Plurality and Unity

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Plurality and Unity

Logic, Philosophy, and Linguistics

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Contents

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PART II

Pluralities in Semantics

6

Plural Reference and Reference to a Plurality

Linguistic Facts and Semantic Analyses

Friederike Moltmann

There are two fundamentally different approaches to the semantics of (definite) plurals, which I will call:

[1] Reference to a Plurality
[2] Plural Reference.

Reference to a Plurality takes a definite plural noun phrase such as *the children* to stand for a single entity that is a plurality of some sort (a sum, set, or class, say), a "collection as one." Plural Reference takes *the children* to stand for a "collection as many" or a "multitude," or better to refer to each child at once.[1] Whereas the first view makes plurality a matter of ontology, the second makes it a matter of reference.

While there are different formal conceptions of "pluralities as one," I will focus on the mereological version of Reference to a Plurality.[2] On that view, the semantics of *the children* will be as in (1a), where sum is an operator mapping a set of individuals to the sum (or plurality as one) of those individuals and *s* is the relevant context or situation involving the relevant domain of entities[3]:

(1)   a. [*the children*$_s$] sum([*children*$_s$])

Plural Reference is the view that definite plural NPs stand for several individuals at once.[4] On that view, *the children* refers to each child in the relevant situation at once.

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[1] The terms "collection as one" and "collection as many" are due to Russell.

[2] Representatives of the view of Reference to a Plurality include Link (1984), Sharvy (1980), Ojeda (1993), Gillon (1987), Schwarzschild (1996), and Moltmann (1997).

[3] Technically, sum(X) may be considered the least upper bound of the set X with respect to the part relation that holds among individuals and pluralities (or sub-pluralities and pluralities).

[4] Representatives of that view are Boolos (1984, 1985), Yi (2005, 2006), McKay (2006), Oliver/Smiley (2006, 2013), Linnebo (2012), Yi (2005, 2006), Simons (this volume), among others.

Moreover, a (one-place) predicate with a definite plural will have to be true of each individual that the plural term stands for at once, to give a true sentence:

(1)   b. *The children gathered* is true iff *gathered* is true at once of all the *x*s of which *children* is true at once.

Plural Reference goes along with plural logic, a logic that contains besides singular variables and singular terms plural variables of the sort "xx," "yy," …, variables that are assigned several individuals at once, as well as plural terms, terms that stand for several individuals at once. Moreover, plural logic contains plural predicates, predicates that are true only of several individuals at once (for a particular argument position).

The two views of Reference to a Plurality and Plural Reference differ not only theoretically; they pertain to two very distinct intellectual traditions, differing both in theoretical and empirical interests and backgrounds. Reference to a Plurality is by far the dominant view in linguistic semantics, to a large extent due to influential articles by Link and some others. This approach focuses on a unified semantics of plural, mass, and singular NPs and formal semantic notions allowing for the semantic analysis of a great range of expressions and constructions relating to plurals. Plural Reference has been the focus of philosophical logicians, whose main interests are questions of the ontological commitment of sentences with plurals and the development of plural logic as a means to avoid paradoxes arising from the use of set theory and extensional mereology. This approach has paid little attention to relevant linguistic issues and generalizations, which are not only of interests to empirically minded semanticists but may bear crucially on the theoretical concerns themselves.

This chapter will review the two approaches by focusing on two issues regarding plurals for which the empirical side plays a particularly important role:

[1]   higher-level plurality
[2]   plural-specific predicates or readings of predicates.

Higher-level pluralities (or the terms that describe them, "superplurals" as they have been called) have been discussed within both approaches, but little attention has been paid to the particular linguistic conditions that permit reference to higher-level plurals. Those conditions have important implications for the theoretical treatment of the phenomenon. I will argue that they require a notion of reference situation that will include not only properties about objects, but also information about referential terms used to describe those objects.

It has at least ~~been~~ implicitly been recognized that some predicates or readings of predicates (in particular distributive readings) apply only to plurals. A closer look at relevant linguistic phenomena indicates, however, that it is not strictly a restriction on an argument of the category plural. Moreover, it differs from a semantic selectional requirement, a restriction to a particular ontological type of argument.

The two issues [1] and [2] are connected: there is an important distinction between number-related and other plural-specific predicates (or readings of predicates), only the latter of which can involve higher-level plurality.

This chapter will be focused on two theoretical issues:

[1] the two approaches—Reference to a Plurality and Plural Reference
[2] the two ontological theories of pluralities—the extensional mereological theory and the information-based theory of Moltmann (1997, 1998).

The extensional mereological theory focuses on a part relation specific to pluralities, and the aim of the information-based theory is to view the part–whole structure involving pluralities as part of a more general notion of part–whole structure. Central on the information-based theory are conditions of integrity, which may be intrinsic or just driven by the information content of the expressions used to describe the objects in question. By contrast, the extensional mereological theory makes use only of a part relation meeting formal conditions such as transitivity, closure under sum formation, and extensionality.

This chapter will argue in favor of Plural Reference, rejecting both the extensional-mereological and the information-based version of Reference to a Plurality. In the semantics of natural language, pluralities are simply never treated as "single" entities or as particular types of entities. In a given context, though, pluralities may be structured and divided into lower-level pluralities. The chapter argues that some of the insights of the information-based theory should be carried over for an account of higher-level plurality within the Plural Reference approach. I will also discuss and reject an alternative analysis of higher-level plurality, reducing it to multigrade predicates and enriched plural descriptions.

1 Reference to a Plurality: two ontological approaches

The main motivation for the Reference to a Plurality approach is the apparent parallels in the semantics of singular count and plural NPs. Just as *the child* refers to a single child, *the children* should refer to a single entity as well, a plurality; and just as *some child* existentially quantifies over individual children, *some children* appears to quantify over pluralities of children. There are also part-related constructions that appear to apply to individuals and pluralities alike, such as the partitive construction, which quantifies over the parts in *all/some of the house* and apparently over the parts of a plurality in *all/some of the children*. Also adverbial part-related modifiers such as *in part/to some extent* may relate singular count and plural NPs in the same way:[5]

(2) a. The house is in part/to some extent white.
     b. The people are in part/to some extent French.

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[5] Also adjectival modifiers in some languages may function that way. Thus, German *ganz* "whole" can apply to definite singular count, plural, and mass NPs, with the same part-quantificational effect as *all* in the partitive construction:

(i) a. das ganze Haus
         "the whole house"
     b. die ganzen Leute
         "the whole people"

There are two ontological theories of pluralities that I will discuss: the extensional mereological theory and the information-based theory. They make use of fundamentally different formal notions of part–whole, and differ in the scope of the part–whole relation needed for the semantics of plurals. The extensional mereological theory makes use of a specific part relation applicable only to pluralities and the relation between individuals and pluralities. By contrast, the information-based theory makes use of a single notion of part structure applicable both to individuals and their parts, and to pluralities.

The extensional mereological theory makes use of a part relation for pluralities that is transitive, closed under sum formation, and extensional (two entities sharing the same proper parts are identical).[6] Plural nouns will have as their extension sets of sums of individuals: elements of the extension of the corresponding singular count noun. Thus, *students* will have as its extension the set of sums of individual students. A definite plural NP such as *the students* will stand for the sum of all the contextually relevant entities in the extension of the corresponding singular count noun.

