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► **To cite this version:**

Alda Mari. A NOTE ON GENERIC QUANTIFICATION AND THE ONTOLOGY OF 'TWINS' AND 'BIKINI'. Recherches Linguistiques de Vincennes, 2012. ijn_02161805

HAL Id: ijn_02161805

https://hal.science/ijn_02161805

Submitted on 21 Jun 2019

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**A NOTE ON GENERIC QUANTIFICATION AND THE ONTOLOGY OF ‘TWINS’
AND ‘BIKINI’**

1. Introduction

It is commonly held that quantification requires a form of ‘individuation’ (see Kratzer, 1995, von Stechow, 2004). This note is concerned with the ontology of the plural individuals denoted by a plural noun like *twins*. Its main goal is to explain what type of object plural nouns like *twins* denote and why, and in what sense, this object qualifies as an ‘individual’. We also explain why plural nouns like *squares* do denote an object that qualifies as an ‘individual’.

Nouns like *twins* have the specificity of being able to be used in ‘des’ indefinite generic sentences, as already noted by Dobrovie-Sorin and Laca (1996) Dobrovie-Sorin and Mari (2007a/b) and Dobrovie-Sorin (2012).

These authors note that while (1a) is a perfectly acceptable sentence, (1b) is not.

- (1) a. Des jumeaux se ressemblent dans les moindres details
‘des’ twins look like each other down to the minor details
 b. *Des carrés ont quatre côtés
‘des’ squares have four sides

We proceed on the assumption that sentence (1a) has a tripartite structure and that the generic unselective quantifier ranges over variables in the restrictor and in the nuclear scope (see Krifka *et al.* 1995).

- (2) GEN (restrictor) [nuclear scope]

Dobrovie-Sorin and Laca (*ibid.*) explained that the values of the variable in the restrictor and in the nuclear scope must be of the same semantic type. In the present case, they must range over plural individuals. According to the authors, *carré* does not provide such a plural individual. The resulting LF for (1b) is shown in (3), where *x* is a variable that ranges over singular individuals, and *X* is a variable that ranges over plural individuals.

- (3) # GEN *x* (carrés (*x*)) [ont quatre côtés (*X*)]

Dobrovie-Sorin and Mari (2007a) elaborate this claim and explain that plural individuals must be of the right sort to be bound by the quantifier, and, in particular, that they have to be ‘groups’ (e.g. *mafia* denotes a group). This view is problematic as not any noun that denotes a group can be used in ‘des’ generic sentences, as shown in (4).

- (4) #Des mafias sont dangereuses
‘Des’ mafias are dangerous.

Dobrovie-Sorin and Mari (2007b) attribute the unacceptability of (1b) to a ban against quantification over domains organized into part-whole structures. Dobrovie-Sorin (2012) elaborates this claim and extends it to mass nouns, a topic which is well beyond the scope of this note. The idea behind this constraint is that a quantifier must quantify over individuals that are ‘distinct’ and explain why nouns like *mafia* do not denote in a domain of ‘distinct’ individuals. As we show later in the paper, the notion of ‘distinctness’ cannot fully capture the data.

In this paper we propose a new view for the notion *individualhood* in connection with what have been labeled ‘inherently plural predicates’ (Hackl, 2002) including nouns like *twins*. We propose that along with sums and groups (Link, 1984; Landman, 1991a/b), the ontology of pluralities contains coordinated wholes (Mari, 2003,2005; Jayez and Mari, 2005).

Coordinated wholes are intensional objects. We explain why nouns like *twins* denote such coordinated wholes and how they qualify as individuals.

Besides challenging the view that ‘distinctness’ is not needed, we also show why the view elaborated here is preferable to the one claiming that nouns like *twins* denote sets of sets (Winter, 2002).

Finally, our account for intensional plural objects also extends to singular scattered objects, as denoted by nouns such as ‘bikini’ (Casati and Varzi, 1999), and covers a larger variety of data than the extensional notion of integrated whole introduced by Simons (1987).

This note is structured as follows. We introduce inherently plural predicates in section 2. We lay down the ontology of pluralities in section 3, introducing coordinated wholes. We explain why Winter’s view cannot account for the data in section 4. In section 5, we propose a new ontological view that builds on the reciprocal account proposed in Hackl (2002), in which inherently plural predicates are claimed to denote objects with intensional properties. In section 6, we compare our intensional view with the extensional views of objecthood and plurality.

2. The basics: inherently plural predicates

2.1. A preliminary note on indefinite plural generic sentences

Plural indefinite generic *des* can be used in four types of generic sentences (see discussion in Heyd, 2002).

