**Higher-Level Plurality in Natural Language**

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It is uncontroversial that definite plurals in natural language stand for pluralities and permit predicates that are inherently distributive as in (1a) as well as predicates that can apply both collectively or distributively, as in (1b):

(1) a. The stones are grey.

 b. The stones are heavy.

There are different views, though, concerning such pluralities. On one view, pluralities are identified with mereological sums or fusions of individuals or with sets. A general difficulty for that view is its failure to distinguish what is ‘one’ (a sum) from what is ‘many’ (a plurality ‘as many’). On another view, increasingly favored by philosophical logicians, definite plurals stand for pluralities ‘as many’. This is generally cast in terms of plural reference: a definite plural such as *the stones* stands for each stone at once. Formally, the view is that of plural logic, a logic that contains besides individual variables ‘x’, ‘y’, … plural variables ‘xx’, ‘yy’, …, which can stand for several individuals at once. I myself will adopt the view of plural reference, though without limiting myself to first-order plural logic.

 More controversial than the semantics of simple plurals as in (1) is the apparent ability for plural noun phrases to denote higher-level pluralities or structured pluralities, pluralities consisting of pluralities. Thus, the conjunction of definite plurals in (2a) seems to stand for second-level plurality, the plurality consisting of the plurality of the students and of the plurality of the teachers, and the conjunction of four definite NPs (2b), on one reading, seems to stand for a third-level plurality, a plurality consisting of two second-level pluralities:

(2) a. The students and the teachers came together (to discuss a new schedule).

 b. The fathers and the sons and the mothers and the daughters had similar problems with

 each other.

On a collective reading, the predicate *came together* in (2a) applies to a second-level plurality consisting of the two pluralities of the students and of the teachers, and *had similar problems with each other* in (2b) applies to the plurality of two pluralities, one of which consists of the plurality of the fathers and the sons, the other of the plurality of the mothers and the daughters. NPs apparently standing for higher-level pluralities have also been called superplurals (Rayo 2006).

 Some scholars have argued that, despite appearances, natural language does not in fact involve higher-level pluralities and thus does not actually display superplurals (McKay 2006, Linnebo 2017), while others (Moltmann 1997, Grimau 2021a, b, Ban-Hami 2013, Linnebo and Nicolas 2008, Oliver and Smiley 2016) have maintained the view that natural language does permit reference to second-level and even third-level pluralities. Most recently, Nicolas and Payton (to appear) have argued that the appearance of superplurals can be analysed away in terms of first-order plural logic, by making use of contextually given covers associated with the application of plural predicates. In what follows, I will argue that such an analysis fails for a range of reasons, most importantly because it is inapplicable to attributively understood plurals and to plural noun modifiers such as collective relative clauses. I will also provide further evidence that natural language in fact does involve higher-level plurality. This is not surprising since higher-order pluralities are entirely expected given basic assumptions about collective predicates and plural descriptions, as Oliver and Smiley (2016, 275ff) have pointed out. I will propose a novel analysis of higher-level pluralities in terms of pragmatically enriched plural descriptions, making use of an ‘ontology’ of higher-level multitudes (Simons 2016).

**1. Predicates of higher-level pluralities**

I will start with a few preliminaries. I will make use of the resources of plural logic for translating sentence of English. Thus, xx’, ‘yy’ , … will be first-level plural variables, ‘xxx’ second level plural variables etc. ‘aa’, ‘bb’, … will be a first level plural parameters, ‘aaa’, ‘bbb’, … second level plural parameters. Moreover, there will be a two-place operator + forming a plural term from individual parameters, such that a+b is the term standing for what ‘a’ stands and for what ‘b’ stands at once. I will take ‘+’ to also be applicable to plural terms, forming higher-level plurality terms. Thus, ‘aa+bb’ will be a term that stands for what ‘aa’ stands for and what ‘bb’ stands for at once. In addition, there will be an operator ∪ of union, which serves to flatten higher-level pluralities. That is, ‘aa∪bb’ is a term that refers to each individual that ‘aa’ refers to or that ‘bb’ refers to at once.