Extensional mereology needs to avoid that parts of individuals always count as parts of the pluralities of which the individuals are parts (e.g., legs of children counting as parts of the plurality of the children). The extensional mereological theory therefore must distinguish different part relations for individuals and for pluralities, part relations that will be tied to the syntactic categories singular count and plural nouns. The one part relation applies to individuals—entities in the extension of singular count nouns—and the other part relation applies to pluralities—entities in the extension of plural nouns. The distinction between the two part relations means that individuals count as atoms with respect to the extensional mereological part relation associated with plural nouns. The notion of an atom, as a notion associated with singular count nouns, plays a central role in the extensional mereological theory of pluralities.

The information-based theory, developed in Moltmann (1997, 1998, 2005) makes use of a single part relation for individuals and pluralities and pursues the view that the same conditions that drive the individuation of objects drive the "contextual individuation" of higher-level pluralities. These conditions crucially involve the notion of an integrated whole. There are particular constructions and modifiers that impose conditions on the part structure of an entity, for example defining an entity in the extension of a singular count noun as a plurality or defining a plurality as a higher-level plurality. These conditions generally involve the notion of an integrated whole. The adjective *individual* as in *the individual students*, for example, imposes the condition that the plurality in question has no subgroups that are integrated wholes and thus are among the parts of the plurality; rather only individuals are. This means that *the individual students* cannot stand for a higher-level plurality. The modifier *whole* as in *the whole*

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[6] For the extensional mereological theory see in particular Link (1983) and Ojeda (1993), as well as the overview of Champollion/Krifka (to appear).

class imposes the condition that the entity referred to is not an integrated whole, but a mere plurality.

The notion of atom, which on the extensional mereological theory defines an individual, does not play a role in the information-based theory. Rather it is the notion of an integrated whole that plays a central role. Singular count nouns, on that view, generally convey properties of integrated wholes, and pluralities are themselves entities that consist of integrated whole and are not generally integrated wholes themselves.

2 Plural-specific predicates and readings of predicates

There is an apparent constraint to plural arguments that both distributive readings of predicates and predicates of a certain semantic type exhibit. The constraint imposes an important criterion for evaluating semantic analyses of plurals. The true nature of the constraint, we will see, presents a difficulty for the extensional mereological theory, as well as in fact any account within Reference to a Plurality.

By "distributive reading" is meant a particular interpretation of a predicate that can also have a collective interpretation, for example *heavy*:

(3)   a. The boxes are heavy.

Heavy as in (3a) has both a collective and a distributive reading, and differs in that respect from a predicate like *sleep*, which involves distributivity as part of its lexical meaning and does not require a particular distributive interpretation to be represented at logical form.[7]

Distributivity may also involve distribution over sub-pluralities of a plurality, as is possible below:

(3)   b. John weighed the stones.

(3b) has readings with the predicate applying to individuals ("John weighed the individual stones") and with the predicate applying to subgroups ("John weighed particular contextually relevant subgroup of stones").

Also collective predicates such as *gather* may display distributive readings distributing over subgroups:

(3)   c. The students gathered.

(3c) can mean that particular contextually relevant subgroups of students gathered.

A common account of the distributive interpretation of a predicate is to posit an implicit distributive operator in the logical form of a sentence with a distributive reading

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[7] *Sleep* as a predicate displaying only a distributive interpretation licenses the inference in (ib) below in virtue of its lexical meaning, not a special, distributive interpretation:

(i)   a. The children slept.

b. For a plurality x, if Px , then Px, for all y < x.

of the predicate. Such an operator will act as a quantifier ranging over the contextually relevant parts of the plurality, as below, where $<_s$ is the proper-part relation, relativized to a situation s:[8]

(3)   d.   For a situation s, [D VP]([*the* N'$_{plur}$], s) = 1 iff for all d, $d <_s$ [*the* N'$_{plur}$], [VP](d) = 1.

Distributive readings are generally available only with plural NPs, but not with collective NPs, that is, singular count NPs referring to collections of some sort (Moltmann 1997, 2005). For example, a distributive reading is available in the a-examples below, but not in the b-examples:

(4)   a.   The things are heavy.
     b.   The collection of things is heavy.

(5)   a.   John has evaluated the students.
     b.   John has evaluated the class.

(6)   a.   The paintings are expensive.
     b.   The collection of paintings is expensive.

(7)   a.   The team members lifted the piano.
     b.   The team lifted the piano.

The very same constraint holds for the application of part-related predicates, more precisely, for any predicate making reference to the parts, but not the whole of an argument (Moltmann 1997, 2005):

(8)   a.   John compared the students.
     b.   # John compared the class.

(9)   a.   John cannot distinguish the students.
     b.   # John cannot distinguish the class.

(10)   a.   The students are similar.
      b.   The class is similar.

(11)   a.   John counted the students.
      b.   John counted the class.

(12)   a.   John has enumerated the students.
      b.   # John has enumerated the class.

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[8] Note that by using a predicate like *heavy*, the speaker must have either a distributive or collective reading in mind. This requires the distributive interpretation to be explicitly represented in the logical form of the sentence.

   This differs from the account of distributivity given in Moltmann (1997), which proposes disjunctive lexical meanings of predicates, with one disjunct representing "the ordinary" collective reading and the other disjunct the distributive reading. One motivation for that was to account for disjunctions of collective and distributive modifiers as in *They lifted the piano together and alone*. I will leave a discussion of the conflict in intuitions regarding distributive interpretation for another occasion.

(13) a. The students are numerous.
     b. # The class is numerous.

(8b), (9b), and (10b) do not allow for an internal reading of *compare, distinguish*, and *similar*. (11b) is not unacceptable semantically, but it can only mean that John counted one.

Predicates that make reference not only to the parts of an argument, but also to the whole (its organization or overall structure) are not subject to the constraint (Moltmann 1997, Ch. 3). These are predicates such as *organize, ~~rank, dissolve,~~ and *rearrange*:

(14) John organized/rearranged the collection of things on his desk.

Like distributivity, part-related predicates may take into account relevant subgroups as the parts of the plurality to which they apply and not its individual members. This is the case with relevant readings of the examples below:

(15) a. John compared the men and the women.
     b. John compared the students (in the different classes).

Following Moltmann (1997, 1998, 2005), I will call ~~the constraint on~~ part-related predicates, or readings of predicates to plural arguments, the Accessibility Requirement. The Accessibility Requirement is not strictly a restriction to plural NPs, but may also be satisfied with singular count NPs of certain types.

First, the adjectival modifier *whole* allows a singular count NP to permit a distributive interpretation of the predicate and to accept the relevant part-related predicates:

(16) a. The whole collection is expensive.
     b. John has evaluated the whole class.

(17) John has counted the whole class.

Second, there are certain singular count quantifiers that may take the place of plural NPs. They then quantify over pluralities, allowing for a distributive interpretation of the predicate and for part-related predicates. Such quantifiers include *something* and the pronoun *what*. The examples below illustrate the availability of a distributive interpretation and the acceptability of part-related predicates with such quantifiers:

(18) Even John has evaluated *something*, namely the paintings.

(19) There is *something* John is unable to count, namely the grains of sand.

(20) a. *What* did John evaluate? The paintings.
     b. *What* can't John distinguish? The cups.