1. It can be used when the noun denotes a plural individual (what type of plural individual remains to be specified).

(5) Des jumeaux se ressemblent dans les moindres détails
‘Des’ twins look like each other down to the minor details

2. Its use is felicitous when the subject DP is modified. In this case, a noun like *carré* is admitted.

(6) a. Des carrés bien faits ont quatre côtés
‘Des’ squares well-done have four sides
b. Des chemises blanches sont sexy
Des white skirts are sexy

3. ‘Des’ with an indefinite generic can be used when an overt modality is present.

(7) Des carrés doivent avoir quatre côtés

‘Des’ squares must have four sides

4. ‘Des’ with an indefinite generic can be used with contrastive prosody, as discussed in Mari (2008) and Mari and Martin (2009).

- (8) Des CARRES ont quatre côtés
‘Des’ SQUARES have four sides

According to the view that distinguishes between quantification over individuals and quantification over events (e.g. de Swart, 1991), we assume that (7) involves quantification over events and will not be considered here (see Mari, Beyssade, Del Prete, forthcoming, for discussion).

This note focuses on indefinite generic sentences in which the generic quantifier binds individuals rather than events, and thus considers only the case of non-modified nominals as in (5).

It is also known that modals rescue generic sentences (see Carlier, 1989; Mari, forthcoming) and generic sentences with overt modality are also not studied here. We also do not discuss the cases in which prosody rescue ‘des’ indefinite generic sentences.

A comprehensive theory explaining what all these cases have in common is well beyond the scope of this paper, which focuses on a very limited set of cases.

Let us also make clear that the constraint that we are about to identify holds uniquely for binary quantification and not for existential closure, as revealed by the possibility of using *des* with nouns like *squares* in existential sentences.

- (9) Des carrés sur cette feuille sont rouges
Some squares on this sheet are red

2.2. Specificity of inherently plural predicates

Dobrovie-Sorin and Mari (2007a/b) (D&M7a/b from now on) show that the non-modified nominals that can be used in ‘des’ indefinite generic sentences (DESG from now on) are inherently plural predicates.

The characteristics of inherently plural predicates have been well studied (see, notably, Winter, 2002; Hackl, 2002 and discussion in D&M *ibid.*).

Plural predicates should be distinguished from pluralized individual predicates on the one hand and from genuine collective predicates on the other.

- (10) Pluralized individual predicates: *students, tables, lamps*

Genuine collective predicates: *couple, family, mafia*
 Inherently plural predicates: *twins, next-door-neighbors*

The main feature that genuine collective predicates and inherently plural predicates share is that they are non-cumulative (*pace* Hackl, 2002). In both (11) and (12) the inferences do not go through (see the contrast with (14) below).

- (11) If John and Mary are a couple and
 Paul and Sue are a couple
 # John and Mary and Paul and Sue are a couple
- (12) If John and Mary are twins and
 Paul and Sue are twins
 # John and Mary and Paul and Sue are twins

The main difference between genuine collective predicates and inherently plural predicates is that only the latter are genuinely plural, as the ability to count the members of the plurality denoted by the noun reveals. This difference is stated in (13):

- (13) a. two twins (*two* counts the members of the plurality)
 b. two families (*two* counts the number of pluralities)

Inherently plural predicates are thus truly plural, whereas genuine collective predicates are singularities in disguise (see Link, 1984; Landman, 1989a/b).

Although plural, inherently plural predicates should be distinguished from pluralized individual predicates. Pluralized individual predicates are cumulative.

- (14) If John and Mary are students and
 Paul and Sue are students
 John and Mary and Paul and Sue are students

Inherently plural predicates are non-divisive (*pace* Dobrovie-Sorin, 2012), while pluralized individual predicates are.

- (15) A and B meet
 #A meets
 #B meets
- (16) A and B are students
 A is a student

B is a student

Hackl (*ibid.*) explains what follows. Inherently plural predicates cannot apply to singular individuals. It seems to be impossible for an individual to be a couple, to be numerous etc.

(17) *John is numerous / a couple / twins

However, according to Hackl (*ibid.*), some process of pluralization must derive inherently plural predicates. According to the author, inherently plural predicates are built from relational predicates¹.

While this conclusion does not seem to hold of all inherently plural predicates (e.g. it is not true of *numerous*), it seems correct for the cases at stake here, such as *twins* or *friends*.

(18) John and Sue are friends
 John is friend of Sue
 Sue is friend of John

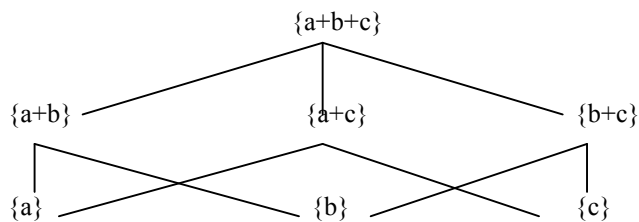
In the ontology that we elaborate, we subscribe to this hypothesis.

