identical extensions at a time the two clubs fail to be identical. In such a situation it would be neither inappropriate nor false for a student to say that she is in two clubs—the chess club and the nature club.[139]

One might think that a further important feature to capture has to do with groups having more than one member. Teams, committees and clubs all seem to be things made up of many members. While groups usually have multiple members, I do not take this to be a requirement due to cases like the following. Suppose that the United States is in turmoil. One senator resigns from office, then another and another until finally all but one senator has resigned. The Senate, if it exists at all, is a group made up of one member. A bit later, new elections are held and new senators are elected. The Senate grows and is, seemingly again, a many-membered group. While one could argue that the Senate before the mass exodus is a distinct entity from the Senate after it is quite natural to say that the Senate shrunk and then grew.[140] I will not argue for either view here. Instead, I will leave out a criterion requiring groups to be many-membered to accommodate both views of the case. Further, the view of groups I develop is able to explain why groups often have many members.

While I do not take the criteria discussed above to exhaust the features of groups I do take them to capture important features that groups share. To summarize, the features groups share and which I take to be criteria an adequate view must capture are:

(1) Members-Times: Groups can have different members at different times

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[139] This criterion goes against the view that two things cannot be in the same place at the same time. For example, David Wiggins notes that "it a truism frequently called in evidence and confidently relied upon in philosophy that two things cannot be in the same place at the same time" (1968, 90). I take it that those who take this to be a truism for all things have failed to adequately examine the properties of groups, for groups seem to clearly violate this rule.

[140] I thank an anonymous referee at Philosophical Studies for bringing a case structurally similar to this one to my attention.

(2) Members-Worlds: Groups can have different members across worlds

(3) Existence-Time: Groups can exist at one time without existing at every time

(4) Existence-World: Groups can exist at one world without existing at every world

(5) Space: Groups are (or can be) located in space

(6) Coincidence: Groups of the same basic kind can be extensionally coincident and non-identical

In the next four sections I examine prominent views of groups that have been developed. I begin each section by laying out a view. I then assess whether it captures the six features of groups given above. Before turning to these discussions I examine how group composition relates to material composition more generally.

For an examination of group composition in particular rather than material composition in general to be warranted one might argue that groups must have some features which distinguish them from tables, trees and other material objects. I have argued that groups share the six criteria set out above. If other objects do not share these features, this would mark a difference between groups and other wholes. At least the first five criteria seem to be satisfied by object generally. Most take it that tables and trees allow for variations in parts across times or worlds, are neither necessary nor eternal and take up space. However, the sixth criterion, that there can be non-identical coincident groups of the same basic kind, might mark a difference between groups and other objects. Could there be two non-identical but coincident tables? Or two completely overlapping but distinct Oak trees? While there can certainly be two coincident and non-identical clubs or teams, tables and trees seem different. Of course some hold that there might be coincident objects. For example, Kit Fine[141] argues that a tree and the wood it is made of are necessarily coincident, but non-identical. He states that the wood and the tree are of different sorts, so even on a view that allows many coincident entities, coincident entities of the same basic kind seem to be ruled out. The Coincidence criterion marks one difference between groups and other wholes.

Structured ocial groups can also be distinguished from other objects by another

[141] (1999)

feature—member intentions. The parts that make up a table do not intend to make up a table. In fact, they have no intentions at all. Similarly, while a person might have intentions, the parts that make up a person fail to have intentions, so they cannot jointly intend to compose a person. Structured social groups are different.[142] The members of a team intend to form a team. A club is formed when individuals join together with the intention of forming a club. Even groups created by fiat involve intention. Suppose that President Obama decides to create a committee composed of the Chief Justice, the Majority and Minority Leaders of the House of Representatives, and the Majority and Minority Leaders of the Senate. Obama intends for these five individuals to form a new committee. Since the individual who is Chief

Justice and the individual who is the Majority Leader of the House and so on have joined (through their intentions) groups which are part of a government that recognizes that President Obama has the power to form committees, one might hold that the new committee is formed through Obama's intention. Alternatively, one might hold that in addition to Obama's intention, the members must also intend to form the committee. Either way, intentions are part of what determines whether some things form a social group. The views examined in the next four sections and developed in the final section might be taken to be views of material objects generally. In order to draw a distinction between social groups and other material objects, a necessary condition that group members or others in suitable positions have group-forming intentions might be added to any of the views discussed in the next five sections. Next, I turn to the first view of groups—that groups are non-singular pluralities.

5.2 GROUPS ARE NON-SINGULAR PLURALITIES?

A proponent of a view of groups as non-singular pluralities argues that groups just are their many members taken together, but not joined together. On such a view

[142] Here I say 'structured social groups' to draw a distinction between, on the one hand, entities like teams, committees and clubs and on the other entities like the middle class and the group of Americans with O positive blood. The former, but not the latter, are the sorts of social groups to which intentions matter.

groups are nothing over and above individuals. On this picture there is no group as one, rather there is only a group as many. A proponent of the view that groups are non-singular pluralities might say "The team played a game" or "A committee met to discuss judicial reform," but 'the team' and 'a committee' are to be understood only as some many individuals, not as further entities.

Let's look at an example of how such a view might work. Instead of the truth of "A committee met to discuss judicial reform" requiring an entity to have done something, it requires that many entities (perhaps suitably arranged) have done something. For instance, it might require that the individuals arranged committee-wise met and discussed judicial reform. Since being arranged committee-wise does not require that there is anything that is a committee, but only that certain relations hold, there is no object that is required in addition to the individuals.

Before addressing whether this view is able to uphold the desiderata set forth in Section 5.1 I address a worry. One might think that including the non-singular pluralities view of groups is odd given that we began with the supposition that there are groups. The claim that groups just are many individuals might sound like a claim that while we talk (think, act...) as if there are groups, really there are no groups, but only individuals. However, the proponent of non-singular pluralities view can talk as we did at the beginning of our investigation. She might accept the claim that there are groups, but understand it as requiring that there are individuals arranged group-wise. While such a position might not fit the spirit of the supposition with which we began our examination it is near enough to be appropriate to include.

Let's now turn to how the non-singular pluralities view of groups handles the criteria laid out earlier. I begin by looking at those that it does uphold. First, the proponent of the non-singular pluralities view is able to maintain Existence-Time, the claim that groups can exist at one time without existing at every time. On this view groups are nothing but many individuals. Since individuals can exist at one time without existing at every time, groups too can exist at one without existing at every time.

Similarly, the pluralities view can accommodate the Existence-World criterion.

Since individuals might exist at some world without existing at every world, groups, which are just many individuals, can also exist at some world without existing at every world. Further, as long as individuals are located in space, a proponent of the pluralities view can hold that groups are located in space, thereby satisfying Space.