The quantifier *several things*, even though it is syntactically plural, belongs to the same type. In (21), *several things* ranges over pluralities, allowing for both distributivity and part-related predicates:

(21) a. John has evaluated *several things*: the paintings, the sculptures, and the drawings.

b. There are *several things* John cannot distinguish: the cups, the glasses, and the plates.

Clearly, *several things* in such contexts is a genuine plural quantifier, counting pluralities.[9]

Something may also act as a singular count quantifier (rather than a mass quantifier), which means that in (18) and (19) *something* may be a genuine plural quantifier.

The fact that the Accessibility Requirement does not consist in a strict restriction to plural NPs is a problem for the extensional mereological theory. Given the extensional mereological theory, the Accessibility Requirement would be a restriction to pluralities as opposed to atoms; pluralities on that theory are associated with plural NPs only and not singular NP, such as those modified by *whole* and quantifiers like *something*. The information-based theory, by contrast, has no problems capturing the Accessibility Requirement in the right way, making use of a notion of plurality that is not strictly tied to the category of plural nouns.

3 Higher-level plurality

Higher-level pluralities, we have seen, play a role both for distributive readings of predicates and for the application of part-related predicates. The extensional mereological theory has difficulties dealing with higher-level pluralities since, on that account, not only all the subgroups, but also all the individuals composing the plurality count as parts of the plurality.

One way of dealing with higher-level plurality within the extensional mereological theory is to map the relevant subgroups onto atoms (Link 1984, Barker 1992). That is, the plurality described by *the men and the women* would have as its atomic parts the plurality of the men and the plurality of the women. This means that the notion of an atom would no longer be associated with singular count nouns, which goes against a fundamental assumption of the extensional mereological account. Alternatively, the approach might restrict the mereological part relation to a situation, so that, in a given situation, the plurality of men and the plurality of women would count as the only parts of the plurality of the men and the women. But this means giving up the extensional mereological relation in favor of a non-mereological (in particular nontransitive) situation-relative notion of part, which assimilates then the account to the information-based one.

4 Attributive readings of definite plurals

Another general problem for the extensional mereological account is the possibility of using definite plurals attributively. On such a use, a definite plural stands for whatever

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[9] For the notion of plural quantification see Linnebo (2012), who, though, does not recognize *several things* or *something* as plural quantifiers in English.

the maximal plurality is in a given circumstance of evaluation. It thus can take narrow scope with respect to modal or temporal operators, for example *every year* in the sentence below:

(22)   a. Every year, John needs to evaluate the students.

An important observation, generally ignored in the literature on plurals, is that on an attributive use, readings involving a contextual partition are equally available. Thus, (22a) can naturally have a reading on which John needs to evaluate contextually relevant groups of students, and similarly for the comparison John has to do according to (22b):

(22)   b. Every year, John needs to compare the students (in the various classes, whoever they may be).

According to such readings, the utterance of *the students* in (22a) and (22b) may involve the same way of dividing the students in the different circumstances of evaluation (whoever they may be) into subgroups.

The possibility of using definite plurals attributively with a contextual partition reading presents a serious, but generally unnoticed problem for the various existing versions of Reference to a Plurality. In particular, it presents a problem for theories using covers of actual pluralities for the analysis of distributivity (Schwarzschild 1996, Moltmann 1997, Gillon 1987).[10] However, we will see that the information-based theory can be modified so as to be applicable to attributively used definite plurals on a partition reading.

5 The information-based version of Reference to a Plurality

The information-based theory of plurality has a seemingly easier time dealing with the Accessibility Requirement and with higher-level plurality. Let me briefly outline the theory first. Two main features characterize the information-based version of Reference to a Plurality (Moltmann 1997, 1998, 2005):

[1] the role of integrity conditions
[2] the relativization of part structures to situations.

5.1 *The role of integrity conditions*

One important assumption of the theory is that the part–whole structure of entities does not just consist in an ordering relation subject to general conditions such as transitivity,

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[10] The possibility of attributively used plural descriptions with incomplete specifications of relevant subgroups parallels the possibility of using incomplete singular definite descriptions attributively. The latter has been discussed by Soames (1990) as a problem for the use of resource situations in situation semantics (Barwise/Perry 1983, Cooper 1993).

closure, and extensionality. Rather it also involves conditions of integrity, conditions on the basis of which entities count as integrated wholes (e.g., by having a boundary, by being maximally connected, or by being a maximal collection of entities sharing a property).

Integrity conditions also play a role in characterizing singular count nouns, as opposed to mass nouns. The entities in the extension of singular count nouns, individuals, generally are integrated whole (or at least are conceived as such), but not so for the entities in the extension of mass nouns.

Integrity conditions are important in determining formal properties of part structures. Thus, integrity conditions may block the transitivity of the part relation. If x is part of y and y of z, and y is an integrated whole, then x need not be part of z. This means that the proper parts of some individuals will not generally count as the parts of the sum of those individuals. By giving up transitivity, one and the same part relation can be used for pluralities and individuals, and no part relation needs to be posited that is specific to the category of singular count nouns, as on the extensional mereological theory.

Integrity conditions also block sum formation. A sum of integrated wholes exists only if the potential sum is itself an integrated whole. Integrity conditions will also be the basis for a division of a plurality into subgroups. If certain subgroups count as integrated wholes and cover the plurality, only they, not their members or other subgroups, may count as the parts of the entire plurality.

Two sorts of integrity conditions may define pluralities (and thus subgroups) as integrated wholes:

[1] the condition of being a maximal plurality of entities standing in a particular relation R to each other and nothing else (R-integrated whole)
[2] the condition of being a maximal plurality falling under a property F (*FF*-integrated whole).

[2] is a special case of [1] given that a relation *FF* can be defined ~~on the basis~~ of a property F. Thus, we have[11]:

(23)   a. Definition of an R-integrated whole.

For a symmetric (non-formal) relation R, x is an R-integrated whole iff for all y and z, if $y < x$ and $z < x$, then Ryz, and for no w, $-w < x$, Rwy.

b. For a property F, for any x, y, $FFxy$ iff Fx and Fy.

If definite plural descriptions stand for the sum of individuals that fall under the corresponding count noun (provided it is nonempty), then definite plural descriptions stand for integrated wholes (*FF*-integrated wholes). There will be such a sum since it

[11] These conditions are taken from Simons (1987).

would be an integrated whole. The referent of *the children* will thus be an integrated whole since it will be the maximal plurality (in the context) of individuals that have the property of being a child.

The integrity-based conditions on part structures also allow that in (14a) the maximal plurality of men and the maximal plurality of women may count as the only parts of the plurality of the men and women, and that in (14b) the maximal pluralities of students belonging to particular classes may count as the only parts of the plurality of the students.[12]

5.2 *The relativization of part structures to situations*

The information-based theory is so-called because it holds that what matters for the semantically relevant part relation involving pluralities ~~semantics~~ is not whether entities are integrated wholes as such, but rather whether they are integrated wholes in the relevant context of information or *reference situation* (Moltmann 1997, 1998, 2005). Thus, the referent of an utterance of *the students* forms an (*FF-*)integrated whole in the reference situation given that it is the maximal plurality of students in that situation. The part–whole structure of a plurality thus is to be relativized to the reference situation associated with the plural NP describing it. A reference situation associated with an NP is to be understood, roughly, as a minimal situation carrying the information content of the (possibly enriched) description conveyed by the use of that NP.

