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Superplurals analyzed away*

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Abstract

Many natural languages include plural terms, i.e., terms which denote many individuals at once. Are there also *superplural* terms, i.e., terms which denote many pluralities of individuals at once? Some philosophers say ‘Yes’, citing a range of sentence-types which apparently can’t be analyzed in a first-order plural logic, but which *can* be analyzed in a superplural one. We argue that all the data presented in favor of the superplural can, in fact, be analyzed using only first-order resources. The key is to add to ordinary plural logic a new notion of a *generalized cover*. A generalized cover reflects how interlocutors in a conversation may divide a salient plurality into many subpluralities, which can then be involved in reference and predication. With generalized covers in place, all the apparently troublesome sentences can be easily handled. Our approach can also be extended to account, not only for linguistic data which seem to favor the superplural, but also for other phenomena involving plurals. The result is a unified approach to natural language plurals on which superplurals are analyzed away.

Keywords: cover; plural logic; superplural reference; superplural predication

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1 Introduction

Recent years have seen increased attention to first-order plural logic, a framework in which the meaning and logic of plural expressions can be analyzed.¹ A major motivation for this framework is the apparent irreducibility of certain kinds of plural predication. Compare the following sentences:

(1) Jane and Peter are young.

(2) Jane and Peter met.

In (1), the predicate *young* is *distributive*, applying to each of Jane and Peter individually:

(1) is true just in case Jane is young and Peter is young. But in (2), the plural predicate *met* is *collective*, applying not to Jane and Peter individually, but to both of them together:

(2) isn't equivalent to *Jane met and Peter met*.² If we're working within the familiar framework of singular first-order logic, in which a term can refer to at most one individual, this is difficult to explain without recourse to special kinds of individuals like sets or mereological sums. We might, for instance, claim that the term *Jane and Peter* is a singular term which denotes the set {Jane, Peter} and that while *young* distributes over the members of this set, *met* is simply true of the set itself.³ The pluralist alternative is to take plural reference and predication at face-value: the term *Jane and Peter* refers to both Jane and Peter — loosely speaking, it refers to their 'plurality'⁴ — and predicates can be

¹ See in particular Boolos (1984), Oliver and Smiley (2001, 2016), Rayo (2002, 2006), Yi (2005, 2006), McKay (2006), Linnebo (2017), and Florio and Linnebo (2021).

² In general, a sentence in which a predicate is interpreted collectively isn't logically equivalent to one in which the same predicate is applied distributively. Exceptions can occur when both sentences are necessary truths. For instance, given suitable axioms about sets, whenever *a* and *b* are distinct, the collective interpretation of

(i) *a* and *b* form a set.

is logically equivalent to

(ii) *a* forms a set and *b* forms a set.

³ We won't survey the various criticisms that have been made, over the years, of singularist translations; for this see e.g. McKay (2006) and Oliver and Smiley (2016). For critical discussion see e.g. Scha (2012) and Florio and Nicolas (2021).

⁴ This is *merely* loose talk. A 'plurality' isn't a special kind of individual to which a plural term refers; rather, a plurality of individuals 'is' just those individuals.

applied to *them*. A distributive predicate like *young* is true of some things just in case it's true of *each* of them, while a collective predicate like *met* can simply be true of some things without being true of any one of them.

Standard plural logics easily accommodate cases in which a predicate applies collectively to, or distributes over, some *individuals* – what Grimau (2021b) calls, respectively, *individual-collective* and *individual-distributive* predication. But it seems that a predicate might also apply collectively to, or distribute over, some *pluralities*. Consider:

- (3) Serena and Venus, and Marc and Pau are siblings. (Grimau 2021b, p. 152.)
- (4) The students and their teachers met in adjacent rooms. (Modified from Grimau 2021b, p. 150.)

On one reading, (3) says that Serena and Venus are siblings, and so are Marc and Pau. So, again using Grimau's terminology, this is a case of *plurality-distributive* predication: the predicate holds of some pluralities just in case it holds of each of them. By contrast, on one reading of (4), it says that the students met in one room, their teachers met in another room, and that these two rooms were adjacent. This is a case of *plurality-collective* predication: the predicate holds of the two pluralities taken together, rather than of each of them individually.

It also seems that a predicate may apply to what Grimau calls 'structured pluralities', where (again, speaking loosely), a 'structured plurality' is built up from several pluralities.⁵ Consider:

- (5) The philosophy students and their teachers, and the history students and their friends met in adjacent rooms. (Modified from Grimau 2021b, p. 151.)
- (6) The philosophy students and their teachers, and the history students and their enemies, fought on different streets.

On one reading, (5) says that the philosophy students and their teachers met in adjacent rooms, and so did the history students and their friends. The predicate thus seems to distribute over two structured pluralities: that of the philosophy students and their

⁵ Similar cases were discussed by Link (1984) and subsequent works.

teachers, and that of the history students and their friends; this is a case of *structured-plurality distributive* predication. By contrast, on one reading of (6), it says that the philosophy students fought against their teachers, the history students fought against their enemies, and that these fights happened on different streets. The predicate seems to hold collectively of two structured pluralities; this is a case of *structured-plurality collective* predication.

We thus arrive at the following typology of plural predications:⁶

TYPOLOGY OF PLURAL PREDICATIONS

individual-distributive	Jane and Peter are young.
individual-collective	Jane and Peter met.
plurality-distributive	Serena and Venus, and Marc and Pau are siblings.
plurality-collective	The students and their teachers met in adjacent rooms.
structured-plurality-distributive	The philosophy students and their teachers, and the history students and their friends met in adjacent rooms.
structured-plurality-collective	The philosophy students and their teachers, and the history students and their enemies, fought on different streets.

First-order plural logic can handle individual-distributive and individual-collective predication, but it has trouble with the other types. Take sentence (3). In first-order plural logic, the term *Serena and Venus, and Marc and Pau* simply refers to the four individuals. So, if *siblings* distributes over the referents of this term, it distributes over each individual, and (3) says that all four of them are siblings; we can't secure the intuitive reading of the

⁶ In principle, we could keep ascending the hierarchy, e.g., by adding *super-structured-plurality* predications, in which the predicate is applied to several pluralities of structured pluralities. However, it's not clear that such predications are realized in natural language, or that they raise any special issues.

sentence. Similar problems arise for the other three types of predication.

In response to this, some have claimed that the step from the singular to the plural can be iterated, yielding a new form of reference, *superplural* reference.⁷ *Superplural terms* are terms which stand to ordinary plural terms as ordinary plural terms stand to singular ones. They, as it were, refer to several pluralities at once. In turn, *superplural predicates* are predicates that apply to superplural terms. For instance, in (3), the predicate *are siblings* wouldn't apply plurally to the four people; instead, it would apply superplurally to the two pairs of people.

Not everyone is convinced. Indeed, some have argued that the very idea of superplural reference (as well as superplural predication) is incoherent.⁸ In this article, we argue that even if superplural resources are intelligible, they needn't be used in linguistic semantics. All the data presented in favor of the superplural *can* be analyzed using first-order plural logic, provided it's supplemented by a new notion of *generalized cover*.

2 Covers

2.1 The concept

There is tradition in linguistics which purports to explain some of the examples above in terms of a notion of *cover*.⁹ The intuitive idea behind cover-based semantics is that the application-conditions of a plural predicate can be sensitive to how the participants in a conversation 'divide' the referent(s) of a plural term. For instance, if the participants are thinking of Serena, Venus, Marc, and Pau simply as four people, then to claim that they're siblings is to claim that they all have the same parents. But if the participants are instead of thinking of Serena, Venus, Marc, and Pau as two pairs of people, then to claim

⁷ Notably Rayo (2006), Linnebo and Nicolas (2008), Oliver and Smiley (2016, ch. 15), Simons (2016), Florio and Linnebo (2021, ch. 9), and Grimau (2021a). Landman (1989) argues for the existence of the relevant readings but doesn't explicitly endorse the resources of superplural logic.

⁸ See especially Simons (1982, pp. 187–195), Uzquiano (2004, pp. 438–440), McKay (2006, pp. 46–53, 137–39), and Ben-Yami (2013).

⁹ See especially Higginbotham (1981), Gillon (1992), Schwarzschild (1996, ch. 6), and Champollion (2017).

that they're siblings is to claim that each pair has the same parents. Informally speaking, a cover is whatever corresponds, in the semantics, to the way in which a plurality is being divided. So, a natural hypothesis is that the application-conditions of *siblings* are sensitive to a choice of cover. And since reference to a cover appears to be ordinary, first-level reference (perhaps to a set, as in section 2.2), no higher-level resources are needed.