Of the remaining three criteria for groups, two are not satisfied on the view in question. Whether the third is satisfied is controversial. Let's start with the more controversial case. We took it that there could be non-identical coincident groups. On a straightforward understanding it seems that the non-singular pluralist cannot accommodate Coincidence. Suppose that some people, Ted, Joe, Angelika and Terry, make up a chess club and these same people make up a nature club. The individuals Ted, Joe, Angelika and Terry are identical with themselves. Since the chess club just is those four people and the nature club is also just those four people, the chess club is the nature club. The 'two' clubs are really one club described in two ways.

One might take the non-singular pluralist to have a viable response. She might argue that her view is not simply that a group is some individuals, but that a group is some individuals arranged in a suitable way. Some individuals might be arranged chess-club-wise and nature-club-wise. Since the arrangements are different, the groups, while coincident, are not identical. So, there can be coincident groups.

In utilizing arrangements one might worry that the non-singular pluralist is pitted with a position that is not nearly as nominalistic as the view originally seemed. It seems, one might argue, that the non-singular pluralist has been forced to reify arrangements. A group is no longer merely some individuals. Instead it is some individuals combined with an arrangement. If this is correct, attempting to capture Coincidence leads to a rejection of the non-singular pluralist view. Here, I will not further examine whether adding arrangements into the picture leads to a rejection of the non-singular pluralist view. Doing so would require an examination of the metaphysics of arrangements which is far beyond the scope of this paper. However, we will see that the non-singular pluralist has other problems which give us reason to abandon it.

We can now turn to an examination of the two criteria that the non-singular

pluralities view definitively cannot handle. First, on this view groups cannot have different members across times, so Members-Times is not met. A group is just some individuals (perhaps suitably arranged). Individuals d, e and f are identical to individuals a, b and c if, and only if, d is identical to one of a, b or c, e is identical to one of a, b or c and f is identical to one of a, b or c and each of a, b and c is identical to one of d, e or f. Suppose that a group, G, is a, b and c arranged committee-wise. If, at a later time, one attempted to add an individual not identical to a, b or c to G, a new group would come into existence. This is represented in the following argument:

1. G is a, b and c (suitably arranged)
2. Individuals a, b and c are not identical to the individuals a, b, c and d.
3. So, G is not a, b, c and d (suitably arranged).

Members-Times is not met.

Instead of trying to add d to G at a different time, one might try to add d to G at a different world. The same sort of argument can be employed to show that the non-singular pluralities view of groups fails to capture Members-Worlds, the criterion that groups can have different members at different worlds. The chart below summarizes how the non-singularist pluralist handles the criteria for groups.

Non-Singular Pluralities	Members-Times	Members-Worlds	Existence-Times	Existence-Worlds	Space	Coincidence
Captured?	No	No	Yes	Yes	Yes	Maybe, if arrangements can be included

Table 5.1: Non-Singular Pluralities

The non-singular pluralist fails to accommodate that groups can change members across times and worlds. The view should be rejected. Groups should be reified in a way in which the non-singular pluralist refuses to allow. In the remaining sections I consider only views which take groups as one seriously.

5.3 GROUPS ARE FUSIONS?

A proponent of the view that groups are fusions holds that members of a class fuse to form a whole. Theodore Sider, a proponent of the fusion view, defines a fusion as:

> x is a fusion at a time, t, of a class, S, iff (1) every member of S is a part of x at t, and (2) every part of x at t overlaps-at-t some member of S.[143]

A proponent of fusionism relies on a parthood-at-a-time relation. This relation might be defined as:

> x is a part of y at t iff x and y each exist at t, and x at t is a part of y at t.[144]

Parthood is a transitive relation, so anything that is part of the fusion, or a part of a part of the fusion, and so on is a part of the fusion. The identity conditions for fusions are usually given extensionally. Given this, and since parthood is relativized to times we might take the primary notion of identity to be relativized to time as in:

> Two fusions z and y are identical at a time, t, if, and only if, for any x, x is a part of z at t, if, and only if, x is a part of y at t.

Unrelativized identity might then be taken to be identity at every time at which either z or y exists. The following table shows how the fusionist view stands on the criteria for groups.

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[143] (2001, 58)

[144] This is similar to the explication Sider gives of parthood at a time.

Fusions	Members-Times	Members-Worlds	Existence-Times	Existence-Worlds	Space	Coincidence
Captured?	Yes—because the parthood relation is relativized to times	If one appeals to counterpart theory, Yes	Yes—because a fusion exists only when some part of it exist	Yes—if none of a fusion's (counter)parts exist at a world, the fusion does not exist at that world	Yes—because fusions exist where their members exist	No

Table 5.2: Fusions

The fusionist has trouble capturing Coincidence. The fusionist cannot capture Coincidence since the identity conditions of groups when they are taken to be fusions are extensional. Take the following unrelativized identification principle for fusions: two fusions, z and y, are identical if, and only if, for any x, x is a part of z if, and only if, x is a part of y. Given this principle, Coincidence cannot be satisfied. If groups are fusions, then two extensionally equivalent groups are identical. For example if the chess club and the nature club have all of the same parts at time t, they are a single club at time t. So, on this view it is strictly false for a student to say that she is in two clubs when the club memberships overlap completely.

One might argue that while strictly a student is in one club at a time when all the members of the chess club are all and only the members of the nature club, the clubs themselves are distinct due to times at which they differ in membership. While such a line might be promising for some cases, there are other cases for which it will fail. For instance, suppose that a new committee is formed which includes all and only the Supreme Court Justices. The new committee and the Supreme Court will have all and only the same members at every time at which they exist. So, on the fusionist view they will be one group. However it is certainly possible for such a committee to exist. It is not a court so it is not identical to the Supreme Court. Yet on the fusionist view such a committee and the Supreme Court are identified.

The fusionist might appeal to counterpart theory[145] to try to capture Coincidence. For example, suppose that in another world the chess/nature club of the actual world has two counterparts g1 and g2. g1 has a part, d, that g2 does not have, but otherwise g1 and g2 overlap. Suppose that one takes g1 to be the nature club and g2 to be the chess club. Since g1 has a part that g2 fails to have, it turns out that it could have been the case that something was a part of the nature club without being a part of the chess club.

Contra the fusionist, one might argue that g1 is a counterpart of the chess club as much as it is counterpart of the nature club. So, an appeal to counterparts shows only that there could be two clubs that are both identical to a single actual club. Counterpart theory, such an objector might argue, fails to show that only the nature club, and not the chess club, could have had some part, d. Since these two possible clubs are not identical they need not have all parts in common, but given that the nature club and the chess club are actually co-extensional a counterpart of one is a counterpart of the other.

To reject this conclusion the fusionist might argue that something is a counterpart of an actual thing qua a sortal. For instance, something might be a counterpart of a group qua nature club or qua chess club. These counterpart relations could be taken to have different standards of application even in a single context. Since the relations differ, they need not stand or fall together. In the example above, the actual club might bear the counterpart qua nature club relation to g1 (and not g2) and the counterpart relation qua chess club to g2 (and not g1). Since g1 has a part that g2 does not have and since g1 is a nature club counterpart of the actual nature/chess club while g2 is not a nature club counterpart of the actual nature/chess club, the chess club might not have been co-extensional with the nature club.