 Concerning the choice between distributive and collective interpretations of predicates like *heavy*, there are three options: first, the predicate is polysemous between a collective and a distributive interpretation; second, the distributive interpretation is due to an implicit distributive operator in the sentence (Link 1983 and others following him); third, the predicate has a disjunctive meaning, one disjunct representing a collective reading and the other a distributive interpretation (Moltmann 1997).[[1]](#footnote-1) One strong argument in favor of the first two options is that it depends on whether the speaker intends the predicate to be understood collectively or distributively. I will adopt a view that is in between the first and second option, by taking the distributive interpretation to be due to a modifier applying to the verb only. The reason for that is that a distributive operator does not generally allow for a narrow scope interpretation of another (true) quantifier in the sentence (*The students discovered exactly one mistake*.) This means that distributive interpretations are to be associated with a different predicate or a predicate associated with a distributive modifier I(P). Thus (3a) on a collective interpretation is represented as in (3b) and on a distributive interpretation as in (3c):

(3) a. The stones are heavy.

 b. heavy(aa)

 c. (I(heavy))(aa)

Given plural logic, on a collective interpretation, *heavy* applies to all the stones at once to yield truth; on a distributive interpretation, it applies to each individual stone:

(4) a. For a plurality xx, H is true of the xx iff H is true of all the xx at once.

 b. For a plurality xx, I(H) is true of the xx iff H is true of each individual among the xx.

 As is familiar, collective predicates such as *gather* may apply distributively as well, applying to relevant (contextually given) subpluralities, as in the example below, in a situation in which the students at different universities gathered (at their universities):

(5) The students gathered.

 There are various types of predicates that appear to act as predicates of higher-level pluralities. The most discussed examples are those with conjunctions of definite plural NPs (Ben-Hami 2013, Grimau 2021a, b). Let us focus on the following examples, discussed by Nicolas and Payton (to appear):

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

 b. The square things, the blue things, and the wooden things overlap.

 c. The French students, the German students, and the Hungarian students played a game.

 d. The philosophy students and their teachers and the history students their teachers fought

 (with each other) on different streets.

The examples in (6) have a plurality distributive reading (on which the predicate distributes over pluralities denoted by the conjuncts) as well as a plurality collective reading, on which the predicate holds collectively of the pluralities denoted by the conjuncts. It is the second reading that is of particular interest since it seems to involve second-level plurality.

 (6d) has a third-level plurality reading on a reading on which the philosophy teacher-student fightings took place on a different street than the history student-teacher fightings.

Another sentence permitting a third-level plurality readings is this:

(7) The fathers and the sons and the mothers and the daughters have similar problems with

 each other.

On a collective reading of the predicate in (7), *similar* compares the father son- problems to the mother daughter problems.

 Conjunctions of definite NPs are not the only constructions that enable higher-level plurality readings, though. Noun modifiers may have that same effect as in the example from Oliver and Smiley (2016):

(8) the joint authors of treatises on logic (Russell and Whitehead, Hilbert and Bernays)

I will discuss the challenge imposed by such constructions shortly.

**3. Problems with analysing superplurals away**

Nicolas and Payton (to appear) analyse the examples trying to do away with higher-level plurality. First, they assume that plural NPs always stand for first-order pluralities They then propose analyses of individual predicates on which a plural predicate applies to the plurality aa denoted by the NP relative to a contextually given cover C, a function mapping the plurality *aa* and an index *i* in a set *I* to subpluralities of *aa*. Here are the application conditions of the predicates of (6a), (6b), and (6c) that are proposed:

(9) a. Application conditions for *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 *𝑟𝑖* such that*𝛿*(*𝑎𝑎,𝑖*) met in *𝑟𝑖*;

 (ii) any such rooms *𝑟𝑖* and *𝑟𝑗* are adjacent to one another.