3. Ontology and representations

3.1. Introducing coordinated wholes

Following Link (1983), we consider that definite and indefinite plural DPs denote *sums of individuals*. Sums are represented as elements of a join semi-lattice (Scha (1981), Link (1983), Landman (1989a,b)) :

(19)



Pluralized noun phrases (like *cats*) denote sums. Groups are obtained by applying a type shifting operation (\uparrow) to sums.

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Whether relational predicates are themselves inherently plural is a separate question.

(20) $\uparrow(a+b+c)$ is the group whose elements are $\{a\}, \{b\}$ and $\{c\}$

The entity that results from the application of the type shifting operation is a singularity. As a consequence, groups can be the atomic elements of a semi-lattice.

Dobrovie-Sorin (2012) explains that as subsets of the semi-lattice are related by part-whole relations, groups cannot be suitable values for variables bound by binary quantifiers. She asserts that there is a ban against quantification over a domain of overlapping individuals.

As we will see later in the paper, this ban is not entirely justified.

Moreover, the question arises of what type of entities inherently plural predicates denote, and why do they denote individuals that can be bound by a binary quantifier. We label *coordinated wholes* the object denoted by inherently plural predicates. The endeavor of the remainder of this note is to provide a hypothesis for what coordinated wholes are.

The ontology we work with is thus the following.

<i>Types of entities</i>	<i>Types of predicates</i>	<i>Examples</i>
groups	Genuine collective predicates	Mafias, couple, family
sums	Pluralized nouns	Cats, squares, pens
coordinated wholes	Inherently plural predicates	twins

3.2. ‘Des’ and coordinated wholes

We have started from the assumption that quantification requires individuation, in line with much work on the topic and in particular quantification over situations (e.g. von Stechow, 2004; Kratzer, 1995,2007; Dobrovie-Sorin and Mari, 2007a/b). Here we claim that *des* in generic sentences requires the plurality in the denotation of the subject NP to qualify as an individual.

Let us first make clear that the reason why *des* requires a plurality is to avoid competition with the singular indefinite *un*, as in (19).

- (21) Un carré a quatre côtés
A square has four sides

Whenever the generalization is true of singular individuals, *un* is used. *Des* is used whenever the generalization is true of a plurality (Corblin, 1987). The constraint that we are after is that the plurality that the generalization is about must be able to qualify as ‘individual’. That putative ‘individual’ is the one that we have labeled ‘coordinated wholes’.

Before explaining what coordinated wholes are, and why they qualify as individuals, we consider Winter’s (2002) view of inherently plural predicates and the consequences that this theory would lead us to derive in relation with the constraints on the use of DESg. We then propose our own view.

4. First try: sets of sets and the parallelism between individuals and situations

One of the ways to represent the denotation of inherently plural predicates consists of using sets of sets, along the lines of Winter (2002).

Let $A = \{a,b,c,d\}$ be the domain of individuals and le the denotation of *twins* be the following.

$$(22) \llbracket \text{Twins} \rrbracket = \{\{a,b\}, \{c,d\}, \{e,f\}\}$$

This representation seems to provide the right handle to explain why inherently plural predicates provide suitable values for a variable bound by a generic quantifier. To see why this is the case, let us consider the proposal that has been made for quantification over situations, which raises questions similar to those under discussion here.

In relation with quantification over situations, Kratzer develops a notion of exemplification, which captures the idea that a quantifier has to pick out an entity that is of the right ontological sort (see also von Stechow, 2004). Exemplification is defined as follows:

(23) *Exemplification*. A situation s exemplifies a proposition p iff whenever there is a part of s in which p is not true, then s is a minimal situation in which p is true. (Kratzer, 2007/2009)

The entity that exemplifies the proposition at hand is the one that is the value of the variable bound by the relevant quantifier.

In relation with individuals, the idea is that each of the sets in the set of sets (22) provides an entity of the right size to be selected by the quantifier, as it is the minimal entity that exemplifies the property ‘twins’. ‘To be twins’ is not true of any part of each set in the set of sets (on the formal level, this is revealed by the fact that there are no atomic individuals in the denotation of *twins*); it is also not true of sets larger than each of the sets in the set of sets, as it is true of each of the sets in this larger set.

This can be considered the simple answer to our problem: inherently plural predicates provide the type of domain that is needed for the use of the quantifier in indefinite *plural* generic sentences, and this consists of sets of sets.