Adding qua-counterpart relations does not capture genuinely coincident groups. To capture Coincidence we wanted some individuals at a time to form two distinct groups, in our example a nature club and a chess club. By appealing to counterpart theory, the fusionist argued that that group might have many complex modal properties. It might have the property 'being counterpart related to g1 qua nature club relation.' Further, it might

[145] In counterpart theory individuals are usually taken to be world-bound. An individual has many counterparts according to different relations. These relations ground the truth of counterfactual claims. See Lewis (1986).

have the property 'being counterpart related to g2 qua the chess club relation.' These are two properties that the one actual chess club/nature club fusion possesses. Having more than one modal property, even qua some sortal, does not allow a single actual fusion satisfy Coincidence. The fusionist is unable to adequately handle Coincidence. Since we took at that there can be coincident but non-identical groups, the view that groups are fusions should be rejected. Next I turn to the view that groups are aggregates.

5.4 GROUPS ARE AGGREGATES?

Tyler Burge[146] developed a theory of aggregates based on set-theoretic principles. Burge restricts his theory to the first-order, allowing only sets with individuals as members. He excludes the null set and identifies singleton sets with their members. The 'member of' relation is replaced by the 'member-component of' relation, which is reflexive and intransitive. As Burge develops the theory, what counts as a member-component of an aggregate is determined by a plural construction like "the stars in the Pleaides galactic cluster." Here, the Pleaides galactic cluster's member-components are stars. The gases and molecules and … that make up the stars are not member-components of the galactic cluster. Since we are concerned with things often referred to without the use of a plural (e.g., in 'the Supreme Court'), language is a less clear guide to member-components. However, a privileged sort of member-component is usually easy to find. The Supreme Court has justices as member-components. A high school chess club has students as member-components. Burge uses the member-component relation to define aggregates:

> x is an aggregate if, and only if, for some z and some y (z is a member-component of x & y is a member-component of x & z is not identical to y).[147]

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[146] (1977)

[147] (1977, 100)

Two aggregates, z and y, are identical if, and only if, any individual x is a member-component of z if, and only if, it is a member-component of y. An aggregate can sustain alterations in parts only if the parts are not member-components. That is, an aggregate might alter in the parts of its member-components, but not in its member-components themselves. An aggregate persists if it retains all of its member-components and gains no new member-components. Burge takes aggregates to be located in space and time. They are located where their member-components are located. They come into and pass out of existence along with their member-components. The following table shows how the aggregate view of groups handles the criteria.

Aggregates	Members-Times	Members-Worlds	Existence-Times	Existence-Worlds	Space	Coincidence
Captured?	No	If one appeals to counterpart theory, Yes	Yes—because it exists only when its member-components exist	Yes—because it exists only at worlds in which its member-components exist	Yes	If what counts as a member-component is the same, No

Table 5.3: Aggregates

The aggregate view has trouble with three of the criteria. I begin by examining Members-Times. Burge allows for aggregates to sustain alterations in parts, but not in member-components. If Members-Time is understood as requiring only that some change in part-hood is allowed, the aggregate view holds up. However, it was meant to capture the ability for a team or committee to gain or lose not only molecules, but also players and committee-members. The view that groups are aggregates does not allow for Members-Time to be upheld on the robust understanding that was meant.

Given that an aggregate cannot lose a member-component at a world, one might conclude that an aggregate cannot vary in member-components across worlds, thereby

failing to satisfy Members-Worlds. However, like the fusionist one might appeal to counter-part theory. One would then allow for an aggregate to have counterparts with different member-components.

Last, the aggregate view of groups fails to capture Coincidence in many cases. Burge takes two aggregates, and so, on the view in question, two groups, to be identical if they have all and only the same member-components. In the chess club and nature club example above, each have the same member-components. So, on the groups are aggregates view, "they" are a single club.[148] Like the fusionist, one might here too appeal to counterpart theory to try to avoid rejecting Coincidence. However, the moves available here will be similar to those already canvassed and shown to ultimately be unhelpful options for the fusionist. Since they would be put to the same use by the proponent of the aggregate view here, they will also be unhelpful. So, I will not rehash them here. Next, I examine the view that groups are sets.

5.5 GROUPS ARE SETS?

A simple view of groups as sets runs into problems straightaway. Sets cannot change members across times and worlds, while groups can. Sets are not and groups are located in space. Coincident sets are and coincident groups are not identified. Nikk Effingham[149] recently developed a more sophisticated version of the set view of groups which attempts to handle these problems. On his view a group is defined as follows where '$member_S$' is set membership:

> g is a set with only ordered pairs as $member_S$; (b) every possible world is the first member of exactly one ordered pair that is a $member_S$ of g; and (c) the second member of each such ordered pair is itself a set of ordered pairs such that (i) every

[148] Coincidence can be captured when two aggregates have different member-components. For instance, suppose there is an aggregate of committees and an aggregate of senators. All and only the individuals in the aggregate of senators are in the aggregate of committees. However, the aggregate of committees has committees, not senators, as member-components. So, the two groups are distinct.

[149] (2010)

> instant is the first member$_S$ of exactly one of those latter ordered pairs and (ii) the second member$_S$ of each of the latter ordered pairs is either the empty set or a set of individuals.[150]

On this view groups are sets of tuples with worlds as the first member and sets of tuples of times and either sets of individuals or the empty set. Group membership, written as 'member$_G$', is defined partially in terms of set membership as follows:

> x is a member$_G$ of g at t at world w=df (i) g is a group; (ii) g has the ordered pair z as a member$_S$ where (iii) z has w as the first member$_S$ and (iv) z has z* as its second member$_S$; (v) z* has as an ordered pair y as a member$_S$ where (vi) y has t as its first member$_S$ and (vi) x is a member$_S$ of the second member$_S$ of y.[151]

The table below shows how the sophisticated setist handles the criteria.

Sets	Members-Times	Members-Worlds	Existence-Times	Existence-Worlds	Space	Coincidence
Captured?	Yes	Yes	Maybe	Maybe	Maybe, but only if one takes some sets to be located	No, but it may capture it in spirit

Table 5.4: Sets

The proponent of a sophisticated set view of groups has trouble with four of the criteria. First, sets are usually taken to be abstract. If one holds this standard view about sets, Space is not captured. To capture Space a setist must argue that (at least some) sets are concrete.