 b. Application Conditions for *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*𝛿*(*𝑎𝑎,𝑖*).

 c. 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:

(i) *𝑒* is a game;

 (ii) for any indices *𝑖* and *𝑗*,*𝛿*(*𝑎𝑎,𝑖*) played against*𝛿*(*𝑎𝑎, 𝑗*) in *𝑒*.

 d. Application conditions for *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 *𝑠𝑖* such that*𝛿*(*𝑎𝑎,𝑖*) fought on *𝑠𝑖*;

 (ii) any such streets *𝑠𝑖* and *𝑠𝑗* are distinct;

 (iii) for any things *𝑥𝑥* and *𝑦𝑦* and indices *𝑖*, *𝑗*, and *𝑘*, if *𝑥𝑥* = *𝛿*(*𝑗,𝛿*(*𝑖,𝑎𝑎*)) and *𝑦𝑦* =

 *𝛿*(*𝑘,𝛿*(*𝑖,𝑎𝑎*)), then *𝑥𝑥* fought against *𝑦𝑦*.

The general idea of doing away with higher-level pluralities through such application conditions is that predicates are able to select and then possibly connect first-level pluralities from the cover, rather than applying to a higher-level plurality denoted by the NP in question. The cover depends on the speaker’s intentions, and may match the choice of the structure of a particular plural, but as a matter of pragmatics not semantics.

 Nicolas and Payton’s overall conclusion is that first-order plural logic suffices for the semantics of plurals in natural language. Their proposal consists in case-by-case paraphrases of predicates, and thus does not offer an account of potential plural predicates in general, as they admit.

 Aside from that issue, there are a number of serious problems for the proposal, which I will call the ‘reductive analysis’. The first problem is that plurals, including apparent superplurals, allow for attributive uses, which means uses on which a definite plural stands for whatever satisfies its description in a circumstance of evaluation. On such a use, a speaker need not have a particular individual or plurality in mind, and in particular the plural NP will not be evaluated with respect to a fixed domain.[[2]](#footnote-2) Attributive uses are particularly apparent in generic sentences such as (10), which can naturally be understood as general statement about office distribution to whoever the professors and students at the university may be at a given time:

(10) The professors and the students have their offices in different buildings.

Likewise, (11) can be understood as a general statement about students at the two universities, whoever they may be at a given time or circumstance:

(11) The students at the two universities play sports together.

If (11) is true, then any two pluralities of students studying at the two universities whoever they may be at a given time will play sports together.

 Attributive readings are possible even without explicit descriptive material identifying divisions at a particular time:

(12) a. Every year the students play sports together.

 b. The students must take different exams.

(12a, b) can be used having the students at two different universities in mind, whoever they may be in the particular circumstances of evaluation. On an attributive use, the plural description is meant to apply to whatever the domain of entities may be in the circumstances of evaluation.

 Attributive uses are also apparent in quatificational and modal contexts in which a plural describing a higher-level plurality is used, as below:

(13) a. The students and the teachers always have offices in different buildings.

 b. The students and the teachers should not have offices in different buildings.

 c. The students of these two universities have to take exams on different days.

What this means is that a plural predicate cannot generally apply just to a particular contextually given cover. Rather it applies to whatever cover or higher-level plurality is identified in a particular circumstance of evaluation by the description that is used or that the speaker has in mind.

 Higher-order pluralities do not require definites, but may also be involved in conjoined bare plurals in generic sentences, as below (Moltmann 1997, p. 99):

(14) Father and sons and mothers and daughters have similar problems with each other.

The problem of attributive uses is a problem that affects a great range of proposals regarding plurals, all those that make use of a fixed domain with a contextually given division or a cover (Schwarzschild 1996, Gillon 1987) or of a particular resource or reference situation for the evaluation of an NP (Moltmann 1997).[[3]](#footnote-3)

 The second problem with the reductive analysis is that the issue of higher-level plurality does not just arise with a predicate applying to a subject or object referent. It also arises in the compositional semantics of complex plural NPs. In such a case, the analysis is simply inapplicable. Let us go through various cases.