Is this enough? The answer is no. The question that immediately arises is why should *des* not to be able to ‘extract’ the right entity out of a semi-lattice? That is to say, why is it not able to quantify over those entities that satisfy exactly the same constraints as those in the set of sets in (22)?

5. Second try: relational predicates and coordinated wholes.

Hackl (2002) proposes to build inherently plural predicates from the corresponding relational predicates. The plural *friends* is built from the singular relational *friend of*, plus an operation of reciprocation. The view developed in Hackl is syntactic and the theoretic details are not relevant here. What matters is that in so doing, Hackl (*ibid.*) espouses the view that inherently plural predicates do not denote sets of any sort, but rather are associated with a more complex operation of group formation at the syntactic level.

Mari (2003,2005) and Jayez and Mari (2005) have developed an ontological theory of pluralities that contains not only sums and groups but also coordinated wholes.

The ontological hypothesis we defend here is that inherently plural predicates denote a coordinated whole. These intensional plural individuals qualify as objects, whereas sets formed by sum do not.

We now briefly explain what coordinated wholes are.

5.1 Introducing coordinated wholes

The notion of coordinated whole has been introduced to account for comitative constructions such as

(24) John walks with Mary

With constructions are claimed to be characterized by two features: (1) each of the entities satisfy the property provided by the predicate (each of John and of Mary walks), and (2) there is some form of ‘association’ between them.

To capture this notion of ‘association’, let us use the example of two strangers walking down the street who, by chance, happen to walk side by side. In this case, we would not describe the scene using the preposition *with*.

The major difference between two people randomly walking down the street side by side and two people that can felicitously be described as walking ‘with’ one another is that in the first case, the choice of the same trajectory is purely accidental.

As often noted (see e.g. Jackendoff, 1990; McNally, 1993; Mari, 2003) the notion of *withness* patterns with a notion of coordination, which has to be considered a weaker notion of causation or non-accidentalness.

The account proposed in Mari (2003) and Jayez and Mari (2005) used channel theory (Barwise and Seligman, 1997). Here we propose a simpler view that uses inertial worlds. The basic idea is that two people are said to walk with one another if, provided some notion of *inertia* (Dowty, 1979), whenever one goes in one direction, the other follows the same direction (we do not consider worlds in which one of them gets struck by a truck and thus is obliged to change direction). Let $W = \{w, w', w'', \dots\}$ be the set of worlds and $T = \{t, t', t'', \dots\}$ the set of times. For any $w \in W$ and $t \in T$, $Inr(w, t)$ is a function that returns the inertia worlds of world w fixed at a time t .

We use the symbol \otimes_{descr} to express causal coordination, for a given property *descr*. In the case of (24), letting a and b stand for individual constants, the condition is the following.

$$(25) \quad [[a \otimes_{walk} b]]^{w, t} \text{ iff } \forall w' \in Inr(w, t) \text{ (follow_a_direction}(a, w') \rightarrow \text{follow_a_direction}(b, w'))$$

5.2. Back to ‘twins’

Applying this view to the predicate ‘twins’, and assuming with Hackl (2002) that the description which the plural reciprocal is built from is *be a twin of*, we obtain the following:

$$(26) \quad [[a \otimes_{twin} b]] \text{ iff } \forall w' \in Inr(w, t) \text{ (twin_of}(a, b, w') \rightarrow \text{twin_of}(b, a, w'))$$

This simply states that in inertial worlds, a being a twin of b entails that b be a twin of a . In other terms, it cannot be the case that a be a twin of b and that b is not the twin of a .

The definition for a coordinated whole is the following, where *descr* is a relational predicate constant and *descrs* is the inherently plural predicate constant.

$$(27) \quad [[a \otimes_{descrs} b]] \text{ iff } \forall w' \in Inr(w, t) \text{ (descr}(a, b, w') \rightarrow \text{descr}(b, a, w'))$$

6. Back to ‘des’ and coordinated wholes

6.1 Coordinated wholes vs. sums

With this ontological hypothesis at hand, let us return to the initial question. Why is it the case that with pluralized noun phrases, the generic quantifier cannot pick the minimal set that exemplifies the property, in the way it would be entitled to do with sets of sets?

Our answer builds on the difference between the sum operation and the causal coordination operation. Our claim is that the sum operation does not build a set that qualifies as ‘individual’ and which, as such, can be the value of the variable bound by the quantifier.

We reason as follows: Assume that DES can pick entities of the right size, i.e. $\{a+b\}$ or $\{b+c\}$ or $\{c+a\}$ in the semi-lattice in (17). None of these sets qualifies as ‘individual’. This is because a being of a certain sort does not depend on b being of the same sort. For instance, it does not follow from the fact that a is a student that b is also a student.