Second, the sophisticated set view does not capture Coincidence since set identity obeys the following: for any set, s, and any set, s', if s has all and only the same members as s', then s is identical to s'. Given this principle co-extensional sets are identified. However, the sophisticated setist can hold that two actually coincident groups are not identical as long as the two differ in members across worlds. The most straightforward cases we have

[150] (2010, 259)
[151] (2010, 259)

considered, like the nature club and the chess club, will be such that they will vary in members across worlds. So, perhaps the setist captures the spirit of Coincidence by allowing for two groups to be distinct when possibly, but not when necessarily, coincident.

Since groups are identified with sets which include every world and time, the setist appears to take groups to exist at every world and time, thus violating Existence-Times and Existence-Worlds. A setist might argue that while sets exist necessarily and eternally, groups exist only when and where the members of the second member of their ordered pairs beginning with instants exist. If this is the case, whenever a time is paired with the empty set, the group does not exist. If all of the instants of the ordered pairs associated with some world, w', have the empty set as their second member, the group does not exist at that world. With these modifications, a group might exist at only some times and worlds.

While arguing in this way allows for Existence-Times and Existence-Worlds to be captured it is ad hoc. Why is it the second member of the ordered pair that begins with an instant which determines whether the group exists at a time or world? The setist identifies groups with a set whose precise construction appears arbitrary. Benacerraf gave a worry of this sort against the view that numbers should be identified with sets. Benacerraf[152] argued that there are sets that are equally good candidates with which to identify a given number. Since choosing to identify, for example, the number 2 with a set constructed according to Zermelo-Fraenkel set theory rather than, say, von Neumann set theory is arbitrary, 2 should not be identified with either set or with any of the other candidates on offer. Similarly, there is no reason why groups are identified with sets with ordered pairs with instants as their first member rather than as their second member. Since identifying groups with one candidate set rather than another would be arbitrary, groups should not be identified with any set.

Effingham acknowledges that a Benacerraf problem exists for the setist. He suggests two responses which take the worry seriously. First, he suggests identifying groups with sets which bear the 'same group as' relation to one another. Sets constructed as

[152] (1973)

Effingham's describes and those which are constructed in the same way, but which include ordered pairs with a set of group members as the first member and an instant as second member bear the 'same group as' relation to one another. If the setist opts for this response Existence-Times and Existence-Worlds cannot be captured. To capture these criteria a claim like the following is needed: a group is located only where the second members of its ordered pairs which have instants as their first members are located. If groups are identified with classes of sets, such a fix is no longer available.

Second, Effingham suggests, but does not develop, that one might appeal to a structuralist view of groups to avoid an arbitrariness worry. He concedes that in opting for this route one no longer maintains that groups are sets. So, the setist cannot avoid a Benacerraf-style problem in this way. In the next section I develop a structuralist view of groups.

The four views assessed each fail to capture one or more of the criteria. In the next section I present a new view of groups which captures the six criteria. Further, it captures a distinctive feature of groups—that they are entities with structure—that is not captured by the views just canvassed.

5.6 GROUPS ARE REALIZATIONS OF STRUCTURES

The structuralist view of groups I propose and sketch here has two components. The first captures the importance of the maintenance of a group's structural organization to a group's persistence. The second captures the requirement that a group must be made up of things. I discuss these in turn.

One component of a group is its structural organization. The structure of a group can be represented with nodes (or places) and edges connecting nodes to other nodes. The edges of a structure capture the relations that hold between nodes. Since all members of a group are related to some degree, each node in structure S is connected to every other node in S. Functional relations connect nodes in group structures. Some of these functional relations might be hierarchical in nature. Hierarchical relations capture

the "order of command" or power relations between nodes. Such relations might be represented by directed edges.[153]

Many non-hierarchical functional relations might hold between nodes. For instance, in the baseball team structure the node labeled 'pitcher' is related to that labeled 'catcher' by the pitch-ball-to relation. Similarly catcher[154] is related to pitcher by the return-ball-to relation. Some functional relations which appear via description to be the same differ upon closer examination. For instance, the node labeled 'shortstop' is related to pitcher via the return-ball-to relation since that is a relation that might hold between individuals occupying those nodes. However, it seems to hold more strongly between pitcher and catcher than between shortstop and catcher. In the first it holds more frequently and seems more integral to the way the baseball team functions than in the second.

To represent this seeming difference we might take one of three options. First, edges in a structure might be weighted. A more heavily weighted edge marks a relation which holds more strongly. On this option, structures are fine grained as they include not just places and relations, but strengths with which relations hold. The weights might be represented by a number or might be specified only relative to other relations in the structure. On the first option the weight of the 'return-ball-to' relation as it holds between pitcher and catcher might be represented by .8 and as .4 between shortstop and pitcher. Alternatively, it might be represented as holding more strongly between pitcher and catcher than between pitcher and shortstop without specifying a precise weight, but through a partial ordering of relations. The 'return-ball-to' relation as it relates catcher and pitcher will be higher in the ordering than it as it relates shortstop and pitcher.

Second, one might hold that structures are made up of only nodes and relations. To capture the difference between the return-ball-to relation as it holds between a pitcher and a catcher and as it holds between a shortstop and a catcher one might take 'a group's

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[153] For views on the nature of structures see Shapiro (1997), Resnik (1997), Hellman (1989) and Putnam (1967)
[154] From here I use "catcher," "pitcher" and the like to mean "the node labeled 'catcher" and "the node labeled 'pitcher,'" respectively. I still occasionally use the longer "the node labeled 'N'" when it makes the discussion more clear.

structure' to pick out a vaguely delimited class of structures. The structures all share some features in common, but might include slightly different relations. A group exists when some suitable number of the class of structures is realized.

Third, one might argue that instead of 'a group's structure' picking out a vaguely delimited class of structures the reference of 'a group' is vague. There are many different groups. Each is a realization of some structure which is made up of nodes and relations. The structures share many similarities, but include some differences, perhaps in their relations.[155] I will not settle on one of these options here. Instead, the view that groups are realizations of structures might be developed in accordance with any of the three.

In addition to intra-structural functional relations, functional relations hold inter-structure when a structure is (or some structures are) embedded in a larger structure. For instance, when engaged in playing a game two teams are a part of a game structure. Relations hold between, for example, a pitcher on Team 1 and a batter on Team 2. The teams might also be part of league or division structures. Inter- and intra-structural roles wholly define the nodes in a structure, as nodes are defined only in terms of structural or functional relations.

Nodes in a structure might have a one or more than one satisfier at a time. Some node might be marked to allow only one satisfier at a time (e.g., the 'Chief Justice' node) while some other might allow one or many satisfiers (e.g., the 'treasurer' node). By allowing for a varying numbers of satisfiers of a node, a group can alter in size without a structural change. A node that was once occupied by only a single satisfier, might later be occupied by more than one satisfier. To capture relations between individuals who share a node in a realization of a structure, nodes must bear reflexive relations to themselves. In some structure this will be the 'has-same-functional-role' relation, in others it might be something more specific.