 First, the problem arises for plural predicates when forming restrictive plural relative clauses:

(15) a. The students that shared a room studied together.

 b. The people that have the same name were not listed separately.

 c. the boys that jointly solved the puzzle (Oliver and Smiley 2016, p. 275)

 d. the numbers whose product is 12 (Oliver and Smiley 2016, p. 275)

There are two readings of *the student that share a room*. On one reading, the NP stands for the unique plurality of people that share a room. On the second reading, it stands for the maximal second-level plurality of pluralities of people that share a room. The first reading presupposes the uniqueness of a single plurality of people sharing a room. The first reading is appropriately formalized by a iota operator binding a plural variable as in (16a); following Oliver and Smiley (2016), I will formalize the second reading as a plurally exhaustive description using the colon operator, which binds a second-level plural variable, as in (16b):

(16) a. ιxx[student(xx) & share a room(xx)]

 b. xxx: students(xx) & share a room(xx)

The second reading is the relevant one since on that reading the plural NP denotes a second-level plurality.

 The second-level pluralities denoted by plurally exhaustive descriptions may consist of subpluralities that are integrated wholes (maximal pluralities sharing a room), in the situation of reference.[[4]](#footnote-4) However, that would not necessarily be the case given the formalization in (16b). (16b) could stand for the plurality of pluralities of students that share a room, whether these are maximal pluralities sharing a room or not. That seems, intuitively, correct. It is thus the simple presence of a collective predicate in the relative clause that gives rise to a second-level plurality. This highlights the source of pluralities: pluralities, including higher-level pluralities, are due to the existence of (collective) plural properties and exhaustive plural descriptions. The application of a collective plural predicate makes available a plurality as well as subpluralities of second-level pluralities, and for that maximality itself is not required.

 Clearly, collective relative clauses do not apply with respect to a contextually given cover, to which the predicate of the entire sentence would then also apply. Rather, on a distributive reading, collective relative clauses themselves define a second-level plurality. Semantically, collective relative clauses involve predicate modification: intersection of the noun denotation with the relative-clause denotation, rather than application of the relative clause to a given contextual cover. Contextual restrictions involving a contextual cover could only apply after the composition of the denotation of the second-level NP, not before.

 The fact that relative clauses may denote properties of higher-level pluralities means that there are no longer reasons to prevent collective main predicates from applying to higher-level pluralities. The latter are made available by a collective relative clause modifier of the NP.

 Not only plural relative clauses can lead to higher-level pluralities, but also other noun modifiers:

(17) a. the joint authors of treatises on logic (Russell and Frege, and Hilbert and Bernays)

 (Oliver and Smiley 2016)

 b. John compared the students at the various schools. (Moltmann 1997, p. 100)

 c. The students in the two departments are competing with each other. (Moltmann 1997,

 p. 100)

 In fact, nouns such as *twin* and *parent* themselves may set up higher-level pluralities (as well as compounds formed with nouns like *twin* such as *twin cities, twin towers, twin primes*):[[5]](#footnote-5)

(18) a. John listed the twins in this school.

 b. John compared the parents and found that the younger ones had different ideas from

 the older ones.

(18) has several readings, the unique-plurality description reading, a reading on which John compared twins *aa* to twins *bb* for the various the twins in the school and a reading on which John compared individual twin a to individual two b, for all the twins ab in the school. If *the twins in this school* is taken to uniformly denote a second-level plurality, as in (19b), then in the latter case, distributivity applies twice. This means that the distributive operator can be iterated so that I(I(P)) applies as in (19b), where η is the membership relation holding between individuals and pluralities or pluralities and higher-level pluralities:

(19) a. xxx: twin(xx) & in(xx, this school)

 b. For a plurality xxx, and a predicate P, I(I(P))is true of xxx iff for every xx, xx η xxx

 and every x, x η xx, P is true of x.