The same definite plural NP may, in different contexts of use, be associated with differently structured descriptions, which, given a suitably fine-grained notion of situation, can lead to different reference situations. For example, both (24a) and (24b) allow for two readings:

(24)   a. John compared the students of the different classes.
       b. John compared the male and female students.

One reading is the higher-level plurality reading based on ~~properties of being~~ maximal plurality of individuals in a given class or a maximal plurality of either male or female students. The other reading is the individual-student comparison reading. Both sorts of readings are available on the basis of the very same descriptive content of the NP. But the descriptive content can be structured in different ways. Thus, the descriptive content of (24b) can be given either as (25a) or as (25b):

(25)   a. $sum_s\, y[M_s\, y + F_s\, y]$.
       b. $sum_s\, y[y = sum_s\, z[M_s z]\ \mathrm{v}\ y = sum_s\, z[F_s z]]$.

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[12] Note that entities may be integrated wholes either essentially or accidentally. This allows collective NPs to denote the same plurality as is denoted by a plural NP, namely if the collective NP specifies only accidental integrity conditions. Thus, *the pile of papers on the desk* and *the papers on the desk* may denote the very same plurality, namely a plurality that accidentally comes in the shape of a pile.

(25a) is a description of the plurality based on the description of the individual members; (25b) is a description of the plurality based on the description of two sub-pluralities. Only the latter gives rise to higher-level plurality readings.[13]

The information-based theory avoids the two problems for the extensional mereological theory. First, it makes use of a language-independent notion of part, and does not tie singular count nouns to the notion of an atom. Instead it assumes that singular count nouns always express conditions of integrity. This means that in general the referent of a definite singular count NP is an integrated whole, but not always. It is not, for example, in the presence of the modifier *whole*. *Whole* is an expression whose semantic function as an adjectival modifier is to map an integrated whole onto the mere sum of its parts (Moltmann 1997, 2005). Moreover, special quantifiers, even if they classify as singular count, can be exempt from the condition (see section 5).

Given the information-based theory, the Accessibility Requirement will naturally be considered a condition on predicates not applying to integrated wholes. However, this requires several qualifications. First of all, definite plurals in fact refer to integrated wholes (FF-integrated wholes). The information-based theory has to make a distinction between weak integrated wholes and strong integrated wholes. FF-integrated wholes would have to count as weak integrated wholes, and the Accessibility Requirement will have to require only that the arguments of part-structure sensitive predicates and readings of predicates not be strong integrated wholes.

Furthermore, a plurality may in actual fact be a strong integrated whole; but this will not matter if it has not been described as such. To capture such information-dependence, the information-based theory needs to assume that a predicate does not apply to an object as such, but rather to a pair consisting of an object and a situation. This then lead to the following formulation of the Accessibility Requirement:

(26) The Accessibility Requirement (Moltmann 1997, 1998, 2005).

A predicate or reading of a predicate making reference to the parts, but not the whole of an argument can apply to an object *d* in a situation *s* only if *d* is not a strong integrated whole in *s*.

The relativization to a situation with its partial information content is meant to allow integrity-related conditions on part–whole structure to apply to pluralities in just the way they do to individuals.

There are some serious difficulties, though, for the information-based theory. First, there is a problem concerning the use of the notion of integrity. The information-based theory has to assume that pluralities could at best be weak integrated wholes, whereas individuals as referents of (unmodified) singular count NPs would always be strong integrated wholes. But this is just not plausible. It would mean that entities described

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[13] This account of the two readings is an elaboration of what is in fact an incomplete account in Moltmann (1997). Moltmann (1997) just allows the two part structures without clarifying what they are based on.

as "sums," "pluralities," "collections" would always have a greater degree of integrity than the plural objects that the account takes to be the referents of definite plurals. It is very implausible that what is referred to as *the (loose) collection of things in the room* has greater integrity than what is referred to as *the things in the room*—unless a notion of merely conceived integrity is invoked for which there is little empirical ground. The difference between pluralities as semantic values of definite plurals and individuals as semantic values of definite singular count NPs does not reside in a difference in the degrees of integrity that individuals and pluralities exhibit. Rather it consists in that the former count as "one," whereas the latter count as "many."

A second difficulty for the information-based theory concerns the availability of readings involving higher-level plurality. Such readings are in fact more construction-driven than predicted by the information-based account. The account predicts that exactly the same readings are available in (27a) and (27b):

(27) a. John compared the men and women.
      b. John compared the men and the women.

But in fact there is a significant difference in the availability of higher-level plurality readings. First, higher-level plurality readings involving the maximal plurality of men and the maximal plurality of women are significantly more easily available in (27b) than in (27a). Second, (27b) allows for the reading on which John compared the young men and women to the old men and women, but this is not a reading available for (27a).

The following examples from Linnebo/Nicolas (2008) make the point even clearer:

(28) a. The things that are square, blue, or wooden overlap.
      b. The square things, the blue things, and the wooden things overlap.

(28b) allows for a higher-level plurality reading on which the overlap regards shared parts of pluralities, but such a reading is not available in (28a). Given the information-based theory, such sentences should share exactly the same readings, since the descriptive content of the NPs is exactly the same. But they don't.

4 The information-based account and attributively used NPs

Attributively used definite plural NPs appear to pose a problem for the use of reference situations in the semantic analysis of plurals in the information-based theory. The use of reference situations was to make sure that only the integrity conditions conveyed by the descriptive content of the NP in question determines the part structure of the plural referent. By relativizing the interpretation of a plural NP to a particular situation that is part of the argument of the predicate, the account as it stands is inapplicable to attributively used definite plurals. The semantic value of attributively used definite plurals is independent of any particular circumstance of evaluation.

However, the account can in fact apply to attributively used definite plurals as well, namely if reference situations are considered derivative with respect to the (enriched) plural description that is used. In the case of an attributively used description, the description will determine various reference situations as part of the different circumstances of evaluation. In the case of a referentially used description, it will determine a single reference situation that is part of the actual circumstance. When using a plural definite NP attributively, it is not a particular situation that is part of the speaker's intention, but rather a possibly enriched plural description. The part structure of an entity in a circumstance of evaluation will then have to be strictly driven by the description used and not any other properties that the members of the plurality may happen to have in those circumstances. We then have a notion of a reference situation as part of a circumstance of evaluation, as indicated below:

(29)   For a circumstance of evaluation c for an attributively used (enriched) definite description D, the reference situation of D in c is the smallest part of c in which D is true of its referent in c.

Thus, the information-based theory, unlike the extensional mereological one can easily be accommodated so as to be applicable to attributively used definite plurals. But the other difficulties for the information-based account remain, such as the difficulties with the Accessibility Requirement (regarding degrees of integrity) and the construction-relatedness of higher-level plurality readings. There is an even more serious problem for the information-based theory, namely number-related predicates.

5   Reference to a plurality and number-related predicates

One general problem for Reference to a Plurality is that it treats pluralities as entities on a par with individuals. This also holds for the pluralities that are the parts or the relevant parts of higher-level pluralities. The extensional mereological account in particular does not distinguish between pluralities whose "atomic parts" are individuals from pluralities whose atomic parts are themselves pluralities. Both sorts of pluralities are entities with atomic parts. The information-based account might distinguish the two sorts of parts in terms of degrees of integrity (a subgroup has a lesser degree of integrity than a part that is an individual). But still a part of a plurality that is a subgroup will count as "one" just like a part that is an individual.