Next, I turn to the second part of the structuralist view of groups, explaining how

[155] I thank an anonymous reviewer at *Philosophical Studies* for comments on the grain of structures and for suggesting the third option discussed here.

members of a group at a time and world relate to the structure of a group. When a group exists it has both a structure and some members which occupy the nodes in the structure. Some things are members of group G with structure S at time t and world w just in case they jointly realize S. Some things jointly realize a structure if, and only if, each occupies a node (or some nodes) in the structure and every node in the structure is occupied by one or more of the things. To occupy a node is to stand in the relations required by the node. It is only through the efforts or actions of the many members of a group that all of the nodes in the structure are filled and that the structure of the group is realized.

Occupying a node requires the satisfaction of two conditions. First, something occupies or some things occupy a node in a structure S if, and only if, every node in S is occupied. Second, the occupier(s) of a node, n, must stand in the relations required by n to the other things occupying nodes in S. If these two conditions are met, X[156] occupy a node in S.

One thing might occupy the role of more than one node. For instance, someone might be both Secretary and Treasurer of a club. By allowing for a single thing to occupy more than one node, a group structure might be realized by a single thing. While this is possible, it is uncommon due to the sorts of structures most groups have. Most group structures include at least one irreflexive relation. For example, in the baseball group structure the relation 'return-ball-to' is irreflexive. All hierarchical relations like has-more-power-than are irreflexive. Committees with bylaws based on Robert's Rules of Order will include the seconds-a-motion-introduced-by relation, which is irreflexive. More generally, many groups require collaboration between members. Since collaboration is not something one can do with oneself (i.e., collaborates-with is an irreflexive relation), many groups require more than one member. Since irreflexive relations cannot relate a thing to itself, a realization of a structure with an irreflexive relation requires at least two entities.

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[156] Here X is a plural variable. Standardly in plural logic, plural variables allow for something or somethings to be taken as argument. See, for example, Boolos (1984).

Once a group structure is realized a group, G, exists. The persistence of G requires the continuity of the realization of S. That is, occupiers of the nodes of S which form the realization of group G (i.e., members of G) must continue to bear the functional relations required for a realization S. Persistence of G allows for alterations in members given the following understanding of group membership:

> Some thing, x, is a member of group G with structure S at time t and world w if, and only if, x occupies a node(s) of S and is functionally related (in the ways required by S) to other occupiers of nodes in S of G.

If something, x, comes to occupy a node in S at t' and at w, it is then related to other occupiers of nodes of S in its realization as group G and is a member of G at time t' at w. If something, y, which was a member of G at t at w, fails at time t' to bear function relations (in the ways required by S) to other occupiers of nodes of S, y ceases to be a member of G at t' at w.

A group can also persist through changes in structure. For example, after realizing that their funds are being mismanaged a committee might decide to add a treasurer position. In so doing, the structure of the committee comes to have an additional node. In such a case it seems that a group has sustained a structural change. So, the persistence conditions for groups should allow the possibility for structural changes.

Given these constraints on persistence group identity at a time and world can be defined as: A group G1 and a group G2 are identical at t at w if, and only if, (1) G1 and G2 have the same members at t at w, and (2) G1 and G2 include all the same intra- and inter-structural relations holding between the same individuals at t and w. More generally groups G1 and G2 are identical just in case

> (1) for all t and all w, the structure of G1 at t at w is identical to the structure of G2 at t at w

and

> (2) for all t and all w and all x, x occupies node n in the structure of G1 at t at w if, and only if, x occupies n in the structure of G2 at t at w.

The general definition of groups allows for a group's membership and structure to change

across times and worlds, thereby satisfying the constraints on group persistence discussed above.[157]

The view that groups are realizations of structures treats groups as one rather than many. A group is a realization of a structure. However, a view of groups as many is also delivered. What a group as many is is relative to a time and world. Some things count as the many things making up a group G at time t and world w just in case they are all and only the things that make up G at t. The things jointly "make up" G just in case they are all and only the things that occupy the nodes in the structure of G. The proposed view of groups as realizations of structures can capture the notion of a group as many and a group as one.

The table below shows how the view that groups are realizations of structures meets the criteria developed at the beginning of the chapter.

Realizations of Structures	Members-Times	Members-Worlds	Existence-Times	Existence-Worlds	Space	Coincidence
Captured?	Yes	Yes	Yes	Yes	Yes	Yes

Table 5.5: Realizations of Structures

The view that groups are realizations of structures has advantages over its rivals. It captures all six criteria. According to the definition of group membership I gave above, some thing might be a member of a group G some times and worlds without being a member of G at every time and world. So, Members-Times and Members-Worlds are captured. I argued that a group, G, exists only at times when and worlds where there is a realization of its structure. So, Existence-Times and Existence-Worlds are captured. Groups are located where their

[157] My examination here develops some constraints on a view of group persistence conditions. These include that a group can change its members and its structure across time. Here I do not develop a view of group persistence. I do not deal with difficult cases involving, for example, fusion or fission. In further work I plan to examine difficult cases more closely to develop a view of group persistence and a view of how the persistence conditions of groups are similar to or differ from the persistence conditions of other entities.

realizations are. Group structures are (usually) realized by physical entities. So, groups are (usually) located in space and the view meets Space. Last, given the identity criterion I developed above, two groups that have all the same members are not identified if there is any modal or temporal difference in structure or membership. So, Coincidence is captured.

The view that groups are realizations of structures captures all six criteria while giving a substantive answer to the question, "What are groups?" Further it gives a neat picture of groups as many as well as groups as one. Of the views of groups currently on offer, the view that they are realized structures comes out on top.

Appendix:

Justifying Claims 1 and 2

In this Appendix I sketch how Claim 1 and 2 at the end of Chapter 2 might be justified. I repeat the claims here:

> Claim 1: Both the Pluralist and Singularist systems have an available interpretation that delivers treatments that attribute to plural-involving object language theories a commitment to summed entities.
>
> Claim 2: Both the Pluralist and Singularist systems have an available interpretation that delivers treatments that fail to attribute to plural-involving object language theories a commitment to summed entities.

While here I will not prove that the two claims hold, I will sketch a way in which one might go about proving that the two hold. I give some justification for Claim 1 and then for Claim 2.

Justification for Claim 1

I begin this section by laying out a formal semantic theory for a Singularist treatment of plural expressions. Since this treatment is being used to sketch a way in which one might justify Claim 1, it will include a Singularist Interpretation. In the second part of this section I lay out a Pluralist formal system combined with a Singularist interpretation.

Lexicon and Syntax for the Singularist Treatment

Lattice theory uses a first order predicate language. I use '=' to symbolize definitional identity and metalinguistic identity. The context will make clear for which it is being used.