Natural language also permits third-level pluralities. These are particularly straightforward with complex conjunctions of plural NPs:

(20) The mothers and the daughters and the fathers and the sons have similar problems with

 each other.

*Each other* in (20) relates to the two second-level pluralities, and *similar* to the third-level plurality.

 Third-level pluralities are possible also with plural relative clauses, though. Thus, (21) may refer to the very same third-level plurality as the subject of (20):[[6]](#footnote-6)

(21) the relatives that have similar problems with each other

Here are more examples:

(22) a. the parents that have the same number of children

 b. the colleagues that collaborate in adjacent rooms

On a third-level plurality reading, (22a) stands for the plurality *aaa* of pluralitiesof parentssuch that any (two) parents *aa* among *aaa* have the same number of children as any parents *bb* among *aaa*. Similarly, (22b) would refer to a third-level plurality consisting of pluralities *aaa* and *bbb* of collaborating pluralities of colleagues, so that the collaborations among *aaa* and among *bbb* take place in adjacent rooms. The third-level plurality readings of (22a, b) are not easy to get, yet available.

 A third problem for the reductive analysis is the semantics of *among,* which is briefly discussedby Oliver and Smiley (2016, p. 277). *Among* takes first-level and second-level plural NPs as complements. In the first case, *among*-phrases are predicates of individuals; in the second case, they are predicates of pluralities of at least two:

(23) a. John was among the student protesters.

 b. John and Mary are among the twins of the orphanage.

 c. Russel and Whitehead are among the philosophers that coauthored a book.

For the reductive analysis, *among* would just apply to first-level pluralities even in cases such as (23b). This wrongly predicts the acceptability (24a, b):

(24) a. ??? John is among the twins of this orphanage.

 b. ??? Russell is among the philosophers that co-authored a book.

*Among* applies to second level pluralities and in that case among-phrases apply to first-level pluralities, not individuals. That is, we have either ‘among(x, xx)’ or ‘among(xx, xxx)’, for individuals x, pluralities xx, or second-level pluralities xx.[[7]](#footnote-7)

 There is a fourth difficulty for the reductive analysis and that is concerns adverbial modifiers of plural events:

(25) The boys and the girls danced in similar ways.

(25) has a natural reading on which *in similar ways* compared the plurality of individual dancings by the boys to the plurality of the individual dancings of the girls. Those two event pluralities in fact should make up the Davidsonian event argument position of *danced* in (25). *Similar ways* thus applies to a second-level plurality of events. For Nicolas and Payton (to appear) *danced in similar ways* would apply relative to a contextual cover to a first-level plurality of events. But a Davidsonian plural event is existentially quantified over, and thus does not constitute a particular domain to which a pragmatically determined cover could apply. The reductive analysis faces the very same issue of higher-level pluralities with events, and those do not form a given domain for which the speaker may intend the one or the other cover. Thus, even if predication of plural subjects could be dealt with in terms of first-order plural logic, higher-level plurality issues reappear within the domain of events, in the application of adverbial predicates.

 An event plurality to which adverbial plural modifiers apply rather comes with a structure imposed by participants and complex modifiers. It is that structure that relational adjectives such as *similar* in (25) may make reference to. This is in fact just the analysis of relational adjectives proposed by Carlson (1987) and Moltmann (1992), namely on which relational adjectives involve implicit quantification over event parts as determined by plural participants and conjunctive adverbial modifiers.

 Let us summarize. Higher-level plurality in natural language appears irreducible. This in fact follows simply from the existence of plural properties together with one of the meaning of the definite determiner, as the colon operator able to bind a plural variable: together they automatically generate higher-level pluralities as denotations. Descriptions of higher-level pluralities are the joint result of plural descriptions and collective predicates on a distributive reading. This means that arguing against higher-level plurality would thus require arguing against one of its sources (which is not what Nicolas and Payton do).

 Note that plural descriptions could not apply on a non-distributive application of a collective predicate:

(26) the students that had gathered in protest

There may be different gatherings of different groups of students, hence the description in (26) would not be complete, unlike a description on which *gather* is understood collectively.

