The Semantics of Plurals

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This course will cover some basic issues that plurals raise to the study of semantics.

We will discuss the following topics:

- How to fit in plurality into our theories of semantics.
- Distributive, collective, and cumulative readings.
- Bare plural nouns and their readings (focusing on English).
First order predicate logic

- It is common practice in model-theoretic semantics to use predicate logic as a representation of sentence meaning.
- However, standard first-order predicate logic cannot properly account for plural meaning.
- The normal interpretation of first order logic predicates, for example, is to take them to be sets of individuals:

  \[(1)\]  
  a. Andrea is a student.  
  b. \text{STUDENT}(a).
First order predicate logic

If the predicate is distributive, we can also accommodate plural/conjoined subjects:

(2) a. Andrea and Beth are students.
   b. Andrea is a student and Beth is a student.
   c. \(\text{STUDENT}(a) \land \text{STUDENT}(b)\)

(3) a. The girls are students.
   b. \(\forall x [\text{GIRL}(x) \rightarrow \text{STUDENT}(x)]\)
Similarly, if there is a quantifier that induces a distributive reading, there is no problem, regardless of whether the predicate is always distributive, or whether it is ambiguous:

(4) a. Every girl is a student.
    b. $\forall x [\text{GIRL}(x) \rightarrow \text{STUDENT}(x)]$

(5) a. Every girl lifted a piano.
    b. $\forall x [\text{GIRL}(x) \rightarrow \text{LIFT-A-PIANO}(x)]$
But...

But, what do we do if we have no distributive predicate or quantifier?

(6)  a. John and Mary are a happy couple.
     b. *HAPPY COUPLE(\(j\)) \land HAPPY COUPLE(\(m\))

(7)  a. All the students gathered.
     b. *\(\forall x [\text{STUDENT}(x) \rightarrow \text{GATHER}(x)]\)
But, what do we do if we have no distributive predicate or quantifier?

(6) a. John and Mary are a happy couple.
   b. *HAPPY COUPLE(j) ∧ HAPPY COUPLE(m)

(7) a. All the students gathered.
   b. *∀x[STUDENT(x) → GATHER(x)]

As a general rule, predicate logic cannot handle non-distributive predication/quantification.
What to do?

There are two (families of) solutions in the literature:

1. Reduce all non-distributive predication to distributive predication.
2. Use a more robust logic.

Following the majority of the (linguistic) semantic literature, we will be focusing on the first strategy.
Reductive (singularist) approaches

The most common approach is the view that treats non-distributive sentences as distributive sentences over some other type of entity.

(8)  a. John and Mary are a happy couple.
     b. $\exists \alpha [\alpha R j \land \alpha R m \land \text{HAPPY COUPLE}(\alpha)]$

Where these approaches differ is in the nature of $\alpha$ and the relation $R$. 
One approach says there is no need to look beyond the set of tools already available from standard set theory.

A set, after all, is a single thing, but it may have many elements.

Thus, accounting for plural predication can be as simple as taking plurals to denote sets, and non-distributive predicates are taken to be predicates of sets of individuals.

This has been the approach taken by a wide range of plurality literature, including Scha (1981), Hoeksema (1983), Gillon (1987, 1990), Lasersohn (1995) and Schwarzschild (1996).
In this view, we have the following:

(9)  a. John and Mary are a happy couple.
     b. HAPPY COUPLE(\{j, m\})

Plural quantifiers can be taken to be quantifiers over sets, so that (10a) can be interpreted as (10b):

(10) a. Three students met.
     b. \( \exists X [X \subseteq \text{STUDENT} \land |X| = 3 \land \text{MET}(X)] \)
Mereological theories

Set-based theories, however, have been criticized on a variety of grounds, the main one being metaphysical.

(11) Godehard’s daughters made a mess in the living room.
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(11) Godehard’s daughters made a mess in the living room.

(12) ⇒ The set of Godehard’s daughters made a mess in the living room.

(13) ⇒ A set made a mess in the living room.

Argument from Link (1998)
Another problem

Both sets and sums work by positing the existence of an entity (set or sum) that represents the plurality.

But it has been argued (Boolos 1984, Schein 1995, Higginbotham 1998) that this is a highly problematic point.

(14) The sets that do not contain themselves are numerous.
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(15) There is a set, such that it is the set of sets that does not contain themselves, and it is numerous.
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(16) ⇒ There is a set of sets that do not contain themselves
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So, we have the following:

(17) a. John and Mary are a happy couple.
     b. HAPPY COUPLE\( (j \oplus m) \)

Plural quantifiers can be taken to be quantifiers over sums:

(18) a. Three students met.
     b. \( \exists X[\forall x[\text{ATOM}(x) \land x \leq X \rightarrow \text{STUDENT}(x)] \land \left| X \right| = 3 \land \text{MET}(X)] \)

This approach is also common in the semantic literature, including Hoeksema (1988), Moltmann (1997), Winter (2002) and Landman (2000).
Non-reductionist theories

Unfortunately, just like the set-based system, it has been argued that the sum-based system leads to inevitable paradox (Schein 1995)

\[
\text{(19) The non-atoms are the atoms. (False)}
\]

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\text{(20) The sum of all non-atoms is the sum of the atoms. (True)}
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Non-reductionist theories

As a response, there have been several advocates (esp. in the philosophical literature) of plural semantics that do not involve a mediating level in which predication is distributive.

These include monadic second-order logics (Boolos 1984, Schein 1993, Pietroski 2005, McKay 2006):

\[(21)\]
\[
\begin{align*}
\text{a. } & \text{Adam fought with Yuri and Zero.} \\
\text{b. } & \text{FIGHT}(a) \left( \begin{array}{c} y \\ z \end{array} \right)
\end{align*}
\]

And logics based on polyadic relations (Oliver and Smiley 2004):

\[(22)\]
\[
\begin{align*}
\text{a. } & \text{Adam fought with Yuri and Zero.} \\
\text{b. } & \text{FIGHTa; yz}
\end{align*}
\]
So, there are a variety of approaches for handling non-distributive predication.

However, they all have an unavoidable consequence.

(23)  
a. John and Mary are a happy couple.  
b. HAPPY COUPLE\((j \oplus m)\)

(24)  
a. John and Mary are tall.  
b. TALL\((j) \land TALL(m)\)

We need a method of distinguishing distributive from non-distributive predication.
Consequences

- So, there are a variety of approaches for handling non-distributive predication.
- However, they all have an unavoidable consequence.

(23)  
   a. John and Mary are a happy couple.  
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(24)  
   a. John and Mary are tall.  
   b. TALL\(j\) \(\land\) TALL\(m\)

- We need a method of distinguishing distributive from non-distributive predication.
- To be continued...
For the rest of this course, we will use the sum-based notation for plurals, for convenience.

However, this should not be taken to be an endorsement of this theory over the alternatives.

Rather, unless explicitly stated otherwise, the issues we will deal with apply to all the views above.
Boolos, George. 1984. To be is to be the value of a variable (or the values of some variables). *Journal of Philosophy* 81:430–450.


Link, Godehard. 1998. *Algebraic semantics in language and philosophy*. CSLI.


References