Basic Elements:

> Logical constants: '¬', '&,' '=,' and '∃.' All other logical constants can be defined in terms of these.
> Variables for clauses: '$\boldsymbol{\Phi}$,' '$\boldsymbol{\Psi}$'
> Variables for constants: 'a,' 'b,' 'c'
> Variables (which can stand for atomic or plural individuals): 'x,' 'y,' 'z'
> Variables for n-place predicates: 'P_1,' 'P_2,'…, 'P_n'
> Primitive symbols of the language: Two-place predicate constant 'Π' which takes individuals as arguments

Constants and variables can stand for atomic or plural individuals.

Terms:

Constants are terms
Variables are terms
If T_1,….T_n are terms, then T_1+…+T_n is a term

Clauses:

$P^nT_1…T_n$ is a clause
$T_1 \Pi T_2$ is a clause
If G is a clause, then ¬G is a clause
If G and H are clauses, then G&H is a clause.
If Q is a quantifier, v is a variable and G is a clause, then Qv(G) is a clause.
Nothing else is a clause.
A clause is a sentence if it contains no free variables.

Defining Primitive Symbols:

'*a*Π*b*' is interpreted as "*a* is an individual part (*i*-part) of *b*."

1. $a = b \leftrightarrow a\Pi b \ \& \ b\Pi a$
2. $(a\Pi b \ \& \ b\Pi c) \rightarrow a\Pi c$

Defining Predicates:

'At*a*' is interpreted as "*a* is an atomic individual."
'Dist(*P*)' represents that predicate *P* is distributive.

1. At*a* $\leftrightarrow \neg\exists x\neg(x\Pi a \rightarrow x = a)$
2. ***Pa* ↔ (*Pa* & ¬At*a*)
3. Dist(*P*) $\leftrightarrow \neg\exists x\neg(Px \rightarrow At\ x)$

Defining Definite Descriptions:

'The *P*s' or the individual sum (*i*-sum) of the Ps can be defined by a plural analog to the Russellian analysis of definite descriptions:

4. $(\sigma x\Phi)\Psi = \exists x(\Phi \ \& \ \neg\exists y(\Phi \rightarrow \neg y\Pi x) \ \& \ \Psi)$ [158]

Semantics for the Singularist Treatment

The semantics for ST can be given using a Boolean model structure. **B** = <*E, A* > such that:

[158] Link uses a free logic and defines *i*-sums slightly differently. If one wishes to follow Link here, one could make the same amendment to the Pluralist system.

1. E is a complete atomic Boolean algebra with join operation $\sqcup$ and the intrinsic ordering relation $\leq$;
2. $A \subseteq E$ is the set of atoms in E.

A Model for the Singularist Treatment

A model is an ordered pair $M = \langle \mathbf{B}, \|\cdot\| \rangle$ such that

1. $\mathbf{B} = \langle E, A \rangle$ is a Boolean model structure, E is the domain of individuals in $M\backslash 0$ and A is the set of atoms in M.
2. $\|\cdot\|$ is a first-order assignment of denotations to the primitive expressions of LTP such that
   (i) $\|a\| \in E$ if a is an individual constant;
   (ii) $\|P\| \subseteq E^n$ if P is an n-place predicate constant.
   (iii)

Truth-Theoretic Definitions for Primitive Symbols in the Singularist Treatment

'1' stands for 'true' and '0' stands for 'false' and bivalence is assumed. Assignments of sequences of elements of the domain are defined relative to a model, M, and an infinite sequence of elements of the domain. Here 'sup' denotes the supremum or join of the Boolean model structure:

1. $\|a\|_{M,S} = a$
2. $\|v\|_{M,S} = S(v)$
3. $\|T1 + \cdots + Tn\|_{M,S} = \|T1\|_{M,S} \sqcup \ldots \sqcup \|Tn\|_{M,S}$
4. $\|\exists v \Phi\|_{M,S} = 1$ iff $\|\phi\|_{M,S} = 1$ for some S'$\approx_v$ S
5. $\|T1 = T2\|_{M,S} = 1$ iff $\|T1\| = \|T2\|$
6. $\|At\ T1\|_{M,S} = 1$ iff $\|T1\| \in A$
7. $\|T1 \Pi T2\|_{M,S} = 1$ iff $\|T1\| \leq \|T2\|$
8. $\|(\sigma v \Phi)\Psi\|_{M,S} = 1$ iff there is an S'$\approx_v$ S and $\|\Psi\|_{M,S'} = 1$ and S'(v)= sup$\{S''(v): \|\Phi\|_{M,S''} = 1$ S"$\approx_v$ S$\}$
9. $\|P^n(T_1 \ldots T_n)\|_{M,S} = 1$ iff $\langle \|T_1\|_{M,S}, \ldots \|T_n\|_{M,S} \rangle \epsilon \|P^n\|_M$
10. $\|\Phi\|_{M,S} = 1$ iff $\forall S \|\Phi\|_{M,S} = 1$

Theorems of the Singularist Treatment

1. $a = b \leftrightarrow (a \Pi b \ \&\ b \Pi a)$
2. $(\exists x Px \ \&\ P \subset Q) \rightarrow Q(\sigma x Px)$
3. $\neg \exists x \exists y \neg (x \Pi y \leftrightarrow (x + y = y))$

That will suffice for an explication of the Singularist Treatment. Next, I lay out the Pluralist+Commitment Treatment of Plurals. This treatment combines the Pluralist formal system with a Singularist Interpretation.

Lexicon and Syntax of the Pluralist+Commitment Treatment

Basic Elements:

Logical constants: '¬,' '&,' '=,' and quantifier '$\exists xx$.' All other logical constants can be defined in terms of these

Variables for clauses: 'Φ,' 'Ψ'

Variables for constants: '*a*,' '*b*,' '*ι*'

Plural variables: '*xx*,' 'yy,' 'zz'[159]

Variables for *n*-place predicates: 'P_1,' 'P_2,'…, 'P_n'

Primitive symbols of the language: Two-place predicate constant '*A*' which takes individuals and *n*-tuples of individuals as arguments

Constants and variables can stand for individuals or *n*-tuples of individuals. When a constant stands for an *n*-tuple of individuals, it plurally refers to the *n* individuals.[160]

Terms:

Individual constants are terms

Variables are terms

If $T_1,\ldots T_n$ are terms, then $[T1, ..., Tn]$ is a term

Clauses:

$P^nT_1\ldots T_n$ is a clause

$T_1A\ T_2$ is a clause

If G is a clause, then ¬G is a clause

If G and H are clauses, then G&H is a clause.

If Q is a quantifier, vv is a variable and G is a clause, then Qvv(G) is a clause.

Nothing else is a clause.

A clause is a sentence if it contains no free variables.

Defining Primitive Symbols:

'*xx*A*yy*' is interpreted as "*xx* is/are among *yy*."

1. $a = b \leftrightarrow (aAb \ \& \ bAa)$
2. $(aAb \ \& \ bAc) \rightarrow aAc$

Defining Predicates:

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[159] Plural variables can take one or more individual as value, so no strictly singular variables are needed.