**4. Outline of a higher-level plurality approach**

On the approach of plural reference and plural logic, pluralities are just the entities simultaneously denoted by a plural noun phrase. Higher-level pluralities, moreover, are the pluralities denoted by plural noun phrases restricted by collective predicates on a distributive reading. Pluralities and higher-level pluralities thus are connected to the use of plural terms and collective predicates. But, while keeping that in mind, they can also be viewed ontologically, as ‘multitudes’ subject on various axioms on their existence, identity and relations among each other (Simons 2016). Simons takes multitudes to comprise individuals and pluralities of at least two individuals. The membership relation η among multitudes is taken to be a reflexive, antisymmetric and to satisfy supplementation and extensionality. Higher-level multitudes have pluralities as members that are distinct from themselves. Thus, the multitude *a b ab* has *a, b, ab,* and *a b ab* as members and thus will be distinct from the multitude *ab*. Instead of writing *ab* for the multitude that has a, b, and ab as members, I will also write a+b, with the understanding that a+b is not an entity beyond a and b themselves. a+b will be distinct from (a+b)+a, which has a, a+b, and (a+b)+a as members. There is another operation of union of multitudes ∪. Thus, a+b will be the union of (a+b)+a (∪((a+b)+a)).

 Let us then turn to the formal semantics of higher-level plurality terms. Together with much of the literature, I take the division relative to which a definite plural is evaluated to be dependent on speaker’s intentions, but not as a cover of an actual plurality in a given domain, but as a description of a higher-level plurality that may have as its extension different structured pluralities in different circumstances.

 There are constraints on the plural properties making up descriptions of such higher-level pluralities. It appears that the plural properties coming from the nonlinguistic context are generally properties of integrated wholes. For the semantics of plurals only very simple, definable notion of integrated whole are needed, namely the notion of a maximally self-connected plurality of things (R-integrated whole), a maximal plurality of this sharing a property (FF-integrated whole), and a maximal plurality of things standing in a relevant relation to another entity (R(a)-integrated whole). Below the notions are defined for first-order pluralities only:[[8]](#footnote-8)

(27) a. R-integrated whole.

 For the transitive closure Rtrans of a non-formal relation R, a plurality aa is an

 R-integrated whole (R-INT(aa)) iff for any a, a’, a η aa, a’ η aa, Rtrans(a, a’).

 b. FF-integrated whole

 An FF-integrated whole is an R-integrated whole for a non-formal property F, where

 FF(x, y) iff F(x) and F(y).

 c. R(a)-integrated whole

 For an individual a and a two-place non-formal relation R, a plurality aa is an R(a)-

 integrated whole iff aa is an FF-integrated whole, for F = λxR(x, a).

Consider:

(28) The students gathered.

Students at different locations may have gathered in proximity, students sharing particular political view, or students of particular disciplines may have gathered. In such a case, if R is the relevant relation defining maximal connectedness, the plurally exhaustive descriptive description of the integrated pluralities will be:

(29) xxx; R-INT(xx)

If the plurality is determined by the construction, then the notion of an integrated wholes does not seem to play the same role. Let us consider (30), on the third-level plurality reading:

(30) The mothers and the daughters and the fathers and the sons have similar problems.

On a second-level plurality reading, the predicate applies to a plurality of four pluralities, each of which would in fact be an FF-integrated whole in the situation encoding the descriptive content of the NP: ‘the mothers’ forms an FF-integrated whole with respect to the property of being a mother etc. On a third-level plurality reading, ‘the mothers and the daughters’ form one of two subpluralities. As suggested by Moltmann (1997, p. 178), there is a way of conceiving of it as an integrated whole in the situation carrying the information given by the NP, namely if the property λxx[mothers and daughters(xx)]], on a non-Boolean interpretation of *and,* were allowed to form an FF-integrated whole (possibly based on a syntactic ambiguity).[[9]](#footnote-9) Without elaborating the suggestion in detail, on this reading, the description takes the following logical form, with the semantics of non-Boolean *and* as in (31b):