How covers get selected is a difficult question, and we can't provide a comprehensive account here. But we can make some remarks. The selection of a cover is traditionally taken to be a matter of pragmatics (Gillon 1992, pp. 482–483; Schwarzschild 1996, pp. 92–98). In context, an interlocutor attempts to select a cover which best fits what she takes to be the speaker's intentions, guided by some general principles. For instance, according to Grice (1975, p. 27), speakers are bound by a maxim of manner: *Be perspicuous!* This maxim plausibly explains why the natural reading of (3) is what it is.¹⁰ A speaker who referred to the four people simply as *Venus, Serena, Marc, and Pau* would strongly suggest that the plurality of four people is the relevant one, and hence that what she meant was that all four people share the same parents. By contrast, a speaker who refers to the four people as *Venus and Serena, and Marc and Pau* strongly suggests that the relevant pluralities are the two pairs of people, and hence that what she means is that the people in each pair share the same parents.

It's unlikely that an interlocutor can always assign a particular cover as *the* relevant one. Consider a variant of sentence (3) in which, instead of a term signaling the relevant division of the plurality, we simply have a demonstrative:

(7) These people are siblings.

There seems to be a reading of (7) on which it says, not that all the people denoted are siblings of *each other*, but rather that they are some *groups* of siblings. And this reading seems to be available even if the context doesn't make any particular carving of the people into groups of siblings salient. On our view, what's going on in such cases is that

¹⁰ On this point, see Champollion (2017, p. 20) and Grimau (2021b, pp. 178–185).

the interlocutor engages in existential quantification over covers. That is, an interlocutor can take (7) to be true just in case there's *some* cover of the people which carves them into groups of siblings. Here's another example.

(8) These are the people who lifted the piano.

The speaker may utter this sentence without knowing which groups of people did the lifting. And so she may simply assert that there exists a cover dividing the people into subpluralities which lifted the piano.

While the pragmatic approach is flexible and powerful, it has its problems. On the pragmatic approach, even when a sentence contains a plural term which refers to some particular individuals and signals a certain division of them, that division can only be strongly suggested, never forced. That is, the cover suggested by a speaker's choice of noun phrase could be overridden if the context were rich enough. But that's not always the case. Consider (3) again:

(3) Serena and Venus, and Marc and Pau are siblings.

This sentence simply can't be taken to mean that Serena and Marc are siblings and Venus and Pau are siblings (with different parents than Serena and Marc).¹¹

Our considered view is that while the selection of a cover is *largely* a matter of pragmatics, there are semantic factors which constrain the range of permissible interpretations (Nicolas and Payton [Forthcoming](#)). Fortunately, nothing hinges on this for the purposes of the present paper. Our aim is to show that all the types of plural predication in Grimau's typology can be accounted for in terms of covers, not to give a comprehensive account of how covers get selected in context.

2.2 The classic conception

We've explained the general *concept* of a cover, i.e. what, in the abstract, covers are supposed to do. We haven't provided a specific *conception* of a cover, i.e. an account of what kind of thing plays this role in the semantics of plural predication, and how it

¹¹ For other objections, see for instance Dever (1998, ch. 3, sec. 2).

does it.¹²

The classic conception comes from set-theoretic semantics, and it has two components. First, the denotation of a plural term is taken to be, not some things, but a set with those things as members. Consequently, covers are defined over sets. A *cover* of a non-empty set x is a set of non-empty subsets of x whose union is x .¹³ Formally:

SET-THEORETIC COVER

Let x be a non-empty set. $C(x)$ is a cover of x just in case:

- (i) $C(x)$ is a set of non-empty subsets of x ;
- (ii) every member of x is a member of a member of $C(x)$.

Second, a plural predicate applies, not directly to the denotation x of the plural noun phrase, but to each member of a cover $C(x)$ of this denotation. The individual-distributive reading corresponds to the case where, for every element y of x , $\{y\}$ is an element of $C(x)$. The individual-collective reading corresponds to the case where $C(x) = \{x\}$. Other cases correspond to plurality-distributive readings.

Consider again (3). On this view, the denotation of *Venus and Serena, and Marc and Pau* is the set $\{\text{Venus, Serena, Marc, Pau}\}$. But by using this plural term, the speaker makes salient a certain cover, $\{\{\text{Venus, Serena}\}, \{\text{Marc, Pau}\}\}$, and the predicate *are siblings* distributes over the elements of this set, namely, $\{\text{Venus, Serena}\}$ and $\{\text{Marc, Pau}\}$.

2.3 Limitations

Naturally, since we accept the primitives of plural logic, we reject the first component of the classic conception. On our view, *Venus and Serena, and Marc and Pau* denotes the four people, not a set with those people as members. Likewise, *siblings* is true of each pair of people, not of the sets $\{\text{Venus, Serena}\}$ and $\{\text{Marc, Pau}\}$.

More importantly, the classic conception can't do the work required of it. While it serves well enough in cases of plurality-distributive predication, it can't handle the other

¹² The distinction between concepts and conceptions is due to Rawls (1971). For further discussion, see Incurvati (2020, ch.1).

¹³ Cf. Gillon (1987, p. 212) and Schwarzschild (1996, p. 64).

three varieties of predication in Grimau’s typology.

Consider again this sentence:

(4) The students and their teachers met in adjacent rooms.

There’s a reading of (4) on which it says that (i) the students met in one room, (ii) their teachers met in another room, and (iii) these rooms are adjacent to one another. Now, if the denotation of *The students and their teachers* is simply a flat set of individuals,

$$\{s_1, \dots, s_n, t_1, \dots, t_k\}$$

then we seem to lose this reading. And covers, as classically conceived, don’t help. The idea would have to be that while *The students and their teachers* denotes this flat set, the speaker who uses it makes salient a cover which divides the students and their teachers into separate subsets:

$$\{\{s_1, \dots, s_n\}, \{t_1, \dots, t_k\}\}$$

This set reflects the structure relevant to the interpretation of *met in adjacent rooms*. But we can’t interpret *met in adjacent rooms* with respect to this cover. Recall, according to the second component of the classic conception, a plural predicate always distributes over the members of the salient cover. So, on this interpretation, *met in adjacent rooms* is true of each of $\{s_1, \dots, s_n\}$ and $\{t_1, \dots, t_k\}$, and the sentence says that (i) the students met in adjacent rooms and (ii) their teachers met in adjacent rooms. That is, if we interpret the predicate with respect to this cover, the reading of the sentence is no longer *collective*. To restore the collective reading, we would need the predicate to apply only to the flat set of individuals. But then we would be faced with the original problem, namely that this set doesn’t reflect the relevant division of the students and their teachers.¹⁴

Sentence (4) is an instance of plurality-collective predication, but similar problems arise for the other varieties. Consider (5), a case of structured-plurality-distributive predication:

¹⁴ Versions of this argument appear in Linnebo and Nicolas (2008, p. 195), Florio and Linnebo (2021, pp. 192–193), and Grimau (2021b, p. 161).

- (5) The philosophy students and their teachers, and the history students and their friends met in adjacent rooms.

There's a reading of (5) on which it says that (i) the philosophy students and their teachers met in adjacent rooms and (ii) the same is true of the history students and their friends. This suggests that the predicate must be interpreted with respect to the following cover:

$$\{\{p_1, \dots, p_n, t_1, \dots, t_k\}, \{h_1, \dots, h_m, f_1, \dots, f_l\}\}$$

Here, p_1, \dots, p_n are the philosophy students, t_1, \dots, t_k are their teachers, h_1, \dots, h_m are the history students, and f_1, \dots, f_l are their friends. But while this cover seemingly gets the predicate distributing over the right things, it still leaves us unable to secure the relevant reading. For, each subset of this cover is a flat set of individuals and doesn't reflect the division which is relevant to the predicate *met in adjacent rooms*.

In short, in order to account for these varieties of apparently higher-level predication, we need a cover which does two things: ensure that the predicate is true *of* the right things (i.e., that we get the correct collective or distributive reading); and retain the structure which is intuitively relevant to the truth of the sentence. But, it seems, no cover can do both.

Some might conclude that the appeal to covers is hopeless. As we'll now show, this is too hasty. The problem lies, not with the basic concept of covers, but with the classic conception of them. In the next section, we provide a new account of what covers are and of how they figure in the semantics of plural predication. We then show that this new conception allows for satisfactory treatments of the troublesome varieties of predication in Grimau's typology. Along the way, we show that our new conception also allows for a unified treatment of higher-level predication and other phenomena involving plurals.