[160] McKay only allows for individual constants. Given that plural variables are allowed, I take it that plural constants should also be allowed. These are constants which take multiple individuals as value.

'Ind*a*' is interpreted as "*a* is an individual."
'Dist(*P*)' represents that predicate *P* is distributive.

1. Ind*a* ↔ $(\neg\exists xx\neg(xxAa \rightarrow xx = a))$
2. $^{**}Pa$ ↔ (*Pa* & ¬Ind*a*)
3. Dist(*P*) ↔ $\neg\exists xx(Pxx \rightarrow \neg Indxx)$

Defining Definite Descriptions:

'The *P*s' can be defined using a plural analog to the Russellian analysis of definite descriptions:

4. $(\sigma xx\Phi)\Psi = \exists xx(\Phi\ \&\ \neg\exists yy(\Phi \rightarrow \neg yyAxx)\&\ \Psi)$

Semantics for the Pluralist+Commitment Treatment

B is a Boolean model structure
B = <*E, A* > such that

1. *E* is a complete atomic Boolean algebra with join operation ⊔ and the intrinsic ordering relation ≤;
2. *A* ⊆ *E* is the set of atoms in *E*.

A Model for the Pluralist+Commitment Treatment

A model is an ordered pair *M* = <**B**, ‖·‖> such that

1. **B** = <*G, A* > is a Boolean model structure with homogeneous kernel, *G* is the domain of individuals and finite sets of individuals in *M* and *A* is the set of atoms in *M*.
2. ‖·‖ is a first-order assignment of denotations to the primitive expressions of P+CT such that
   (i) $\|a\| \in G$ if *a* is an individual constant;
   (ii) $\|P\| \subseteq G^n$ if *P* is an n-place predicate constant;

Truth Theoretic Definitions for Primitive symbols in the Pluralist+Commitment Treatment

'1' stands for 'true' and '0' stands for 'false.' Bivalence is assumed.

1. $\|a\|_{M,S} = a$
2. $\|vv\|_{M,S}$ = S(vv)
3. $\|[T1, ..., Tn]\|_{M,S} = \|T1\|_{M,S} \sqcup \ldots \sqcup \|Tn\|_{M,S}$
4. $\|\exists vv\Phi\|_{M,S} = 1$ iff $\|\phi\|_{M,S} = 1$ for some S'$\approx_{vv}$ S and = 0 otherwise
5. $\|T1 = T2\|_{M,S} = 1$ iff $\|T1\| = \|T2\|$

6. $\|Ind\ T1\| = 1$ iff $\|T1\| \in A$
7. $\|T1AT2\| = 1$ iff $\|T1\| \leq \|T2\|$
8. $\|(\sigma vv\Phi)\Psi\|_{M,S} = 1$ iff there is an S'$\approx_{vv}$ S and $\|\Psi\|_{M,S'} = 1$ and S'(vv)= sup$\{S''(vv)$: $\|\Phi\|_{M,S''} = 1$ S"$\approx_{vv}$ S$\}$
9. $\|P^n[T1, ..., Tn]\|_{M,S} = 1$ iff $<\|T_1\|_{M,S}, \ldots \|T_n\|_{M,S} > \epsilon \|P^n\|_M$
10. $\|\Phi\|_{M,S} = 1$ iff $\forall S \|\Phi\|_{M,S} = 1$

Theorems of the Pluralist+Commitment Treatment:

1. $a = b \leftrightarrow (aAb \ \&\ bAa)$
2. $(\exists xxPxx\ \&\ P \subset Q) \rightarrow Q(\sigma xxPxx)$
3. $\neg\exists xx\exists yy\neg(xxAyy \leftrightarrow (xx + yy = yy))$

It should be clear that the formal theories for the Singularist treatment and the Pluralist+Commitment treatment are notational variants. In most places they use the exact same notation. The two differ in notation only in three ways. First, the Singularist uses 'Π' for the i-part relation where the Pluralist+Commitment uses 'A' for the 'among'-relation. Second, 'At' is used to stand for 'is an atom' in LTP and 'Ind' is used to stand for 'is an individual' in the Pluralist+Commitment treatment. Last, the Singularist uses lower-case letters from the end of the alphabet which take atomic or non-atomic sums as values. The Pluralist+Commitment uses upper-case letters from the end of the alphabet that take one or more than one entity as value or values. These differences are merely notational.

The given models are isomorphic. If there is an isomorphism between E and G, then there is a bijective function, f: E→G and a function which is the inverse of f, f^{-1} : G→E such that f f^{-1}= id_G and f^{-1} f = id_E. Where 'id_x' is the identity function. There is one predicate and one relation had by each theory not shared by the other. The Singularist utilizes the i-part relation while the Pluralist uses the 'among' relation. The Singularist has the 'At' predicate, the Pluralist, the 'Ind' predicate. To show that there is an isomorphism between the two models, giving a bijective function for these two cases and a general case will suffice.

First, there is a bijective function between the domain of the models of ST, *E*, with binary relation Π and the domain of the model of P+CT, *G*, with binary relation A such that:

$$f(x)\Pi f(y) \leftrightarrow xAy$$

Second, there is a bijective function from *E* with predicate constant At to *G* with predicate constant Ind.

$$At(f(x)) \leftrightarrow Ind\ x$$

Finally, for any predicate P in *E* and *G*, an isomorphism from E to G requires a bijective function f: E → G such that:

$$P(f(x)) \leftrightarrow P(x)$$

Given that the semantics for the two theories are notational variants, both will assign 1 to all and only the same sentences and 0 to all and only the same sentences. If theoremhood is defined as truth in all models, the two theories will produce the same theorems. Both will have the same satisfiable sets of sentences. Both have all and only the same entailments. The Singularist treatment and the Pluralist+Commitment treatments formally schematize the natural language data equally well because their syntaxes are variants. Given the sketch given here, they appear to be expressively on a par. If this is correct, we have a general argument that the linguistic data gives us no reason to opt for one over the other. Next I turn to sketching a justification for Claim 2.

Justification for Claim 2

Instead of going through very similar formalizations to sketch how a proof of Claim 2 might go, I will sketch what the models will need to look like and provide the modifications that would be needed in the truth-theoretic definitions. Claim 2 states that both systems can be interpreted so as to avoid attributing ontological commitments to sums to natural language theories. These systems with the interpretation in which no ontological commitment to sums is attributed to plural-involving object language theories are the Pluralist treatment discussed in the first two chapters and the Singularist system without commitments, what I call the SingularistNoCommitment treatment. On this interpretation, the models for the Pluralist treatment and the SingularistNoCommitment treatment might be as follows:

A model is an ordered pair $M = \langle \mathbf{A}, \|\cdot\| \rangle$ such that

1. $\mathbf{A}$ = is the domain of individuals in *M*.
2. $\|\cdot\|$ is a plural first-order assignment of denotations to the primitive expressions such that
   - (i) $\|a\| \in A$ or are some members of A — if *a* is a constant;
   - (ii) $\|F\| \subseteq \mathcal{P}(A)$ — if *F* is a 1-place predicate constant;
   - (iii) $\|F\| \subseteq$ *n*-tuples of $\mathcal{P}(A)$ — if *F* is an *n*-place predicate constant;
   - (iv) $\|F\| \subseteq A$ — if $F \in DP$.