(31) a. (xx: mothers and daughters(xx)) + (xx: father and sons(xx))

 b. For first-level plural predicates P and Q, and(P, Q) = λxx[∃yy∃zz(P(yy) & Q(zz) &

 xx = yy ∪ zz)]

However, it appears that descriptive content and maximality are not actually what enables higher-level plurality readings of (30). If it did, then (32), which involves the same descriptive content, should just as easily permit a higher-level plurality reading, which it does not:

(32) The mothers, daughters, fathers, and sons have similar problems.

Similarly, (33a) is rather restricted to a second-level interpretation on which the students form one subplurality and the teachers another, in contrast to (33b), which allows for various contextually determined cover-readings:

(33) a. The students and the teachers know each other.

 b. The students and teachers know each other.

In examples (30) and (33a) the first-level pluralities are distinguished not so much by being described as FF-integrated wholes, but because they are the denotations of definite NPs from which second-level and third-level pluralities can be built compositionally. This involves interpreting *and* applied to definite NPs by ‘+’, as in the analysis below, a description that, relativized to a time and a world, will permit attributive uses:

(34) (xx: mother(x)) + yy: daughter(y))) + (xx: father(x) + yy: son(y))

 The availability of a third-level plurality in (35) raises the question whether conjunctions of conjunctions of definite NPs are always interpreted as third-level pluralities. Certainly, first-level plural predicates, on a collective or distributive reading, are applicable to the pluralities that such complex conjunctions denote:

(35) The father and the sons and the mothers and the daughters live in this house.

There are two options of dealing with that. First, *and* applied to definite plural NPs may be considered polysemous between standing multitude composition + and multitude fusion ∪. Second, predicates may be sub-distributive. Given that the latter is needed anyway, it appears to present a better option.

 There are also cases when a complex plural description may be enriched by contextual information, as below:

(36) The students and the teachers gathered.

(37) can be understood as being about the students and teachers at different universities gathering (at their universities). I take this to be part of the general possibility of contextually enriching incomplete attributively used descriptions. Thus, the logical form of (36) would be of the following sort, for contextually given universities *ab*:

(37) a. the students (at ab) and the teachers (at ab)

 b. (xxx: students(xx) & AT(xx, ab)) + (xxx: teachers(xx) & AT(xx, ab))

 Finally, we can turn to special higher-level plural quantifiers:

(38) John forgot two things, the clothes and the shoes.

*Two things* here quantifies over pluralities as single things. There are two possible accounts for why this is possible. The first option, discussed in Oliver and Smiley (2016), is that pluralities in general can be viewed both as many and as one.[[10]](#footnote-10) The second option is that *two things* carries a reifying force, say due to the occurrence of *-thing*, which permits mapping a multitude onto a single ‘thing-correlate’.[[11]](#footnote-11) On either view, *the clothes and the shoes* will stand for a second-level plurality.

 On a view on which *the clothes* *and* *the shoes* stands for first-level pluralities, it is a mystery how *two things* should be able to pick out just the two pluralities of the clothes and the shoes. It is noteworthy in that respect that *two things* cannot pick out contextually individuated subpluralities (??? *John remembered two things, the objects on the table*, ?? *John forgot two things, the contents of the (two) boxes*). Clearly, this means that ‘the clothes’ and ‘the shoes’ do not act as the only subpluralities as a matter of a contextually individuated cover. Rather a second-level plurality goes along with the compositional semantics of *the clothes and the shoes*, where *and* is interpreted by multitude composition + applying to the pluralities denoted by the conjuncts.

**5. Conclusions**

Despite some recent attempts to do away with higher-level pluralities, higher-level plurality appears to be an unreducible part of the semantics of natural language. While the phenomenon has mostly been discussed for conjunctions of definite plurals, the most convincing case actually consist in plural NPs with collective relative clauses or other modifiers on a plurally exhaustive interpretation. The appearance of higher-level pluralities with that construction simply follows from basic assumptions regarding the semantics of collective predicates and plural definites. Higher-level plural logic is much less explored than first-level plural logic and raises considerable challenges, but this of course is not a reason why higher-level pluralities should not part of the semantics of natural language.