3 Generalized covers

3.1 Partial plural functions

In keeping with our commitment to plural reference and predication, we don't think of covers as sets. A cover doesn't divide a set into many subsets. Rather, it divides a plurality into many subpluralities. A cover takes us from some things aa to some things bb_1, \dots, bb_n , each of which are a subplurality of aa , and all of which taken together are identical to aa . In doing so, it indicates whether, and how, a salient plurality is divided into others. For instance, the following cover (represented graphically) indicates that Venus, Serena, Marc, and Pau are divided into the two pairs of siblings:

$$\begin{array}{l} \text{Venus@Serena@Marc@Pau} \quad \longrightarrow \quad \text{Venus@Serena} \\ \text{Venus@Serena@Marc@Pau} \quad \longrightarrow \quad \text{Marc@Pau} \end{array}$$

Here, @ is the term-forming operator from first-order plural logic (Yi 2005, 2006): the plural term $\text{Venus@Serena@Marc@Pau}$ denotes the four people, while the plural terms Venus@Serena and Marc@Pau denote two people each.

More precisely, a cover is a partial function defined over (a) pluralities which are salient in the discourse and (b) what we'll call indices. We'll often use natural numbers as indices, but officially the indices may be individuals of any sort. The function takes two arguments, a plurality aa and an index i , and its output, $\delta(aa, i)$, is some subplurality bb_i of aa . Given some indices $1, \dots, n$, $\delta(aa, 1), \dots, \delta(aa, n)$ are some bb_1, \dots, bb_n which are collectively identical to aa . The limit case is obtained with a single index, where $\delta(aa, 1)$ simply maps aa to aa .¹⁵

We don't want to limit ourselves to cases in which aa are divided into a finite number of subpluralities. (We may, for instance, want a cover which divides the natural numbers into infinitely many pairs of natural numbers.) To avoid this limitation, drawing inspiration

¹⁵ Compare Payton (2021).

from the notion of *indexing* put forth by Florio and Nicolas (2015, p. 456), we define our notion of *generalized cover* as follows:¹⁶

GENERALIZED COVER

δ is a generalized cover of aa if there are some indices ii such that:

(i) for every i among ii , $\delta(aa, i)$ are among aa ;

(ii) for every x among aa , there is some i such that x is among $\delta(aa, i)$.

Covers, so defined, can divide a plurality into infinitely many subpluralities.

As we've said, a cover of aa is a function which, for every index i over which it is defined, yields an output $\delta(aa, i)$. For brevity, we'll often refer to all these outputs as *the outputs of* $\delta(aa)$, leaving all reference to indices implicit. Note that, while this expression might appear to be itself superplural, referring to several pluralities at once, we'll use it merely as a convenient shorthand; everything we say can be stated formally in first-order plural logic, without recourse to super plurals, as shown in our definition of generalized cover and in the application-conditions for various predicates that we present in the rest of the article.

You may wonder how a function can divide a plurality into sub-pluralities; traditionally, the inputs and outputs of functions are taken to be *individuals*, and the whole point of plural reference is that 'pluralities' aren't individuals. However, as Oliver and Smiley (2016, ch.9) have argued, that traditional conception is open to question: it's natural to understand the 'highest common factor of' function, for instance, as taking a plurality of individuals as its input. We'll proceed on the assumption that functions are not, by their nature, forbidden from having pluralities as either inputs or outputs.¹⁷

¹⁶ Technically, an indexing is a generalized cover whose indices are ordered. Florio and Nicolas (2015) use the notion to account for plural sentences whose interpretation depends on order or repetition. While these phenomena aren't our concern here, covers can also be used to deal with them — see section 6.2.

¹⁷ Alternatively, covers could be treated as plural *relations* between pluralities and sub-pluralities. See Payton (Forthcoming) for this approach.

3.2 Generality

On our conception, a cover is a partial function defined over some pluralities salient in the discourse: it maps each of them to some pluralities that cover it. Visually:

$$\begin{array}{ccc}
 & \longrightarrow & bb_1 \\
 aa & & \vdots \\
 & \longrightarrow & bb_n
 \end{array}$$

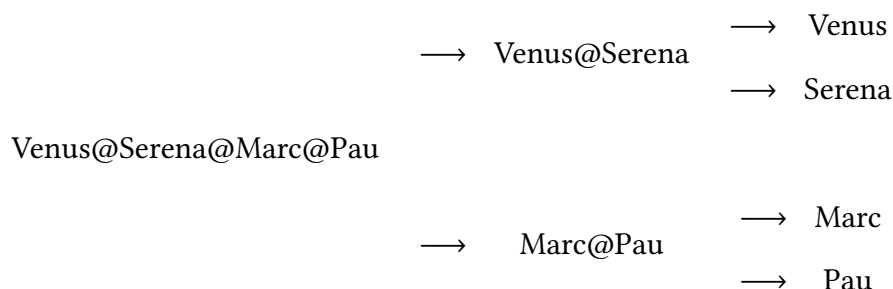
Now, if bb_1, \dots, bb_n are the outputs of $\delta(aa)$, then each of bb_1, \dots, bb_n are themselves pluralities in the discourse. Thus, they can also be inputs of δ . Moreover, $\delta(aa)$ may (but need not) be defined so as to map each of bb_1, \dots, bb_n to two or more of *its* subpluralities:

$$\begin{array}{ccc}
 & & \longrightarrow & cc_1 \\
 & \longrightarrow & bb_1 & \quad \quad \quad \vdots \\
 & & & \longrightarrow & cc_l \\
 aa & & \vdots & & \\
 & & & \longrightarrow & zz_1 \\
 & \longrightarrow & bb_n & \quad \quad \quad \vdots \\
 & & & \longrightarrow & zz_m
 \end{array}$$

And of course, $\delta(aa)$ may be even more complicated than this. Each of cc_1, \dots, cc_l and zz_1, \dots, zz_m may be mapped to two or more of *its* own subpluralities, and so on. In such cases, many subdivisions of the same plurality are salient in the conversational context.

To consider one example, it's plausible that a speaker who uses the term *Serena and Venus, and Marc and Pau*, thereby puts *seven* things into the discourse (assuming they weren't there already): the plurality of the four people; the two pluralities of siblings; and each of the four people. Thus, on our view, the speaker makes salient the following

cover:



Because covers, on this conception, may be defined over several salient pluralities at once, they're *generalized* compared to the classic conception.

3.3 Two roles for covers

So much for our account of what covers *are*. We also give a new account of the roles that covers can play in the semantics of distributive and collective predication.

Taking distributive predication first, we can say, as a first pass, that a cover δ divides aa when $\delta(aa)$ has two outputs or more.¹⁸ Distributive predication occurs when the relevant cover divides the relevant plurality and the predicate is true of each subplurality in the division.

Crucially – and in contrast to the classic conception – we *don't* say that collective predication can only occur when δ leaves aa undivided and simply maps them to themselves. For instance, we don't say that *Jane and Peter met* must be interpreted with respect to a cover δ such that $\delta(\text{Jane@Peter}) = \text{Jane@Peter}$. Collective predication can occur even when a sentence is interpreted with respect to a cover which divides aa . We just say that, if the predicate is understood collectively, then it's true of aa .

DISTRIBUTIVE AND COLLECTIVE PREDICATION WITH RESPECT TO A COVER

Let $NP VP$ be a sentence formed of a plural subject NP and a plural predicate VP . Let aa be the denotation of NP and δ a cover of aa .

¹⁸ More carefully, δ divides aa when there are at least two indices, i and j , such that $\delta(aa, i) \neq \delta(aa, j)$.

- Understood distributively, the sentence is true with respect to δ just in case, for every index i (used for dividing aa)¹⁹, VP is true of $\delta(aa, i)$.
- Understood collectively, the sentence is true with respect to δ just in case VP is true of aa .

This is only a first pass, since it tells us something about the surface-level phenomena of collective and distributive predication, but little about how different readings are to be accounted for at the level of compositional semantics. While we can't provide a full compositional story here, we follow Schwarzschild (1996) in thinking that the distributive reading of a predicate is generated by a distributivity operator which is present in the logical form of the sentence and which modifies the verb phrase. In such cases, the logical form of the sentence isn't 'NP VP' but 'NP Dist_δ (VP)' – e.g. 'The children Dist_δ (lifted the piano)'. So, the schema for distributive predication can be reformulated as follows.