However when a and b form a coordinated whole, a ’s being of a certain sort entails that b be of a certain sort as well. This ensures a form of association that grants individuability: knowing what a is entails knowing what b is.

6.2. Previous views of sums as not qualifying as individuals

The claim that sums do not qualify as individuals has already been defended under an extensional view. Two different approaches have been elaborated.

1. ‘Distinctness’ and ‘non-overlapping’ hypothesis. It has been claimed that a domain closed under sum formation does not contain elements that qualify as individuals, as they are not truly ‘distinct’ (Kratzer, 1995). Put otherwise, there is some overlap between individuals in the domain (Dobrovie-Sorin and Mari, 2007b).

It seems that the notions of ‘distinctness’ and ‘non-overlapping’ do not capture the facts, as they cannot account for the following data. Consider sentence (28):

(28) Des pays voisins se font la guerre.
‘Des’ neighboring countries make war to each other

Assume a set of neighboring countries. a is the neighbor of b , b is the neighbor of a and c and so on.

(28) $[[\text{pays voisins}]] = \{\{a,b\},\{b,c\},\{c,d\}\}$

Here the individuals are not ‘truly’ distinct and there is some overlapping between these sets. Still, sentence (28) can go through.

2. ‘Topological view’. The notion of ‘individual’ has received a topological analysis, which provides the requirement of self-connectedness (Casati and Varzi, 1999).

This notion has been used in the situation semantic theory in relation with cases such as (23) (Kratzer, 2007/2009).

(29) Whenever snow falls around here, it takes ten volunteers to remove it.

Kratzer (2007/2009) explains that what are being counted here are self-connected situations of exemplifying the proposition expressed by *snow falls around here*. Those situations include complete snowfalls.

Dobrovie-Sorin (2012) claims that there are no principles of self-connectedness in the domain of plural individuals.

Our claim is that coordinated wholes are individuals, although non-connected ones. The individuability criterion is provided by the notion of causal coordination and this principle is intensional in nature.

A coordinated whole is such that the fact that each of its members has a certain description depends on another element of the same coordinated whole having a certain description. Sum formation applies without a notion of dependence of description being involved, and thus the resulting set is not categorized as an individual: one can know what *a* is without knowing what *b* is.

The notion of coordinated whole explains that each of the set in the set of sets in (21) is the value of the variables bound by the quantifiers, as each of these sets qualifies as a coordinated whole.

Note that this notion is also superior for explaining the data at hand to that the one suggested by Dobrovie-Sorin (2012), namely that of integrated whole. Dobrovie-Sorin holds that an object qualifies as a integrated whole if there is a division of *x* such that every member of that division stands in a relation *R* to every other member and no member bears *R* to anything other than members of the division. (Simons (1987), Moltmann (1997: 25)). Obviously, this notion does not apply for the cases at hand, as, as shown in (28), there is a member in the set {*a*,*b*} that bears the relation *R* (*be neighbor of*) to another member of the division (namely {*c*} in {*b*,*c*}).

More generally, the notion of integrated whole cannot cover the cases in which the property is symmetrical and transitive, such as *neighbors*, *friends* etc.

6.3. ‘Bikinis’

It is interesting to note that this notion of coordinated whole seems to apply to non-self-connected objects that qualify as objects, such as *bikinis* (and which the self-connectedness view cannot cover (see discussion in Casati and Varzi, 1999; Kratzer, 2007/2009)). Bikinis usually come in two pieces. However, two randomly chosen upper and lower part pieces do not form a bikini. The two pieces are likely to be of the same color, corresponding sizes and so on. In causal terms, the upper part of the bikini must be the upper part of the bottom part, which is the bottom part of the relevant upper part of the same bikini. The modal representation of *bikini* is thus the following².

$$(30) \quad [[a \otimes_{\text{bikini}} b]] = \forall w' \in \text{Inr}(w, t) \quad (\text{upper_part_of}(x, y, w') \rightarrow \text{bottom_part_of}(y, x, w'))$$

Replacing the principle of self-connectedness with a principle of causal coordination of the description for plural and individuals coming in pieces allows us to cover cases of non self-connected objects.

A coordinated whole is thus an object that qualifies as such in virtue of its intensional properties, whose parts are causally coordinated in the sense of (26). Summation cannot ensure this coordination and thus sets resulting from the summation operation do not qualify as proper individuals. As a consequence, they do not provide a suitable value for the variable bound by the binary quantifiers.

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Note that the notion of integrated whole can cover the case of ‘bikini’.

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