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1. Moltmann (1997)’s argument for that view comes from the possibility or disjunctive adverbial modifiers such as ‘individually or together’, as in *They lifted the box individually or together.* I will set aside a discussion of that argument. [↑](#footnote-ref-1)
2. The problem of attributive uses for cover-based approaches to plurals was noted in Moltmann (2016), in reference to Soames (1990). Soames (1990) argued against the use of resource situations for an account of incomplete definite descriptions. He notes that incomplete descriptions allow for attributive readings, which cannot be accounted by recourse to the resource situations with their fixed domains. [↑](#footnote-ref-2)
3. Within a situation-based approach, Moltmann (2016) proposes an account of attributively used definite plurals in terms of types of situations. [↑](#footnote-ref-3)
4. Moltmann (1997, p. 110) gives examples with plural quantifiers where plural relative clauses seem to just apply to integrated wholes (maximal pluralities sharing a property or relating to a given individual):

(i) a. All students who are roommates share a bathroom.

 b. All students who had the same hobby formed a club.

 c. All children who were the same age did not fit into one car.

One may attribute the maximality effect to a contextual restriction associated with quantification, since maximality does not seem part of the understanding of plural relative clauses. [↑](#footnote-ref-4)
5. *Twin* and *parent* seems to make a better case for plural nouns able to stand for second-level pluralities than nouns like *couple*. That is because *twins* and parents are clearly plural and can only be used as plural, unlike nouns like *couple*. This seems to hold even crosslinguistically (French *jumelles*, parents, German *Zwillinge*, *Eltern*). *Twins* and *parents* are particularly suited for forming superplurals by being restricted to pluralities of exactly two [↑](#footnote-ref-5)
6. Third-level plurality seems to generally involve relational adjectives such as *similar*. This should not be surprising if relational adjectives involve a bipartite semantic structure, on which (ia) is first interpreted as in (ib), where *each other* involves quantification over the parts of ‘the students’ and over the ‘the teachers’ and subsequently as in (ic), where *similar* involves quantification over the parts of ‘the problems of the students and the teachers’, that is the problems of the students and the problems of the teachers:

(i) a. The students and the teachers have similar problems with each other.

 b. The students and the teachers have problems with each other. (distributive reading)

 c. The problems (of the students and of the students) are similar.

An analysis along these lines has been proposed by Moltmann (1992), but following Carlson (1987) that analysis of relational adjectives takes them to always quantify over parts of plural events and hence is not applicable to noun modifiers as in *the people with the same problems* and presumable (ia) neither (given that *have* is not likely to involve event arguments). [↑](#footnote-ref-6)
7. *Among* also takes third-level pluralities:

(i) a. John’s parents and Bill’s parents are among the parents that have known each other for a long time. [↑](#footnote-ref-7)
8. See Simons (1987) for the notion of an R-integrated and FF-integrated whole and Moltmann (1997) for the application of the notions to the semantics of plurals. [↑](#footnote-ref-8)
9. Nicolas and Payton claim that the third-level plurality reading would be impossible to account for on the integrity-based approach to higher-level plurality of Moltmann (1997, 2016). This is obviously false, given the way it is addressed in Moltmann (1997). [↑](#footnote-ref-9)
10. Oliver and Smiley (2016, p. 274) cite Russell’s (1903, §490) comment on classes for that view: ‘Although a class is many and not one, yet there is identity and diversity among classes, and thus classes cannot be counted as though each were a genuine unity; and in that sense we can speak of one class and of the classes which are members of a class of classes.’ [↑](#footnote-ref-10)
11. For such a suggestion about the noun *-thing* see Moltmann (2022). [↑](#footnote-ref-11)