DISTRIBUTIVE PREDICATION WITH RESPECT TO A COVER

Let $NP \text{Dist}_\delta (VP)$ be a sentence formed of a plural subject NP and a plural predicate VP modified by the distributive operator Dist_δ . Let aa be the denotation of NP and δ the cover of aa mentioned in the distributive operator. The sentence is understood distributively with respect to δ , i.e. the sentence is true with just in case, for every index i (used for dividing aa) VP is true of $\delta(aa, i)$.

You might wonder: if collective predication can occur whether or not δ divides aa , why is it relativized to a choice of cover at all? Answer: because on our view, covers can do more than determine what a plural predicate distributes over. For any plural predicate VP , we can ask two questions. First, what must VP be true of if it's true of some aa ? (Just aa themselves? Each individual in aa ? Some subpluralities of aa ?) Second, what must certain sub-pluralities of aa be like if VP is true of aa ? The classic conception

¹⁹ Hereafter, for brevity, we'll suppress this precision. In practice, the context should always make clear which indices are used when dividing salient pluralities in the discourse.

effectively assumes that the specification of a cover is only relevant to the first question: a cover determines what, if anything, a plural predicate distributes over; after that, its job is done. On our view, a carving of *aa* into sub-pluralities can be relevant to the application-conditions of a predicate, even when the predicate doesn't distribute over those sub-pluralities.^{20,21} This will be crucial in what follows.

Our distinction between distributive and collective predication may seem quite coarse-grained compared to Grimau's typology. But as we'll now see, it allows us to account for all the seemingly troublesome varieties of predication in that typology.²²

4 Application to examples

4.1 Plurality-collective predication

4.1.1 The students and their teachers

Recall this example:

(4) The students and their teachers met in adjacent rooms.

On the relevant reading, the sentence says that (i) the students met in one room, (ii) their teachers met in another room, and (iii) these rooms were adjacent to one another. As we saw in Section 2.3, the classic conception fails to account for this reading: on that conception, we can ensure a collective reading of the predicate using a flat set of individuals, but then we lose the importance of the division of those individuals into the students and the teachers; we can account for this using a cover which divides the students and their teachers into separate subsets, but then the predicate is forced to distribute over those subsets, and we lose collectivity. By contrast, because *our* conception allows us to

²⁰ Some collective predicates may not be cover-sensitive in this way. The relativization would then be inert. The sentence would be true with respect to all covers if it's true with respect to any.

²¹ On the classic conception, to determine whether a speaker intends for a predicate to be understood collectively or distributively just *is* to determine what kind of cover she intends. On our view, these are different, albeit related, tasks.

²² We leave it to the reader to see that our conception applies straightforwardly to individual-distributive, individual-collective, and plurality-distributive predications, just as the classic conception does.

distinguish two roles for covers — specifically, it allows the carving of a plurality into sub-pluralities to be relevant to the application-conditions of collective predicates — the sentence poses no problem.

First, we specify the application-conditions of the predicate in terms of covers: *met in adjacent rooms* is true of *aa* with respect to δ just in case the outputs of $\delta(aa)$ are such that they met in adjacent rooms. Of course, we can't leave it there. The outputs of $\delta(aa)$ may be pluralities rather than individuals, in which case, to say that they met in adjacent rooms appears to be to engage in superplural reference and predication of the sort we'd hoped to avoid. But we can state the application-conditions of *met in adjacent rooms* more precisely and without such resources:

APPLICATION-CONDITIONS OF *MET IN ADJACENT ROOMS*

met in adjacent rooms is true of *aa* with respect to δ just in case:

- (i) for every index *i*, there is a room r_i such that $\delta(aa, i)$ met in r_i ;
- (ii) any such rooms r_i and r_j are adjacent to one another.

Notice that these are the application-conditions for the *collective* reading of the predicate: even if δ divides *aa* into two or more subpluralities, and so *aa met in adjacent rooms* is true just in case *those* pluralities met in adjacent rooms, the predicate is simply true of *aa*; it doesn't distribute over the outputs of $\delta(aa)$. This is where our distinction between the two roles that a cover can play earns its keep.

Now, to secure the relevant reading of the sentence, we simply interpret the predicate using a cover which divides the denotation of *the students and their teachers* into the two subpluralities of the students and their teachers:

$$\begin{array}{lcl}
 & \longrightarrow & ss \\
 ss@tt & & \\
 & \longrightarrow & tt
 \end{array}$$

With *met in adjacent rooms* so interpreted, the sentence is true just in case these two pluralities met in adjacent rooms. This is the reading we wanted, and which the classic

conception failed to secure.

4.1.2 Overlap

A similar explanation can be given in other cases of plurality-collective predication. Consider this example due to Linnebo and Nicolas (2008, p. 193):

(9) The square things, the blue things, and the wooden things overlap.

On the relevant reading, (9) says, of the square things, the blue things, and the wooden things, that they overlap. That is, (9) is true just in case at least one thing is square, blue, and wooden. The classic conception can't secure this reading. On that conception, the cover which is needed to secure the collective reading of *overlap* is just the flat set of individual things, and so we lose the importance of the division of those individuals into the square things, the blue things, and the wooden things.

We can do better. We specify the application-conditions of the predicate *overlap*, on its collective reading, as follows: *overlap* is true of *aa* with respect to δ just in case the outputs of $\delta(aa)$ overlap. More precisely, and doing away with any lingering appearance of superplural reference and predication:

APPLICATION-CONDITIONS OF *OVERLAP*

overlap is true of *aa* with respect to δ just in case there is an x such that, for every index i , x is in $\delta(aa, i)$.

Now, we interpret the predicate using a cover which divides the denotation of *the square things, the blue things, and the wooden things* into the square things, the blue things, and the wooden things:

$$\begin{array}{rcl} & \longrightarrow & ss \\ ss@bb@ww & \longrightarrow & bb \\ & \longrightarrow & ww \end{array}$$

With *overlap* so interpreted, (9) is true just in case these three pluralities overlap, just as desired.

We've just given an analysis of the meaning of the predicate *overlap*. Some have objected to such analyses on the ground that *overlap* isn't a defined term, but rather a primitive which children can learn as a lexical atom (Linnebo and Nicolas 2008, p. 194; Grimau 2021a, p. 5274). But it's not clear whether a verb like *overlap* really is a lexical atom.²³ And even if it is, the purpose of our analysis is simply to elucidate the application-conditions of the predicate, not to give something like a definition of the predicate which a speaker must understand before they can use it.

4.1.3 The three-way game

Finally, consider the following example, based on another one given by Linnebo and Nicolas (2008, p. 193):

(10) The French students, the German students, and the Hungarian students played a game.

On the relevant reading, (10) concerns a three-way game between the three groups of students.

(11) The French students played a game with the German students, and the French students played a game with the Hungarian students, and the German students played a game with the Hungarian students.

For, (11) can be true even if there was never any three-way game in which all three groups participated. As usual, the classic conception can't secure this reading, since the cover which is needed, on that conception, to secure the collective reading of *played a game* lacks the structure which is relevant to its correct interpretation.

We can do better. We specify the application-conditions of the predicate in terms of covers:

APPLICATION-CONDITIONS OF *PLAYED A GAME*

played a game is true of *aa* with respect to δ just in case there is an event *e* such that:

²³ For discussion, see Winter (2018, sec. 2.4, 2.5) and references therein.

- (i) e is a game;
- (ii) for any indices i and j , $\delta(aa, i)$ played against $\delta(aa, j)$ in e .

To get the desired reading of (10), we interpret the predicate using a cover which divides the denotation of *The French students, the German students, and the Hungarian students* into the French students, the German students, and the Hungarian students:

$$\begin{array}{rcl}
 & \longrightarrow & ff \\
 ff@gg@hh & \longrightarrow & gg \\
 & \longrightarrow & hh
 \end{array}$$

With *played a game* so interpreted, (10) is true just in case there was a single game in which each of these three pluralities played against the other two.²⁴

4.2 Structured-plurality-distributive predication

Recall our example of structured-plurality-distributive predication from section 1:

- (5) The philosophy students and their teachers, and the history students and their friends, met in adjacent rooms.

We've seen in section 4.1.1 how our conception of covers can handle the collective reading of *met in adjacent rooms*, applied to many pluralities at once. Here, things are more complicated, since the relevant reading apparently requires *met in adjacent rooms* to distribute over the 'structured plurality' of the philosophy students and their teachers, and that of the history students and their friends. However, the complications pose no serious difficulties.