Here DP is the set of distributive predicates and *F* includes both distributive and collective predicates. Two comments should be made about the above model. First, an explication of plural first-order assignment functions is needed. Assignment functions according to the Pluralist interpretation are one-many, rather than one-one. Yi defines a plural reference relation. Such relations are used as plural assignment function. A plural reference relations is a relation that satisfies the following condition:

If there are some things, xx, and some things, yy, and something z such that S(z, xx) and S(z, yy), then xx = yy.[161]

Here 'S' is a second-order variable that stands for two-place plural relations. If S is a plural relation and so, satisfies the above condition, S(z, xx) can be abbreviated S(z) = xx.[162] I continue to follow Yi (2005, 2006) in defining assignment functions. A one-many plural function S is an assignment function if it meets the following condition:

There is some thing or are some things xx such that xx = S(vv), for any variable vv.

A plural assignment function S' is a variant of S for variable vv if:

1. $S'(vv_1) = xx$, if $vv_1 = vv$
2. $S'(vv_1) = S(vv_1)$, if $vv1 \neq vv$[163]

An assignment function can assign one or more things as value of a constant. When more than one thing is assigned to a constant, this is done plurally. In the model for the Pluralist interpretation, it states that a constant, *a*, denotes some member or members of the domain. So, a commitment to sums or groups is not invoked in by using a constant according to the Pluralist models.

Second, in (ii) and (iii) in the explication of the models above the denotation of predicates are said to be subsets of the power set of *A* and *n*-tuples of elements of the power set of *A*. One might conclude that a proponent of this definition of a model is thereby committed to all of the entities in the power set of *A* and to all of the *n*-tuples of elements of the power set of *A*. However, it is open to the proponent of the pluralist interpretation of the systems to argue that while these are useful tools to capture the denotations of predicates, they do not carry ontological commitment. Instead, she might argue, it is only denoting expressions (which one might rather misleadingly call 'singular terms') and quantifiers that carry ontological commitment. In so arguing, one would follow Quine's Criterion of Ontological Commitment. Since no denoting expression refers to and no quantifier ranges over a set or an *n*-tuple of sets, this interpretation avoids attributing an ontological commitment to sets or sums to the theory it treats. The proponent of the Pluralist interpretation could then define the truth of a predicate holding of a term or terms as:

$$||P^n[T1, ..., Tn]||_{M,S} = 1 \quad \text{iff}$$

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[161] Yi (2006, 254). In his definition 'xs' is employed rather than of 'xx' and 'ys' instead of 'yy'. He also uses '≈' rather than '='. Yi does so as he takes '=' to allow only singular terms in its argument places and takes '≈' to be neutral in allowing either singular or plural terms in either of its places. See Yi (2005) for the first part of the development of his logic of plurals. I have been taking '=' to be neutral. I continue to follow that assumption here.

[162] Yi (2006, 254)

[163] These definitions are from Yi (2006), but with some modifications so as to be written using the symbolizations I have been using.

$<\{x: x \text{ is one of } ||T_1||_{M,S}\}, \ldots, \{x: x \text{ is one of } ||T_n||_{M,S}\} > \epsilon\ ||P^n||_M$

This definition would replace truth-theoretic definition 12 given above. However, one might argue that if the Pluralist interpretation requires resorting to sets to define the truth conditions of a sentence like 'Anne, Bob and Scott hired a lawyer', the interpretation fails to be truly Pluralist.

In order to avoid using sets in the truth conditions for *n*-place predicates, a proponent of the Pluralist interpretation could develop a plural interpretation of some key notions in set theory. The membership relation could be defined as a plural relation so that some thing or somethings might stand in the member-of relation to a set. The relation would be genuinely plural in that some individuals might stand in the member-of relation to a set without it being the case that each of the individuals stands in the member-of relation to the set. By making the member-of relation plural the truth-theoretic definitions for the true application of a predicate would not need to be changed. I will not further develop this way in which the Pluralist interpretation might proceed. For, this is simply meant to be a sketch of how a proof of Claim 2 might go.

To fully justify Claim 2, some other definitions given above must be amended. The primitive two-place predicate constant '*A*' is now defined as taking one or more individual in each argument place. Similarly, the two-place predicate '**Π**' is defined as taking one or more individuals as arguments in each of its places. Constants and variables can stand for one or more individuals. When a constant stands for many individuals, it plurally refers to (or has as its semantic value) those individuals (i.e., them).

Three additional truth theoretic definitions need to be altered. They are numbers 3, 7 and 8 in the lists above. In the Pluralist treatment 3 is replaced with:

$$||[T1, \ldots, Tn]\ ||_{M,S} = ||T1||_{M,S} \wedge \ldots \wedge ||Tn||_{M,S}$$

The SingularistNoCommitment includes the following in place of 3:

$$||T1 + \cdots + Tn||_{M,S} = ||T1||_{M,S} \wedge \ldots \wedge ||Tn||_{M,S}$$

Here '∧' is a term connective that takes two terms and yields a plural term. The terms '∧' takes as argument might be singular or plural. Either way it forms a plural term.

Truth theoretic definition 7 is replaced in the Pluralist treatment with:

$$||T1AT2||_{M,S} = 1 \quad \text{iff} \quad ||T1|| \text{ are among } ||T2||_{M,S}$$

Truth theoretic definition 7 is replaced with the following in the SingularistNoCommitment treatment:

$$||T1\Pi T2||_{M,S} = 1 \quad \text{iff} \quad ||T1|| \text{ are among } ||T2||_{M,S}$$

Finally, truth theoretic definition 8 in the Pluralist treatment and the SingularistNoCommitment treatment with a plural version of Russellian truth conditions given, somewhat informally as:

> The **Φ**s are **Ψ** is true if, and only if, there exist some **Φ**s and anything that is a **Φ** is among them and they are **Ψ**.

With these changes we have the Pluralist treatment with its intended interpretation and the SingularistNoCommitment treatment.

A proof that the Pluralist treatment and the SingularistNoCommitment treatment are isomorphic notational variants might be given in the same way that was sketched for the Singularist and the Pluralist+Commitment treatments above. If such a proof is given, the Pluralist and the SingularistNoCommitment treatments would be shown to be equally expressive. For any object language sentence, they would agree in their assignments of a truth value. They would have the same entailments and are equally theoretically parsimonious. They would be, given the conditions on semantic adequacy developed in Chapter 1, be equally semantically adequate.

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