An important linguistic motivation for not treating pluralities as entities on a par with individuals comes from predicates that I will call *number-related predicates*. In natural language, two different kinds of part-sensitive plural predicates must be distinguished: those that can take into account subgroups as parts of a plurality and those

that can take into account only individuals as parts of a plurality, which are the number-related predicates. Number-related predicates include *enumerate*, *name*, *count*, and number predicates:[14]

(30) a. John counted the people.
       b. The stones are numerous.
       c. The students are twenty in number.

(31) a. John enumerated the students.
       b. John named the students.

Predicates that can take into account subgroups as parts of pluralities include *compare, distinguish, divide* and also corresponding adjectival predicates such *similar* and *different*. Let me call those *part-related plural predicates.* Distributivity of course patterns the same way.

~~To capture the~~ fact that number-related predicates cannot take into account subgroups, but only individuals is a serious problem for Reference to a Plurality. Given Reference to a Plurality, a contextually relevant subgroup has the very same ontological status as an individual; it counts as "one" rather than as "many."[15] The extensional mereological approach may not want to allow subgroups to count as atoms (thus accounting for higher-level plurality in a different way). In that case, the condition on number-related predicates would simply be one on which such predicates can take into account only atoms as parts of an argument and not proper subgroups.

The information-based theory has greater difficulties with number-related predicates. For the information-based theory, what counts as parts of a plurality are integrated wholes, whether subgroups or entities in the extension of the singular noun. They may differ in the degree of integrity, but they are both integrated wholes and able to be the relevant parts of the plurality in question.

The very same problem also applies to the plurality as a whole that is the semantic value of a plural term. Why can't number-related predicates count the entire plurality as "one." That is, why is (32a) impossible, as opposed to (32b):

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[14] Note that the adjective *individual*, when modifying an NP, has the effect of having the predicate apply to the NP like a number-related predicate.

[15] The information-based account might pursue an alternative by appealing to a distinction between essential integrated wholes on the one hand and accidental or information-driven integrated wholes on the other hand. Referents of definite plurals always count as accidental wholes or information-driven wholes (albeit weak integrated wholes). If the parts of a plurality are individuals, these will generally be essential integrated wholes, but if subgroups count as parts, they will generally count as accidental integrated wholes (or information-driven wholes). Predicates like *count* on this view could apply only to pluralities whose relevant parts are essential integrated wholes, whereas predicates like *compare* could apply to pluralities whose relevant parts are accidental integrated wholes. The problem is that even accidental integrated wholes are single entities rather than pluralities and thus they count as "one." Moreover, it is not obvious that certain pluralities could not be essential integrated wholes, let's say by being maximal pluralities of essential integrated wholes.

(32)   a. John counted the ten children—he counted one.
       b. John counted Mary—he counted one.

The problem is a serious one for both approaches of Reference to a Plurality, which both treat pluralities as single entities. The solution, in my view, can only be to conceive of pluralities not as single entities, but as "multitudes," that is, as pluralities "as many." The difference between number-related predicates and other part-related predicates simply shows that some predicates are sensitive to the fundamental distinction between "one" and "many," whereas others are not.

One might pursue another strategy to account for the problem and that is by insisting on distinguishing between the conception of the semantic value assigned to definite plurals in the semantic theory, and the use of plural terms and predicates in the metalanguage.[16] Suppose in the semantic theory, definite plural terms are assigned sets as denotations, so that those sets combine with the predicate denotation, in some way or another, to give the right overall truth conditions of the sentence. The inference from *John counted the children correctly* to *John counted one* then will be blocked by making sure that *one* is not true of the semantic value of *the children*. The semantic theory will specify that *one* is true only of singleton sets. A predicate like *count* will select only sets of singleton sets, whereas a predicate like *compare* will be applicable also to sets of non-singleton sets. Of course, the semantic value of *the children* is in fact "one" and not "many," and if John counted what *the ~~students~~* stands for correctly, he should have counted one. But that is by using *one*, *many*, and *count* as part of the metalanguage, which the strategy would say is illegitimate.

The problem with this strategy is that it goes against what is generally considered an important condition on a semantic theory, namely that the object language be included in the metalanguage. This is reflected in the disquotational axioms of Davidson's (1984) theory of meaning as a Tarski-style truth theory, as well as Horwich's (1990, 1998) deflationist account of meaning, which posits (33) as a condition on the application of predicates *F*:

(33) $(\forall y)(F$ is true of $y \leftrightarrow Fy)$.

There is an alternative interpretation of that strategy, though, and that is that it treats definite plurals not as referential NPs, but as non-referential terms whose function is not to provide the arguments of predicates, but to combine compositionally with the denotation of the predicate to give the overall truth conditions of the sentence. Then (33) would not be applicable. The problem, however, is that whatever criteria one adopts for referential terms (their behavior with respect to identity predicates or quantifiers, let's say), if definite singular NPs in argument position are referential terms, then certainly so are definite plurals.[17]

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[16] I would like to thank Oystein Linnebo for suggesting that option to me.
[17] See Hale (1987) for a discussion of criteria for referential terms as proposed by philosophers.

6 Reference to a Plurality and the status of the Accessibility Requirement

Another general problem for Reference to a Plurality is the status of the Accessibility Requirement. Given Reference to a Plurality, the Accessibility Requirement has to be considered a sortal restriction of particular predicates to certain types of entities, or to entities with certain types of properties in situations (or rather a sortal restriction of particular argument positions of a predicate). However, the Accessibility Requirement does in fact not behave like a sortal restriction. Standard cases of sortal restrictions (or semantic selectional requirements) characteristically allow for coercion or type shift, that is, the mapping of an object of reference not meeting the sortal restriction to a closely related one meeting it. Typical examples involving type shift are (34b) and (35b) below, which have the interpretation of (34a) and (35a) respectively:

(34) a. John started reading the book.
      b. John started the book.

(35) a. John proposed watching a movie.
      b. John proposed a movie.

(34b) and (35b) involve type shift of an object (which is not what the predicate selects) to a suitable event involving the object (which is what the predicate selects).

With predicates subject to the Accessibility Requirement, by contrast, coercion is completely impossible:

(36) a. The collection is expensive.
      b. The class is similar.

(36a) does not allow for a distributive interpretation of the predicate, and (36b) is impossible with *similar* acting as a part-related predicate comparing the class members to each other. Coercion in order to make those interpretations available would simply involve mapping the collection or class to the plurality of entities constituting it. The relation between a plurality and a corresponding collection or class is certainly ontologically closer than that between an individual and an event involving it. Yet, coercion is entirely unavailable as a way of meeting the Accessibility Requirement.

The total unavailability of coercion is strong evidence that the Accessibility Requirement is not a sortal restriction (or semantic selectional requirement), as Reference to a Plurality would have it.

7 Plural Reference

7.1 Plural Reference and the Accessibility Requirement

Given Plural Reference, definite plural NPs and definite singular count NPs differ not in what they refer to, but in how they refer. Singular definites refer to a single entity,

whereas plural definites refer to several entities at once.[18] Given Plural Reference, the Accessibility Requirement need not be treated as a semantic selectional requirement positing conditions on the argument to which certain predicates can apply. Rather the requirement will simply be a condition specifying which argument places of predicates of a certain sort will be plural argument places:

(37)   The Accessibility Requirement as a condition on plural argument places

A predicate or semantic operation making reference to the parts, but not the whole of an argument in a particular argument position is a plural predicate with respect to that argument position.