Applying our account of distributive predication from section 3.3, we need to interpret *met in adjacent rooms* using a cover which maps the philosophy students, their teachers, the history students, and their friends to two pluralities: the philosophy students and their teachers; and the history students and their friends. The predicate *met in adjacent rooms*

²⁴ Ultimately, this analysis would have to be cashed out within a precise (neo)-Davidsonian semantics. But this would take us too far afield.

then applies collectively to each of these pluralities. Of course, it should do so in an appropriate manner: the first plurality should be divided into the philosophy students and their teachers, the second into the history students and their friends. (Recall, this is where the classic conception failed, since no classic cover could secure both of the needed divisions.)

Here, again, the *generality* of covers earns its keep. The outputs of $\delta(aa)$ are themselves pluralities in the discourse and δ may be defined so as to divide each of them. We may then interpret our sentence using the following cover:

$$\begin{array}{rcl}
 & \longrightarrow & pp@tt & \longrightarrow & pp \\
 & & & & \longrightarrow & tt \\
 pp@tt@hh@ff & & & & & \\
 & \longrightarrow & hh@ff & \longrightarrow & hh \\
 & & & & \longrightarrow & ff
 \end{array}$$

Indeed, a speaker who uses the term *The philosophy students and their teachers, and the history students and their friends*, plausibly puts every entity on this diagram into the discourse (if they weren't there already) and makes this cover salient.

This cover secures the relevant reading of the sentence. At the first step, *met in adjacent rooms* is applied to $pp@tt@hh@ff$. Since the predicate is read distributively at this step, the sentence is only true if *met in adjacent rooms* is true of every output of $\delta(pp@tt@hh@ff)$ – that is, of $pp@tt$ and $hh@ff$. But by the application-conditions given in section 4.1.1, *met in adjacent rooms* is true of $pp@tt$ with respect to δ just in case the outputs of $\delta(pp@tt)$ – that is, pp and tt – met in adjacent rooms. Likewise for $hh@ff$. So, we get the desired result that the sentence is true just in case (i) the philosophy students and their teachers met in adjacent rooms, and (ii) the history students and their friends met in adjacent rooms.

A similar story could be told for other cases of structured-plurality-distributive predication. Rather than rehearse them, however, we turn to consider the case of structured-

plurality-collective predication.

4.3 Structured-plurality-collective predication

Consider again sentence (6):

- (6) The philosophy students and their teachers, and the history students and their enemies, fought on different streets.

On the relevant reading, the sentence says that the philosophy students fought with their teachers on one street, the history students and their enemies fought on another, and that these streets were different. The predicate *fought on different streets* applies to collectively to both pluralities. But the ‘structure’ of these pluralities also matters: on the relevant reading, neither fight was a complete free-for-all; rather, the philosophy students fought against their teachers while the history students fought against their enemies.

To capture this reading of the sentence, we give the following application-conditions to *fought on different streets*:

APPLICATION-CONDITIONS OF *FOUGHT ON DIFFERENT STREETS*

fought on different streets is true of *aa* with respect to δ just in case:

- (i) for every index i , there is a street s_i such that $\delta(aa, i)$ fought on s_i ;
- (ii) any such streets s_i and s_j are distinct;
- (iii) for any things xx and yy and indices i, j , and k , if $xx = \delta(j, \delta(i, aa))$ and $yy = \delta(k, \delta(i, aa))$, then xx fought against yy .

Clauses (i) and (ii) tell us that *fought on different streets* is true of *aa* with respect to δ only if δ divides *aa* into subpluralities which fought on different streets. Clause (iii) imposes the additional requirement that δ further divides those subpluralities into the different ‘sides’ in the fight.

Now, we use the following cover:

$$\begin{array}{rcl}
 & \longrightarrow & pp@tt & \longrightarrow & pp \\
 & & & \longrightarrow & tt \\
 pp@tt@hh@ee & & & & \\
 & \longrightarrow & hh@ee & \longrightarrow & hh \\
 & & & \longrightarrow & ee
 \end{array}$$

(6) is true only if *pp* and *tt* fought against each other on one street, while *hh* and *ee* fought against each other on another. Thus, we get the desired reading.²⁵ And as always, a similar story could be told for other cases of structured-plurality-collective predication.

4.4 Summing up

We can't show in advance that our approach will apply to all possible examples of plurality-collective, structured-plurality-distributive, or structured-plurality-collective predication. What we've given is a proof of concept. Our conception of covers allows us to deal with well-known cases of allegedly higher-level predication using only resources acceptable within first-order plural logic.

²⁵ The astute reader may have noticed that sentence (5) can also have a similar reading. The structured-plurality-distributive and structured-plurality-collective readings of (5) rely on different application-conditions for *met in adjacent rooms*. These correspond to two different interpretations of the predicate *met*:

- (i) The children met.
- (ii) The boys and the girls met.

On the most salient reading, (i) says, of the children taken as a whole, that they met. But on the most salient reading, (ii) says that the boys met with the girls. The application-conditions of the structured-plurality-collective reading of (5) correspond to the latter interpretation of *met*, while those of the structured-plurality-distributive reading correspond to the former.

5 Objections

5.1 Pseudo-singular terms

There are some count nouns (*couple, trio, group*, etc.) which may seem to have a double nature. On the one hand, they behave like other count nouns in admitting pluralization and counting (e.g., *three couples*). On the other hand, at least in some varieties of English, they allow *plural override*: as shown in (12), they can combine with plural verbs and allow plural anaphoric reference even when the nouns themselves are not pluralized.²⁶

(12) The couple are happily married. They met at university.

Because of this, some philosophers have argued that these nouns are *pseudo-singular*: they're syntactically singular, but semantically plural (Oliver and Smiley 2016; Grimau 2021a). But now, consider the following sentence:

(13) These couples only admire one another. (Modified from Grimau 2021a, p. 5273.)

This sentence reports that the denotation of *these couples* are such that each couple among them admires only other couples among them. But if *this couple* is a plural term denoting two persons, then you might think that *these couples* is a *superplural* term denoting several pluralities of people at once.

To be clear, nothing we've said in this paper commits us to the view that nouns like *couple* really *are* pseudo-singular. But assuming for the sake of argument that they are, we can account for them without superplural resources. We can treat *the couples* as an ordinary plural term and give a satisfying treatment of (13) in terms of generalized covers. To do so, we state the application-conditions of *admire only one another* as follows:

APPLICATION-CONDITIONS OF *ADMIRE ONLY ONE ANOTHER*

admire only one another is true of *aa* with respect to δ just in case, for every index *i* and for any *xx*, if $\delta(aa, i)$ admire *xx*, then there is some index *j* such that $\delta(aa, j) = xx$.

²⁶ This phenomenon occurs in British English but is less acceptable in American English.

Let the couples mentioned in (13) be Alice and Beth, Charles and David, and Edward and Fiona. On our view, the denotation of the plural term *these couples* is these six people. But if the hearer knows how they are paired up, then the speaker can, by referring to them as *these couples*, make the following cover salient:

	→ Alice@Beth
Alice@Beth@Charles@David@Edward@Fiona	→ Charles@David
	→ Edward@Fiona

Thus, (13) is understood as saying of the six people that each couple among them admires only other couples among them.

In order for pseudo-singular terms to pose a problem for our view, there must be predicates whose application-conditions, when considered with respect to such terms, can't be accounted for in terms of covers. We know of no such predicate. So, we could accept that nouns like *couple* are pseudo-singular without embracing superplural reference.

5.2 Not enough indices?

We define a cover of *aa* by mapping *aa* to pluralities which are indexed by some individuals in the domain. A version of Cantor's theorem shows that, if *aa* are two or more, the subpluralities of *aa* are strictly more numerous than *aa* (Florio and Linnebo 2021, pp. 41–45). Assume that we can quantify over absolutely everything and let *uu* be all the individuals there are. Cantor's theorem might be expressed as follows, with *the pluralities* denoting *uu*:

(14) The pluralities are more numerous than the individuals.

But now, what happens if we utter a similar sentence in which a predicate seems to distribute over every plurality, as in,

(15) The pluralities contain at least one individual each.

or seems to apply to them collectively with their division into pluralities being relevant to its application-condition, as in,

(16) All the pluralities have different sizes.

Can we then introduce a cover securing the required division?

No. Since indices are individuals, they aren't numerous enough to index every plurality. It might seem, then, that such sentences would have to be understood using superplural resources.²⁷

Here, we confess, we aren't sure what to say. But we'll canvass three possible solutions to the problem.

