

## Unspecification, Ambiguity, and Anaphora with Plurals

Approaches for interpreting different readings of plural sentences like (1) fall generally into three camps (more distinctions are available in Lasersohn (1995)): (a) those claiming that plural nominal terms like *three students* are ambiguous (b) those claiming that predicates like *write* are ambiguous and (c) those claiming plural expressions are unspecified in the sense that different plural readings correspond to different situations that make a sentence containing plurals true.

(1) Three students wrote a paper. (Krifka (1996))

We argue that none of approaches (a)-(c) are right and propose an interpretation of plural readings based on an ambiguity of dynamic transitions. First, examples like (1) generate a real ambiguity at logical form rather than an unspecified meaning and this leads us to reject approach (c) (e.g. Verkuyl & van der Does (1991), etc.). A discourse like

(2) Three students wrote a paper. Four professors wrote a paper too.

has only two natural readings. Either both sentences receive a collective interpretation, or both receive a distributive interpretation. The "mixed" interpretations are difficult to get. This is a characteristic of ambiguous constructions in discourse contexts where some sort of parallel is evoked: however you resolve the ambiguity in the source of the parallel you must resolve the ambiguity in the target in the same way. This not the case with merely unspecified meanings like (3). In (3) which leaves the nature of John's trip unspecified, any further specification of the target need not mirror a corresponding specification of the source.

(3) John took a trip. Sam took a trip too.

A problem for approach (a), the term-ambiguity approach (e.g. Scha (1981), Boolos (1984), Gillon (1987), Schein (1993), Landman (1995), Krifka (1996), van den Berg (1996), etc.), is that it cannot handle sentences in which both readings for the plural DP seem required. Consider the following two sentences (for similar examples and other arguments see also Lasersohn (1995), Link (1993), Roberts (1987), Oliver (2001)).

(4) Three students worked tirelessly and mowed the whole meadow.

(5) Three students mowed the whole meadow together. They worked tirelessly.

In (4), we interpret the plural term *three students* distributively with respect to *worked tirelessly* and collectively with respect to *mowed the whole meadow*. But there is no way to access simultaneously the two interpretations on any sensible, compositional analysis of (4). Example (5) amplifies the problem: if *three students* is interpreted collectively from *mowed the whole meadow*, the pronoun *they* must refer to the collectively interpreted antecedent, but then the second sentence in (5) cannot receive the distributive reading it requires.

Approach (b), the predicate-ambiguity approach (e.g. Link (1983), Lasersohn (1995), Landman (1995), Winter (2001), etc.), also faces problems. This approach typically postulates an ambiguity among predicate interpretations; predicates can either be interpreted distributively with respect to their plural arguments or collectively (e.g. Winter, 2001). While this handles example (4), we run into problems with cumulative readings like that in (6).

(6) Three boys invited four girls.

If the cumulative reading of (6) derives solely from the interpretation of the predicate *invite*, then since we can have a lot of different possible inviting relations between boys and girls, it appears as though the predicate needs to be typed both for individual and set-like arguments. This is either inconsistent (if the two types have no meet) or at least requires an account of how to interpret a predicate with respect to two types simultaneously. We could perhaps avoid this problem by postulating a special type of predicate for cumulative interpretations. But in any case, simply postulating an ambiguity at the level of the predicate won't explain how distributive and collective interpretations affect *subsequent* sentences in discourse. In (7) only the distributive interpretation provides an interpretation for the pronoun *them* in the second sentence. This cannot simply be a matter of different interpretations of the predicate, since even dynamic interpretations of the predicate are all tests; somehow the distributive interpretation has to "carry over" to the next sentence.

(7) Three students wrote a paper. They sent them to L & P.

In (7), the first sentence has both a collective and a distributive reading. But only the distributive interpretation suitably, and dynamically, formalized gives an appropriate antecedent for the pronoun *them*. Further, if the first sentence is interpreted distributively, the distributive reading naturally carries over to the second sentence as well; it is naturally interpreted distributively rather than collectively or cumulatively. If plural readings are interpreted as a feature of the predicate alone, it is difficult to explain these anaphoric dependencies of plural readings. This criticism also applies to an approach that seeks to capture the difference between collective and distributive readings by introducing covert distributivity operators; to handle (4) the distributivity operator must have scope only over the first VP, but to handle (7) the distributivity operator must have unbound rightward scope. Combining approaches (a) and (b) accounts for (4)-(6), but at the price of threatening compositionality (Lasersohn 1995) and failing to account for the carry over effect. Such an approach predicts that the second sentence of (7) has collective and cumulative readings, as well as a distributive one.

We account for our observations in a compositional way by an essential appeal to dynamic semantics. Sentences with plurals give rise to several sorts of dynamic transitions. To illustrate consider again (7). The dynamic logical form for the first sentence has a transition (here the dynamic conjunction ;) between the nuclear scope of the quantifier *three students* and the restrictor. This transition is ambiguous, and two resolutions of that ambiguity yield the collective and distributive readings. These readings result from different operations on outputs and inputs of dynamic transitions. But only the output of the distributive interpretation of the first sentence gives an appropriate antecedent for the pronoun *them*. So the only logic form for (7) is (7') with a distributively marked transition.

(7') three students( $x$ );Dis( $x$ ) a paper( $y$ ); wrote( $x, y$ ); send( $x, y$ )

Our semantics uses structured sets of assignments as the inputs and outputs of the interpretation of logical forms, and our translation of sentences with full, plural DPs (not pronouns) always yields a dynamic transition with one of three labels  $Dis(x)$ ,  $Col(x)$  and  $Cum(x)$ . A transition labelled with  $Dis(x)$  must pass each subset of the input assignments with a single value of  $x$  “one at a time” to the interpretation of the formula on its right. Once the interpretation of the input is set, it can be passed onto other constituents across other dynamic transitions unless it is reset at another transition by contextual, pragmatic or semantic features. This explains the defeasible carry over effect noted earlier. For (7') this means that  $send(x, y)$  is interpreted so that each student sent all the papers she wrote. In the logical form (4') for (4), the transition marked with  $Col(x)$  requires that the values of all the assignments for  $x$  in the input set be considered all at once in the interpretation of the formula to the right of the transition. (4') exemplifies how to reset an input structured set of assignments.

(4') three students( $x$ );Dis( $x$ ) worked tirelessly( $x$ );Col( $x$ ) mowed the whole meadow( $x$ )

On our semantics, (i) plural terms and predicates always have the same interpretation and are not ambiguous; (ii) we capture many facts about discourse ambiguity and plural anaphora; (iii) yet our model theory remains simple, devoid of sums of individuals or of eventualities—we handle plural phenomena by different ways of exploiting input and output structured sets of assignments.

### Selected References

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