Recall that "plural argument position" means that the predicate has to hold of several individuals at once with respect to that argument position in order for the sentence to be true.

Clearly, given (37), coercion will be inapplicable to sentences violating the Accessibility Requirement. Coercion involves shift from one type of object to another, not change from a singular argument position to a plural argument position.

NPs modified by *whole* will be exempt from the Accessibility Requirement if *whole* is considered an expression whose semantic function is to turn an expression referring to a single entity into a term plurally referring to the proper parts of that entity. Special quantifiers like *something* or *two things* will be exempt from the Accessibility Requirement because they are at once plural quantifiers and singular quantifiers, as will be discussed later (Section 9).

7.2 Plural Reference and higher-level plurality

Semantic phenomena involving higher-level pluralities present a well-known challenge to Plural Reference.

Among philosophical logicians it is a controversial issue whether Plural Reference should allow for higher-level pluralities.[19] If Plural Reference consists in a term referring to several entities at once, there is no reason to posit higher-level pluralities, unless there are referential structures reflecting them. If pluralities by nature are pluralities of single entities, then there could not be such as a thing as pluralities of pluralities. Higher-level pluralities could only mean pluralities of pluralities-as-many.

To what extent natural language really displays higher-level pluralities is a somewhat controversial issue as well.[20] However, higher-level pluralities are clearly reflected in natural language in the application of distributivity and part-sensitive predicates as discussed earlier, and this requires an account.

There are two ways of dealing with higher-level plurality semantically that I will discuss: [1] the Multigrade-Predicate Analysis and [2] the Situated Structured Plurality

[18] Of course there may be also the limit case in which a plural NP refers to just a single entity.
[19] See the discussion of Simons (this volume, Ch. 4).
[20] See McKay (2006) for the view that natural language does not involve higher-level pluralities.

Analysis. The Multigrade-Predicate Analysis considers higher-level plurality ~~as arising~~ from the use of a multigrade predicate and (implicit) complex plural description. The Situated–Structured-Plurality Analysis account takes higher-level plurality to involve situated structured pluralities to which part-related predicates and distributivity apply. I will first elaborate and reject the Multigrade-Predicate Analysis of higher-level plurality and then outline the analysis based on situated structured pluralities.

7.2.1 THE MULTIGRADE-PREDICATE ANALYSIS
OF HIGHER-LEVEL PLURALITY

The Multigrade-Predicate Analysis promises a way of avoiding higher-level pluralities. This analysis takes readings of what appears to be higher-level plurality readings to arise from the use of a multigrade predicates and a possibly enriched plural description suited to act as a list of ordinary plural arguments. The appearance of higher-level plurality thus is reduced to the use of plurally referring descriptions of lower-level pluralities.[21] Let us consider the simple example below:

(38)   John compared the men and the women.

Rather than taking *compare* to apply to a situated structured plurality, it is considered a multigrade predicate in one of its places, its second place, which is linked to the object position. That is, the second place of *compare* is considered a position that in principle takes an unlimited number of arguments. This goes along with the analysis of the complement *the men and the women* as a list of two pluralities, the plurality of men and the plurality of women.

A few words are needed concerning the distinction between plural predicates and multigrade predicates.[22] Whereas a plural predicate (for a particular argument place) is a predicate that applies to several individuals at once (with respect to that place) to give truth, a multigrade predicate (or rather multigrade argument place) takes an (unlimited) number of arguments, in a particular order. The arguments in a multigrade argument place can be repeated, which is not the case for a plural predicate.[23] An example of a multigrade predicate in English is *add*:

(39)   a.   John added two and two and two.

Certainly English does have multigrade predicates, and the arguments of multigrade predicates in English can be given by a conjunction of referential NPs.[24]

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[21]   See also Oliver/Smiley (2004) for a discussion of a Multigrade-Predicate Analysis of higher-level plurality.

[22]   For the notion of a multigrade predicate see in particular Oliver/Smiley (2004, 2013).

[23]   There is another option, though, and that is to consider the predicate applying to a list, an ordered plurality of entities, an option I will set aside for the present purposes. See Oliver/Smiley (2004, 2013) for an extensive discussion.

[24]   Note that each position in a multigrade place can itself be plural or multigrade.

It is significant that *add* also has a two-place relational variant, taking a PP-complement:

(39)   b. John added two to two.

Certain types of relational predicates in fact seem to systematically come with a multi-grade variant. Further examples are those below:

(40)   a. John is similar to Mary.
       b. John and Mary are similar.

(41)   a. John cannot distinguish the students from the teachers.
       b. John cannot distinguish the students and the teachers.

In general, arguments for the multigrade position can be specified either by a conjunction of NPs or by a simple plural definite NP, as below:

(39)   c. John added the numbers.

(40)   c. The people are similar.

(41)   c. John cannot distinguish the people.

Compare also has a corresponding relational variant, which gives support to the view that it is a multigrade predicate:

(42)   John compared the men to the women.

But if *compare* is multigrade even when taking a definite plural as a complement, then there appears no further need for positing second-level pluralities as arguments. Instead, both conjunctions of NPs and definite plurals as complements will provide arguments for the multigrade relation.

In the case of definite plurals, this requires a mapping from the plurality onto a sequence of objects to fill in the positions of the multigrade argument place, as below, where $proj_n(s)$ is the nth projection of the sequence s:

(43)   For a multigrade (one-place) predicate P, [P *the* N'$_{plur}$] = 1 iff for some mul-tivalued function f mapping [*the* N'$_{plur}$] onto a sequence s consisting of exactly the entities among [*the* N'$_{plur}$], [P]($proj_1(s)$, $proj_2(s), \dots$) = 1.

A simple definite plural may also provide several lower-level pluralities as arguments of a multigrade argument place. Such a case arguably involves an incomplete descrip-tion whose completion consists of descriptions of lower-level pluralities that are implicitly coordinated.[25] Thus, even if the description used is *the students*, the complex description to be evaluated may be of the sort *the students in class 1 and the students in class 2 and the students in class 3* etc.

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[25] Implicit coordination is coordination lacking an overt coordinator. Implicit coordination might be treated by positing a silent coordinator. Alternatively, on a view on which coordination involves a three-dimensional syntactic structure, implicit coordination just means that the conjuncts, belong to different "planes" and are dominated by a single category node. See Moltmann (1992) for such a view of coordination.

There is a major debate in philosophy of language about whether such implicit linguistic material needs to be silently present in the syntactic structure or whether it may be obtained by "free enrichment."[26] Without going into a more thorough discussion of how this debate would play out with plural descriptions, for the present purposes it should suffice assuming that the plural description used may be incomplete and that a complete description providing the arguments of the multigrade predicate would be part of the speaker's intentions.

Since the Multigrade-Predicate Analysis makes no use of particular situations of reference, it applies straightforwardly to attributively used definite descriptions. Yet, it faces challenges of its own.

First of all, the analysis commits itself to treating all predicates displaying higher-level plurality as multigrade predicates. This is a strong hypothesis that requires independent motivation and justification from a general lexical theory of argument structure. There are certainly predicates for which the hypothesis does not seem well motivated. Predicates like *gather* and *lift the piano*, for example, allow for higher-level plurality readings, yet they do not come with a relational variant indicative of a multigrade predicate status.