First, we might adopt a version of plural logic developed by Florio and Linnebo (2021, ch.12), which they call *critical plural logic*. In this logic, the plural comprehension axiom scheme is restricted — so, it's not generally true that if there's at least one F then there's such a plurality as *the Fs* — and every plurality forms a set. Since every plurality may be indexed to its own set, we needn't worry about having insufficient indices for the interpretation of any sentence. On the other hand, within this system there is no universal plurality, no plurality of all sets, and no way to refer superplurally to all pluralities. Thus, sentence (14) in particular, rather than admitting of a straightforward analysis, would seem to come out semantically ill-formed. This solution will, of course, be unattractive to those who are loathe to give up plural comprehension.

Second, we might try to understand the seemingly problematic sentence entirely in terms of first-order plural logic, without recourse to covers. Suppose that the division of uu into all of its subpluralities is relevant to the interpretation of some predicate VP , either because (i) it seems to distribute over every plurality there is; or because (ii), although VP is understood collectively, this division seems to be relevant to its application conditions. The requisite cover would need to have every plurality as an output, which we've seen is impossible. But in the first case, instead of saying that the predicate distributes over the outputs of $\delta(uu)$, we may simply say that it's true of all pluralities. And in the second

²⁷ Despite referring to *the pluralities*, (14) isn't such a sentence. Indeed, Florio and Linnebo (2021, ch. 3) provide different ways to express its content within first-order plural logic.

case, instead of saying that the predicate is true of uu because of what the outputs of $\delta(uu)$ are like, we may simply say that it's true of uu because of what every plurality is like. However, this solution is *ad hoc* unless we can find a general rule for determining when covers can simply 'drop out' of the interpretation of a given sentence.

Finally, we might revise our assumption that the inputs to a cover are always a plurality aa and a *single* index i , by allowing a *plurality* of indices, jj , as inputs. That is, we might allow that a sub-plurality of aa can be indexed, not just to a single index i , but to many (in the sense of being indexed to them collectively, not to each of them individually). This solution would require us to revise our definition of cover as follows:²⁸

GENERALIZED COVER (REVISED)

δ is a generalized cover of aa if there are some indices ii such that:

(i) for every i among ii , $\delta(aa, i)$ are among aa ;

(ii) for every x among aa , there is either some i such that x is among $\delta(aa, i)$

or some jj among ii such that x is among $\delta(aa, jj)$.

Now, as long as there are at least as many individuals in ii as there are in aa , the fact that the pluralities in aa outnumber the individuals in ii doesn't pose a problem: there may not be enough *individual* indices to go around, but there will be enough *pluralities* of indices. This may be the most painless solution: it requires a non-standard notion of 'indexing', but if we're generally willing to allow pluralities as inputs and outputs of covers, there's no obvious reason to forbid this when it comes to indices.

6 Alternatives

6.1 Multiple covers

All the examples considered in section 4 have the flavor of reciprocal sentences: it seems they can all be paraphrased with a sentence containing *each other* or *one another*. For

²⁸ Note that, if plural variables are treated 'inclusively', i.e. as being able to take either one individual or many individuals as values, then the second disjunct of condition (ii) is trivially satisfied if the first is.

instance,

(9) The square things, the blue things, and the wooden things overlap.

can be paraphrased as

(9*) The square things, the blue things, and the wooden things overlap with each other.

Schwarzschild (1996, ch. 6) provides an analysis of reciprocal sentences using the classic conception of covers which we've rejected. According to him, the key point is that their interpretation involves, not just one cover, but *two*. So, one might object, there's no need to adopt our conception of generalized covers. One can account for all the relevant data using multiple classic covers and treating the troublesome sentences as reciprocal.

Our response is that such an analysis is incapable of capturing the intended reading of (9*). Let's see why. Working with set-theory and supposing each plurality contains two things, the denotation of the subject may be taken to be the set $S = \{s_1, s_2, b_1, b_2, w_1, w_2\}$. Now, according to Schwarzschild, interpretation proceeds as follows. A first cover C_1 of S specifies which pluralities are operative, i.e. which pluralities can, in the context, be related by the relation expressed by the main verbal expression (*overlap with*). A cover C_2 of C_1 then specifies which of *these* pluralities are related to which. Here, the set of operative pluralities is $C_1 = \{\{s_1, s_2\}, \{b_1, b_2\}, \{w_1, w_2\}\}$; and the cover of C_1 is simply $C_2 = \{C_1\}$. The sentence is said to be true just in case *overlap* is true of C_1 , i.e., just in case the relation denoted by *overlaps with* relates any two members of C_1 . But this analysis runs into the following problem: under its intended reading, (9*) is in fact *not equivalent* to such a conjunctive sentence about overlap between pairs of pluralities. So, the account in terms of generalized cover has the advantage here: it allows one to account for a greater variety of interpretations of reciprocal sentences than if one simply used multiple classic covers.

6.2 Articulated reference

Ben-Yami (2013) argues that purported examples of superplurals can be explained away if we recognize the semantic phenomenon of *articulated reference*: co-referring plural

terms can ‘articulate’ the same referent in different ways, and predicates can be sensitive to this articulation. For instance, the following sentences have different truth-conditions, even though they both refer to the same four men (Ben-Yami 2013, p. 95):

(17) Whitehead and Russell, and Hilbert and Bernays are joint authors of treatises on logic.

(18) Whitehead and Hilbert, and Russell and Bernays are joint authors of treatises on logic.

Ben-Yami’s explanation: although the subject terms in these sentences involve the same individuals, they articulate their reference in different ways.

Articulated reference and generalized covers play a similar role. However, there are some important differences.

First, and most obviously, articulated reference is supposed to be a special kind of *reference*, a semantic feature of terms. For Ben-Yami, the crucial difference between (17) and (18) is that the subject terms refer in different ways to the same four men. For us, those terms refer to the same things in the same way (they’re both simply plural terms); the difference lies in the interpretation of the predicate, which is sensitive to a different cover in each sentence.

Second, and relatedly, Ben-Yami sharply distinguishes distributive predication (taken to correspond exclusively to sentences like *The children ran*) from cases involving articulated reference. In our case, a single notion – that of generalized cover – is applied to these phenomena, thereby giving a more unified explanation.

Third, and most crucially, articulated reference is supposed to be due to the syntactic division of a given noun phrase into distinct sub-terms.

A referring expression can refer to a plurality by virtue of containing other referring expressions that refer to some of that plurality. For instance, ‘Jack and Jill’ refers to Jack and Jill because it contains the name ‘Jack’, used to refer to Jack, and the name ‘Jill’, used to refer to Jill. We can say that the reference of ‘Jack and Jill’ is *articulated* into reference to Jack and reference

to Jill. By contrast, if these pail-companions are your children, then ‘your children’ refers to the same children as does Jack and Jill, but its reference is not articulated (Ben-Yami 2013, p. 89, emphasis in the original).

A noun phrase refers in an articulated way to various pluralities whenever it’s divided into distinct sub-terms each of which refers to one of those pluralities. This is why *your children* is supposed *not* to exhibit articulated reference.

But in fact, a division of a plurality may be semantically relevant even when it isn’t reflected in the syntactic division of a referring term.²⁹ Consider:

(19) The students from the two countries met in adjacent rooms.

This sentence naturally receives the same kind of plurality-collective reading as (4): it says that the students from one country met in one room, the students from another country met in another room, and that these two rooms were adjacent to one another. There’s clearly a sense in which the description *the students from the two countries* provides the relevant division, here. But crucially, it does *not* do this by virtue of containing distinct sub-terms referring to each group of students.

Similarly, the division of a noun phrase into sub-terms sometimes only suggests *part* of the semantically relevant grouping. Consider:

(20) The students from the two countries, and the professors from the two disciplines, met in adjacent rooms.

This sentence naturally receives a structured-plurality distributive reading, like (5): it says that the students from the two countries met in adjacent rooms, and that the professors from the two disciplines did, too. But the syntactic division of the subject term into *the students from the two countries* and *the professors from the two disciplines* suggests only that *met in adjacent rooms* should distribute over the referents of these terms; it doesn’t provide the structure which is relevant to the interpretation of that predicate.

The relevant grouping can also be due to various elements in the context, such as pointing or graphical information. This is important in order to explain cases like the

²⁹ See Gillon (1987, pp. 211–215) and Schwarzschild (1996, pp. 63–68).

following.³⁰

(21) The books in the chart below complement each other. (Simplified from Schwarzschild 1996, p. 110)

Fiction	Non-fiction
Richard III	Aspects; Language
Oedipus Rex; Agamemnon	Das Kapital

Again, the subject noun phrase doesn't refer in an articulated way. Here, what's crucial to establish the relevant grouping is the graphical information provided by the chart.

Finally, consider sentences whose truth conditions depend on order or repetition, e.g.

(22) Jane gave birth to Peter and Mary, in that order. (Ben-Yami 2013, p. 98)

Ben-Yami argues that articulated reference naturally accounts for such cases, the order of mention being part of the way reference is articulated. However, as shown by Florio and Nicolas (2015), articulated reference is insufficiently general. In particular, since articulated reference is due to the syntax and semantics of a given noun phrase, it cannot apply to cases where several orders are involved:

(23) Annie, Bonnie, and Connie arrived in the order they were called. (Florio and Nicolas 2015, p. 452)

A better, unified account can be given using a notion of *indexing*. As noted in footnote 16, an indexing is a generalized cover whose indices are ordered. Equipped with our notion of cover, it's easy to adopt Florio and Nicolas' account.³¹

In fairness, Ben-Yami (2013, pp. 96–98) denies that the interpretation of a predicate must *always* be given by the syntactic articulation of the term(s) to which it's applied.

Although that's the base case, Ben-Yami suggests that the notion of articulated reference

³⁰ For a related criticism, see Grimau (2021a, p. 5277).

³¹ Florio and Nicolas wanted to account for cases where order and repetition play a role in the interpretation of a sentence. We aren't concerned with order and repetition as such. Rather, we've carefully developed the notion of a generalized cover in order to account for unordered groupings. In so doing, we've introduced two novelties: first, given the way it's defined (section 3.1), a generalized cover can, as it were, contain sub-covers (section 3.2); second, a cover can play two different roles in the interpretation, bearing either on distribution or on the application-conditions of the predicate (section 3.3). It's an additional virtue of our theory that its formalization has much in common with Florio and Nicolas's notion of indexing.

can be extended to other cases. However, his proposed extensions don't alleviate the problems we've just raised.

First, Ben-Yami considers anaphoric pronouns, like the plural *they* in

(24) The students and their teachers arrived this morning. They met in adjacent rooms. He suggests that an anaphor inherits, not merely a referent, but a way of being articulated, from another term. But this still requires there to be *some* term in the linguistic context which exhibits the supposedly required syntactic articulation. So, he can't secure the correct interpretation of the pronoun *they* in e.g.,

(25) The students and professors from the two disciplines arrived this morning. They met in adjacent rooms.

Second, Ben-Yami considers plural descriptions like *The joint authors of multi-volume treatises on logic*, in which the descriptive material applies, not to any of the individuals denoted, but only to certain pluralities of them (e.g. Russell and Whitehead, and Hilbert and Bernays). He suggests that, because the descriptive material distributes over certain pluralities, the description behaves under predication just like an articulated term whose sub-terms refer to those pluralities. But it isn't clear how this is meant to work, since the articulated term which the description is supposed to mimic needn't actually appear in the linguistic context. Moreover, even if the mechanism at play were more precisely characterized, several kinds of case would still be unaccounted for: those involving context, such as (21); those involving order and repetition, such as (23); and cases like the following.

(26) The flocks of birds landed on adjacent rock-formations.

This sentence can have a structured-plurality distributive reading, e.g. where one flock of birds split into two groups which landed on adjacent rock-formations, and another flock did the same. But how can Ben-Yami account for this? After all, even if we replaced the description, *the flocks of birds* with an appropriately articulated term, *Flock A and Flock B*, we would only have accounted for *part* of the semantically relevant grouping.

Ben-Yami's proposal fails. Despite his attempts at extending the notion of articulated

reference, that notion ties semantically relevant divisions too closely to the syntactic articulation of terms. By contrast, our proposal deals with all the sentences discussed in this section (and more) because, although the intuitively correct cover can be suggested by the syntactic articulation of a term, it may also be provided by something else in the semantics of a noun phrase, or even by something made salient in the context.

6.3 Integrated pluralities

Moltmann (2016, pp. 114–115) proposes that the referents of plural terms be understood as pluralities with context-dependent mereological structure. In a given situation, certain pluralities may be seen as being *integrated*, and other pluralities can be seen as built up from these. Distributive predicates are constrained to distribute over all parts of a plurality, while *part-related predicates* are sensitive to what those integrated parts are like. Consider:

(27) John compared the men, the women and the children. (Modified from Moltmann 2016, p. 112)

By virtue of being a plural definite, the description *the men* makes the plurality of men integrated for the interpretation of the sentence. Similarly for *the women* and *the children*. (27) is true in a situation in which the plurality denoted by *the men, the women and the children* contains integrated pluralities any two of which satisfy the relational predicate *John compared xx with yy*.

The view is sketched in less than two pages, making detailed comparison to our account difficult. But we can make the following points.

Moltmann's proposal is meant to integrate her former work (Moltmann 1997) with plural logic. As a result, it relies on several notions: a non-transitive mereological parthood relation among individual entities and their parts, a (presumably) transitive parthood relation among individuals and pluralities, a notion of *integrated whole* applied to individual entities, a notion of *integrated plurality* applied to pluralities, and a notion of *situation* for the interpretation of a sentence. The proposal is quite complicated, and

it's not clear how these various notions interact.

Relatedly, it's not obvious how the view should be implemented to account for apparently higher levels of predication. As Pianesi (2002, pp. 101–102) notes, the notion of integrated whole isn't given any clear definition: there are a variety of more-or-less precise conditions which an individual entity can meet in order to count as an integrated whole. The notion of integrated plurality seems better in this respect: Moltmann (2016, p. 102) provides only two conditions.

CONDITIONS ON INTEGRATED PLURALITIES PRESENT IN A SITUATION

- (i) Being a maximal plurality of entities standing in relation R to each other and to nothing else.
- (ii) Being a maximal plurality satisfying a property F .

Yet if these conditions are read without some implicit restriction on R or F , then *any* plurality could meet them. So it must be the case that R or F is fixed in the situation, notably when some particular expression like a plural definite is used. It's not clear how this story should be fleshed out.

Consider a case of structured-plurality-distributive predication:

- (5) The philosophy students and their teachers, and the history students and their friends, met in adjacent rooms.

According to Moltmann (2016, p. 114), the predicate *met in adjacent rooms* would distribute over all the integrated pluralities which are parts of the plurality denoted by the subject term. If these integrated pluralities are all those referred to by plural definites, then we don't get the right reading. But if not, Moltmann needs to explain *why*. Moreover, suppose that she can tell a story on which there are only two integrated pluralities in the situation: the philosophy students and their teachers on the one hand, and the history students and their friends on the other. Then distribution targets the right pluralities. But now the predicate *met in adjacent rooms* is applied to each of these two pluralities as a whole. So, again, we don't get the right reading.

A related problem arises with structured-plurality-collective predication.

- (6) The philosophy students and their teachers, and the history students and their enemies, fought on different streets.

As we saw in section 4.3, a correct account of the relevant reading of (6) requires making reference to pluralities at different ‘levels’ – in particular, not only the plurality of the philosophy students and their teachers, but also the plurality of the philosophy students and the plurality of their teachers. By definition, *part-related predicates* are sensitive only to integrated pluralities. So all these pluralities would have to count as integrated parts of the relevant plurality. Again, Moltmann would need to explain *why*. Moreover, even if she can give such an explanation, the result runs counter to her account of distributivity. If a conjunction of integrated pluralities is itself an integrated plurality, then distributive predication would require the predicate to be ‘primitively’ true, not only of the referents of each conjunct, but also of the referents of the conjunction. So, a distributive reading of, e.g., *The philosophy students and their teachers met* would require the collective reading of the sentence to be true as well.

7 Conclusion

Ordinary, first-order plural logic draws a simple distinction between individual-distributive and individual-collective predication. However, it has trouble with other types of plural predication. The classic conception of covers offers an improvement, but only gets as far as accommodating plurality-distributive predication; all other varieties remain troublesome. Our conception of generalized covers can accommodate all of them. Moreover, as we saw in section 6.2, our conception is easily applied to other cases involving order and repetition. Our view is thus a versatile contender in the semantics of ordinary language plural predication, and it should be attractive to those who are wary of superplural resources.