Second, there are cases of third-level pluralities that the Multigrade-Predicate Analysis cannot easily accommodate:

(44)   The daughters and the mothers and the sons and the fathers have similar problems with each other.

On the relevant reading, (44) states similarity between mother–daughter problems and father–son problems.[27]

Third, the analysis faces challenges from phenomena that appear to involve the part–whole structure of pluralities, for example modifiers like *individual*.[28] *Individual* could no longer express a condition on the structure of a plurality in a situation, but would have to express a peculiar syntactic condition on (implicit) complex plural descriptions (to the effect that the complex plural description that the speaker has in mind does not consist in descriptions of lower-level pluralities of at least two).[29]

The Multigrade-Predicate Analysis also faces a serious difficulty with the treatment of distributivity, by having to deal with distribution over individuals differently from distribution over sub-pluralities. In the former case, distributivity will relate to a

[26] See the discussion in Stanley/Szabo (2000).

[27] Note that for such a reading, the structure of the plural description again matters. A third-level-plurality reading is not available in (i), which lacks the right structure:

(i) The daughters, mothers, sons, and fathers have similar problems with each other.

[28] Partitives and the modifier *whole* do not present the most serious challenge. "Is/are among" as a relation between individuals/pluralities and pluralities, and "is part of" as a relation between individuals are certainly analogous notions, allowing a treatment of partitives and *whole* at least as systematically polysemous.

[29] Note that such a condition would not be applicable to the adverbial *individually*, which certainly could not impose a formal condition on the implicit structure of NP.

simple plural; in the latter case, it will relate to an (explicit or implicit) conjunction of plural NPs. The former can be dealt with in the usual way, namely as quantification over the individuals that are members of the plurality denoted by the plural, as in (45b) for (45a):

(45)   a. The N'$_{plur}$ are heavy.
       b. $D([are\ heavy])\ ([N'_{plur}]) = 1$ iff $\forall d\ (d < [N'_{plur}] \rightarrow [are\ heavy](d) = 1)$.

The latter, by contrast, will have to be treated syntactically, involving the distribution of the predicate over the conjuncts of the conjunction, as roughly in (45c):

(45)   c. $[NP_1, \ldots, and\ NP_n\ D\ are\ heavy] = 1$ iff $[are\ heavy\ ]([NP_1]) = 1, \ldots, [are\ heavy\ ]([NP_n]) = 1$.

Another difficulty for the Multigrade-Predicate Analysis is higher-level plural terms that are not of the conjunctive sort and could not be construed as implicit conjunctions. *The people that share an apartment, the lines that intersect*, and *the students in the two schools* are examples.[30]

Finally, the Mutigrade-Predicate Analysis is inapplicable to higher-level plural terms describing an infinite plurality of pluralities such as *the twin primes*. A multigrade predicate can take only a finite number of arguments (Oliver/Smiley 2004).

To conclude, the Multigrade-Predicate Analysis of higher-level plurality faces a number of serious difficulties and thus must be abandoned.

7.2.2 THE SITUATED STRUCTURED PLURALITY ANALYSIS

This section will briefly outline an analysis of higher-level plurality that is similar to the information-based version of Reference to a Plurality in two respects: first, by making use of conditions of integrity; second, by making use of a notion of a reference situation, though now involving pluralities (as many) rather than sums. According to that analysis, higher-level plurality is a phenomenon of situated structured pluralities. Distributivity and part-related predicates will involve the relevant parts of the plurality in the reference situation, which may either be individuals or else sub-pluralities that themselves meet conditions of integrity. Importantly, though, such integrated sub-pluralities do not form sums in that situation. They will remain pluralities "as many," unlike on the information-based version of Reference to a Plurality.

The interpretation of the distributive operator will be as in (46a), where < is now the part-of relation among pluralities (which includes the relation between an individual and a plurality) and INT_s the condition of being integrated in the situation s:

(46)   a. For a situation s,
       $[D\ VP]([the\ N'_{plur}], s) = 1$ iff for all xx, $xx <_s [the\ N'_{plur}]$ and $INT_s(xx)$, then $[VP](d) = 1$.

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[30] See Moltmann (1997, Ch. 3, esp. p. 91ff) for higher-level plurality terms of this and other sorts, as well as Oliver/Smiley (2013, p. 127ff).

Similarly, part-related predicates will now apply to situated pluralities, taking into account their integrated parts in the situation of reference. Thus, the two-place plural predicate *compare* applies to a plurality *xx* in a reference situation *s*, let's say, by applying the three-place predicate *compare to* to integrated sub-pluralities of *xx* in *s*:

(46) b. For an individual *d*, a plurality *xx*, and a situation *s*, [*compare*]$(d, <xx, s>)$ = 1 iff

[*compare to*](d, yy, zz) = 1 for any *yy* and *zz* such that $yy < xx, zz < xx, INT_s^d(yy)$,

$INT_s(zz)$.

Another important difference with respect to the information-based theory of Moltmann (1997,1998) is that not just integrity conditions as conveyed by the content of predicates matter, but also metalinguistic integrity conditions, imposed by the use of referential terms. Moreover, such metalinguistic integrity conditions are an obligatory part of the content of the reference situation, which is not the case for integrity conditions associated with conjunct predicates. Plural terms such as *the men and the women* will thus be distinguished from plural terms such as *the men and women*. With *the men and the women*, the reference situation will obligatorily specify two pluralities as *FF*-integrated wholes, on the basis of the relation *FF* for $F = \lambda x[Ref(x, the N')]$ (the property of being a referent of *the* N'). With *the men and women*, the reference situation will either specify a single plurality as a maximal plurality falling under $\lambda x[man(x)$ v woman$(x)]$ (and thus specifying it as an *FF*-integrated plurality) or two sub-pluralities as maximal pluralities falling under $\lambda x[man(x)]$ and $\lambda x[woman(x)]$ respectively (and thus specifying them as *FF*-integrated pluralities) (see section 5.2.).

Higher-level-plurality readings with attributively used definite descriptions can be dealt with as on the information-based version of Reference to a Plurality, by making use of an enriched plural description (as part of the speaker's intentions). The enriched plural description may impose a structure on the plurality in the reference situation that is part of a given circumstance of evaluation.

Thus within Plural Reference, a few modification of the information-based theory permits an analysis of higher-level pluralities as situated structured pluralities. The modifications consist in applying integrity conditions to pluralities "as many" and allowing part-related predicates to apply to situated structured pluralities, which means to pairs consisting of a plurality and a reference situation. The notion of an *R*-integrated whole applies then also to pluralities in situations. It will thus be both a plural concept and a concept applying to individuals.

8 Plural Reference and restrictions on collective predication

Plural Reference receives further support from certain restrictions on collective predication. There are particular types of predicates that simply cannot have collective

readings with plurals, even though such readings would be perfectly conceivable on a view on which pluralities are entities on a par with individuals. Plural Reference can provide an explanation of the absence of such collective readings. The explanation will go along with the view that collective predication as such is impossible unless it involves predicates whose lexical meaning can be considered one based on predication of properties or relations of individuals.

The restriction on collective predicates concerns predicates that express properties of size, shape or "gestalt," as well as of spatial or temporal extension (Moltmann 2004).[31] The examples below illustrate that such predicates do not permit a collective reading with plurals, but only a distributive reading:

(47)   a.   The children are big.
      b.   The pearls are long.
      c.   The grains are round.
      d.   The fields are extended.
      e.   The short speeches were long.

The puzzle is that it is perfectly clear what those predicates would mean on a collective reading if they were applicable to pluralities in the way they apply to individuals. Thus, *big* in (47a) should mean that the collection of children is big; *long* in (47b) should mean that the entity composed of the pearls, let's say the row of pearls, is long; *round* in (47c) should be able to mean, let's say, that the pile made up by the grains is round. Finally, (47d) should be able to mean that the collection of fields is extended, and (47e) that the sequence made up of the speeches was long.

The impossibility of collective predicates is hard to explain given Reference to a Plurality. Reference to a Plurality treats pluralities on a par with other objects of reference, which means that without further constraints being imposed, collective readings of the predicates in (47) should be available.

Plural Reference, by contrast, does not predict that predicates with the meaning they have with individuals should be applicable to pluralities. Given Plural Reference, plural predicates function fundamentally differently from predicates applying to individuals, and there is no reason why a predicate can carry over the meaning it has when applying to individuals so as to act as a collective predicate ~~predicated of~~ pluralities. Plural Reference does not predict that a predicate can apply both to individuals and, with a collective reading, to pluralities, if its application to individuals and to pluralities is to be based on the same meaning.

Given Plural Reference, what requires an explanation in fact is predicates displaying a collective reading, not predicates displaying only a distributive reading. The restriction on collective readings displayed by (47) indicates that collective readings of predicates in general are derivative and that the way of deriving them is simply not applicable to the predicates in (47). The hypothesis in fact suggests itself that the lexical content of

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[31]   See Schwarzschild (2009) for similar observations.

collective predicates applying to pluralities is obtained from properties or relations involving individuals in one way or another. Three kinds of plural predicates can be distinguished according to their conceptual origin in properties or relations involving individuals:

[1] Plural predicates that alternate with a relational predicate such as *neighbors, roommates, equal (to), compare (with), similar (to), overlap (with), add (to)*

Such predicates arguably are multigrade even with plural arguments (section 7.2.1.). Their lexical meaning as plural predicates involves the very same relation as is expressed by the explicit relational variant.

[2] Event-related predicates such as *gather* and *lift the piano*

Such predicates arguably are plural predicates on the basis of relations of participation of individuals in a collective event. The content of event-related plural predicates would thus be considered derived from individual relations, relating individual agents to a collective event, rather than starting out as a relation relating the entire plurality as a participant to the described collective event.

[3] Measure-related predicates such as *heavy*

Let us assume, as is common, that measure-related predicates such as *heavy* express relations between pluralities and measurements (degrees). Like event-related predicates, measure-related predicates with plurals can be considered plural predicates on the basis of individual contributions to the collective measurement of the entire plurality. Measure-related predicates as plural predicates are cumulative. That is, for a measure predicate P, if $P(x_1, d_1)$ and $P(x_1, d_2)$, then $P(xx, d_1+d_2)$, for the plurality xx consisting of individuals x_1 and x_2, and degrees d_1 and d_2. This means that measure predicates would have their conceptual origin in the relations of individual contributions to the collective measurement.

It is important to emphasize that this would a hypothesis only about the lexical-conceptual origin of plural predicates. It is not in any way a view about the logical form of sentences with plural predicates. That is, it is not a view according to which a re-analysis of plural predicates takes place at logical form; rather it is a hypothesis about the lexical origin of plural predicates, namely that plural predicates are introduced into the lexicon only on the basis of properties or relations involving individuals.

9 Reification of pluralities

This chapter has treated higher-level plurality as a matter of reference or situated structured "multitudes" rather than of ontology. But there is one phenomenon in English that involves counting pluralities and thus treating pluralities as entities of their own, that is, as "one" rather as "many." These are quantifiers like *something*, or, better, more

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obvious count quantifiers of the sort *two things* or *several things*, which were mentioned earlier. In the examples below, those quantifiers take the place of definite plural NPs:

(48)   a.   John has tasted two things: the peas and the beans.
       b.   There are several things John cannot distinguish: the cups, the glasses, and the plates.

Recall that (48b), which contains a part-related predicate, shows that such quantifiers do not interfere with the Accessibility Requirement and thus quantify over pluralities as many.

Quantifiers like *several things* and *something* are in a way both of the category "count" and of the category "plural/mass." This double nature matches the semantic role of such quantifiers as nominalizing quantifiers (Moltmann 2003, 2013). The status of quantifiers like *something* and *two things* as nominalizing quantifiers is apparent in their ability to replace nonreferential complements, yet accept first-order predicates as restrictions and to be able to count, as in the examples below:

(49)   a.   John is wise.
       b.   John is something admirable.
(50)   a.   John needs a car and a house.
       b.   John needs two things.

As nominalizing quantifiers, *something* and *two things* introduce objects that act as arguments of first-order predicates and can be counted, as in (49b) and (50b) respectively. At the same time, they involve quantification over possible semantic values of the types of expressions whose place they take, such as concepts as expressed by predicates in (49a) and intensional quantifiers (as the denotations of complements of intensional transitive verbs) as in (50a).

The nominalizing function of the quantifiers *two things* and *several things* can shed light on the particular behavior of such quantifiers when they take the place of definite plurals, as in (48a, b). Here, such quantifiers involve quantification over pluralities as arguments of the predicate, and at the same time introduce objects that correlate with those pluralities, "reified" pluralities of some sort, that is, pluralities that count as "one" rather than as "many."

10   Conclusion

Plural Reference is an approach that has so far been explored only little in the context of natural language semantics. The main aim of this chapter was to show that there are a range of strong arguments from natural language in favor of Plural Reference. The empirical support for Plural Reference comes from number-related predicates as well as the status of the Accessibility Requirement, an apparent restriction of certain predicates or readings of predicates to plural arguments.

The chapter also addressed the important issue of higher-level plurality. Natural language clearly displays phenomena involving higher-level plurality, namely with readings of part-related predicates and with distributivity. According to the account outlined in the chapter, pluralities involve structures somewhat similar to the part–whole structure of individuals, but driven in part by different conditions. Higher-level plurality requires a notion of a reference situation that includes not only information about entities conveyed by the predicates used, but also metalinguistic information regarding the use of referential terms.

One peculiarity of the account of higher-level plurality, shared with the information-based theory of Moltmann (1997, 1998, 2005), is the unusual role of situations. In semantics, situations have been used to help identify the domain of incomplete quantifier restrictions and descriptions (Barwise/Perry 1983, Cooper 1993). They were not used as part of the argument of the predicate. Hopefully, future research can show that their role as parts of arguments of predicates serves not only the purpose of dealing with part-related predicates and with distributivity.[32]

Finally, the chapter has shown that natural language displays genuine plural quantification, namely in English with quantifiers such as *several things*. However, such quantifiers belong to the class of nominalizing quantifiers and, in addition to acting as plural quantifiers, arguably involve reification of pluralities "as many" as pluralities "as one."

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[32] One potential other application of a situations being part of the arguments of a predicate is the lexical restriction of a predicate like *high* to entities in vertical position (Moltmann 1998):

(i) The flag pole is high.

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