References

- Ben-Yami, Hanoch (2013). Higher-Level Plurals versus Articulated Reference, and an Elaboration of *Salva Veritate*. *dialectica* 67.1, pp. 81–102. DOI: [10.1111/1746-8361.12013](https://doi.org/10.1111/1746-8361.12013).
- Boolos, George (1984). To Be Is to Be a Value of a Variable (or to Be Some Values of Some Variables). *Journal of Philosophy* 81, pp. 430–449. DOI: [jphil198481840](https://doi.org/jphil198481840).
- Champollion, Lucas (2017). Parts of a Whole: Distributivity as a Bridge Between Aspect and Measurement. Oxford: Oxford University Press. DOI: [10.1093/oso/9780198755128.001.0001](https://doi.org/10.1093/oso/9780198755128.001.0001).
- Dever, Josh (1998). Variables. PhD thesis. University of California at Berkeley.
- Florio, Salvatore and Øystein Linnebo (2021). The Many and the One. New York: Oxford University Press. DOI: [10.1093/oso/9780198791522.001.0001](https://doi.org/10.1093/oso/9780198791522.001.0001).
- Florio, Salvatore and David Nicolas (2015). Plural Logic and Sensitivity to Order. *Australasian Journal of Philosophy* 93.3, pp. 444–464. DOI: [10.1080/00048402.2014.963133](https://doi.org/10.1080/00048402.2014.963133).
- Florio, Salvatore and David Nicolas (2021). Plurals and Mereology. *Journal of Philosophical Logic* 50.3, pp. 415–445. DOI: <https://doi.org/10.1007/s10992-020-09570-9>.
- Gillon, Brendan S. (1987). The Readings of Plural Noun Phrases in English. *Linguistics and Philosophy* 10.2, pp. 199–219. DOI: [10.1007/bf00584318](https://doi.org/10.1007/bf00584318).
- Gillon, Brendan S. (1992). Towards a Common Semantics for English Count and Mass Nouns. *Linguistics and Philosophy* 15, pp. 597–639. DOI: [10.1007/bf00628112](https://doi.org/10.1007/bf00628112).
- Grice, Paul (1975). Logic and Conversation. In: *Syntax & Semantics Vol. 3: Speech Acts*. Ed. by Peter Cole and Jerry L. Morgan. New York: Academic Press, pp. 41–58.
- Grimau, Berta (2021a). In Defense of Higher-Level Plural Logic: Drawing Conclusions from Natural Language. *Synthese* 198.6, pp. 5253–5280. DOI: [10.1007/s11229-019-02399-z](https://doi.org/10.1007/s11229-019-02399-z).
- Grimau, Berta (2021b). Structured Plurality Reconsidered. *Journal of Semantics* 38.1, pp. 145–193. DOI: [10.1093/jos/ffaa012](https://doi.org/10.1093/jos/ffaa012).

- Higginbotham, James (1981). Reciprocal Interpretation. *Journal of Linguistic Research* 1, pp. 97–117.
- Incurvati, Luca (2020). *Conceptions of Set and the Foundations of Set Theory*. Cambridge: Cambridge University Press.
- Landman, Fred (1989). Groups I. *Linguistics and Philosophy* 12, pp. 559–605. DOI: [10.1007/bf00627774](https://doi.org/10.1007/bf00627774).
- Link, Godehard (1984). Hydras: On the Logic of Relative Clause Constructions with Multiple Heads. In: *Varieties of Formal Semantics: Proceedings of the Fourth Amsterdam Colloquium*. Ed. by Fred Landman and Frank Veltman. Dordrecht: Foris Publications, pp. 245–257.
- Linnebo, Øystein (2017). Plural Quantification. In: *The Stanford Encyclopedia of Philosophy*. Ed. by Edward N. Zalta. Summer 2017 edition. Stanford, California: Metaphysics Research Lab. URL: <https://plato.stanford.edu/archives/sum2017/entries/plural-quant/>.
- Linnebo, Øystein and David Nicolas (2008). Superplurals in English. *Analysis* 68.3, pp. 186–197. DOI: [10.1093/analys/68.3.186](https://doi.org/10.1093/analys/68.3.186).
- McKay, Thomas J. (2006). *Plural Predication*. Oxford: Oxford University Press. DOI: [10.1093/acprof:oso/9780199278145.001.0001](https://doi.org/10.1093/acprof:oso/9780199278145.001.0001).
- Moltmann, Friederike (1997). *Parts and Wholes in Semantics*. Oxford: Oxford University Press.
- Moltmann, Friederike (2016). Plural Reference and Reference to a Plurality: Linguistic Facts and Semantic Analyses. In: *Unity and Plurality: Logic, Philosophy, and Linguistics*. Ed. by Carrara Massimiliano, Alexandra Arapinis, and Friederike Moltmann. Oxford University Press. DOI: [10.1093/acprof:oso/9780198716327.003.0006](https://doi.org/10.1093/acprof:oso/9780198716327.003.0006).
- Nicolas, David and Jonathan D. Payton (Forthcoming). Collective Nouns and the Distribution Problem. *Synthese*.
- Oliver, Alex and Timothy Smiley (2001). Strategies for a Logic of Plurals. *Philosophical Quarterly* 51, pp. 289–306. DOI: [10.1111/1467-9213.t01-1-00230](https://doi.org/10.1111/1467-9213.t01-1-00230).

- Oliver, Alex and Timothy Smiley (2016). *Plural Logic: Second Edition, Revised and Enlarged*. Oxford: Oxford University Press. DOI: [10.1093/acprof:oso/9780198744382.001.0001](https://doi.org/10.1093/acprof:oso/9780198744382.001.0001).
- Payton, Jonathan D. (2021). Composition as Identity, Now with all the Pluralities You Could Want. *Synthese* 199, pp. 8047–8068. DOI: [10.1007/s11229-021-03152-1](https://doi.org/10.1007/s11229-021-03152-1).
- Payton, Jonathan D. (Forthcoming). From Singular to Plural... and Beyond? *Philosophy and Phenomenological Research*.
- Pianesi, Fabio (2002). Review of Friederike Moltmann, *Parts and Wholes in Semantics*. *Linguistics and Philosophy* 25 (1), pp. 97–120. DOI: [10.1023/A:1014347214919](https://doi.org/10.1023/A:1014347214919).
- Rawls, John (1971). *A Theory of Justice*. Cambridge: Harvard University Press.
- Rayo, Agustín (2002). Word and Objects. *Noûs* 36, pp. 436–464. DOI: [10.1111/1468-0068.00379](https://doi.org/10.1111/1468-0068.00379).
- Rayo, Agustín (2006). Beyond Plurals. In: *Absolute Generality*. Ed. by Agustín Rayo and Gabriel Uzquiano. Oxford: Oxford University Press, pp. 220–254.
- Scha, Remko (2012). Collections and Paradox. In: *The Dynamic, Inquisitive, and Visionary Life of ϕ , $?\phi$, and $\diamond\phi$. A Festschrift for Jeroen Groenendijk, Martin Stokhof, and Frank Veltman*. Ed. by Maria Aloni, Michael Franke, and Floris Roelofsen. Amsterdam: UvA/ILLC.
- Schwarzschild, Roger (1996). *Pluralities*. Dordrecht: Kluwer Academic Press. DOI: [10.1007/978-94-017-2704-4](https://doi.org/10.1007/978-94-017-2704-4).
- Simons, Peter (1982). Number and Manifolds. In: *Parts and Moments: Studies in Logic and Formal Ontology*. Ed. by Barry Smith. Philosophia Verlag, pp. 160–198.
- Simons, Peter (2016). The Ontology and Logic of Higher-Order Multitudes. In: *Unity and Plurality: Logic, Philosophy, and Linguistics*. Ed. by Massimiliano Carrara, Alexandra Arapinis, and Friederike Moltmann. Oxford University Press. DOI: [10.1093/acprof:oso/9780198716327.003.0004](https://doi.org/10.1093/acprof:oso/9780198716327.003.0004).
- Uzquiano, Gabriel (2004). Plurals and Simples. *The Monist* 87.3, pp. 429–451. DOI: [10.5840/monist200487324](https://doi.org/10.5840/monist200487324).

Winter, Yoad (2018). Symmetric Predicates and the Semantics of Reciprocal Alternations.

Semantics and Pragmatics 11.1, pp. 163–190. DOI: [10.3765/sp.11.1](https://doi.org/10.3765/sp.11.1).

Yi, Byeong-Uk (2005). The Logic and Meaning of Plurals. Part I. *Journal of Philosophical*

Logic 34, pp. 459–506. DOI: [10.1007/s10992-005-0560-9](https://doi.org/10.1007/s10992-005-0560-9).

Yi, Byeong-Uk (2006). The Logic and Meaning of Plurals. Part II. *Journal of Philosophical*

Logic 35, pp. 239–288. DOI: [10.1007/s10992-005-9015-6](https://doi.org/10.1007/s10992-005-9015-6).

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