

1 Plurals, Groups

- Semantic analysis: We try to reduce novel semantic facts to the kinds of things we've seen before:

Program Reduce everything to claims about the truth of basic (first-order) relations between individuals.

- Challenges:

Modal claims	Reduced to claims about truth at possible worlds
Propositional attitudes (<i>believe</i> , etc.)	Admit relations between individuals and propositions
Quantification	Reduced to claims about individuals with variables

- Language appears to refer to plural entities (some languages without even bothering to mark the fact).

(1) John and Mary sang.

Program Reduce claims about groups to conjunctions of claims about individuals

(2) John and Mary sang. \Rightarrow John sang and Mary sang.

- Some claims appears plural entities do not appear to be reducible in this way.

(3) a. John, Sue and Mary played poker.(reciprocal reading: there was a single game of poker whose players were John, Sue, and Mary.)

1. John played poker with Sue and Mary and Sue played poker with John and Mary and Mary played poker with John and Sue. [Doesn't capture reciprocal reading, could describe 3 distinct games.]

2. John played poker with Sue and John played poker with Mary and Sue played poker with John and Sue played poker with Mary and Mary played poker with John and Mary played poker with Sue. [Doesn't capture reciprocal reading, could describe 6 distinct games.]
- b. The committee met (on Tuesday). [group noun, singular verb.]

$$\forall x \text{ on-committee}(x) \rightarrow [\forall y [\text{on-committee}(y) \ \& \ y \neq x] \rightarrow \text{meet}(x, y)]$$

But this isn't really right either. Allows multiple pairwise meetings!

- c. The chair of the ice cream committee may not be the same person as the chair of the curriculum committee, *even if both committees have the same members.*
- d.

The committee met.
committee(g) & meet(g)

So we abandon the plan of reducing all group predications to individual predications!

- We want to capture some basic entailment facts:

1. **Distributive** readings/properties.

- (4)
 - a. John, Mary and Sue danced \rightarrow John danced.
 - b. Sue and Alice liked Jean \rightarrow Sue liked Jean.
 - c. The boys _{i} liked Jean \rightarrow Each of the boys _{i} liked Jean.

2. **Collective** (Non-distributive) properties

- (5)
 - a. John and Sue liked each other. $\not\rightarrow$ John liked each other.
 - b. John and Sue met. $\not\rightarrow$ John met.
 - c. John and Sue collided. $\not\rightarrow$ John collided.
 - d. The crowd dispersed $\not\rightarrow$ Each member of the crowd dispersed.
 - e. John, Sue, Alice, and Tom surrounded the refrigerator $\not\rightarrow$ John surrounded the refrigerator.
 - f. The course of study combined history and art. $\not\rightarrow$ The course of study combined history.

g. John and Sue collided. $\not\Rightarrow$ John collided.

- Collective properties that distribute (!?!???)

- (6)
- a. John and Sue got married. \Rightarrow John got married.
 - b. John connected dot A and dot B. \Rightarrow John connected dot A.
 - c. John mixed the blue paint and the white paint. \Rightarrow John mixed the blue paint.

1. Existential entailment:

- (7)
- a. John got married \Rightarrow John married someone
 - b. John and Sue got married. \Rightarrow John married Sue and Sue married John.

2. These are one-place collective predicates systematically related to a two-place individual level predicate:

$$\text{marry}/1(g) \leftrightarrow \forall y \in g \exists x \in g \text{ marry}/2(y, x)$$

3. John connected dot A and dot B. \Rightarrow John connected dot A with dot B. (connect/2 and connect/3)
4. John mixed the blue paint and the white paint. \Rightarrow John mixed the blue paint with the white paint. (mix/2 and mix/3).
5. John and Sue collided. $\not\Rightarrow$ John collided with Sue. (collide/1 and collide/2)

- Problem cases (both distributive and collective readings)

- (8)
- a. Sue and Alice lifted the piano. $\not\Rightarrow$ Sue lifted the piano.
 - b. Distributive reading possible. Means Sue and Alice each lifted the piano.
 - c. Non distributive reading means: Sue and Alice lifted the piano together.

- (9)
- a. The apples in this barrel weigh at least 6 ounces.
 - b. The apples in this barrel weigh 200 pounds.

- Collective and distributive quantifiers

- (10) a. All these pieces fit together to make a picture.
 b. ?? Every piece fits together to make a picture.
 c. The price of all the pieces is \$20.
 d. The price of every piece is \$20. [10 pieces cost \$200.]
 e. ?? Every boy met in the den.
 f. All the boys met in the den.

every is distributive. *All* can be both collective and distributive.

- Cumulative Readings: Note: These are distinct from both distributive and collective readings

- (11) a. 200 computer companies bought 5000 computers last year.
 b. Ten architects submitted seventeen designs to the competition.

Try to represent these as distributive readings:

Ten x architect(x)[Seventeen y design(y)[submit-to-competition(x, y)]]

What's wrong with this representation. How many designs does it say there can be?

Cumulative readings intuitively mean: there is a way of SUMMING smaller facts to get the facts stated:

3 architects submitted 5 designs
5 architects submitted 8 designs
2 architect submitted 4 designs
10 architects submitted 17 designs.

- Definition of Cumulativity and Distributivity:
 - Distributivity: If P is distributive, then

$$\begin{array}{l}
 \text{From} \quad P(a \oplus b) \\
 \text{Infer} \quad \frac{P(a) \wedge P(b)}{P(a \oplus b) \Rightarrow P(a) \wedge P(b)} \\
 \text{Synonym for}
 \end{array}$$

Examples

- * *walk* is distributive: Joan and Mary walk entails John walks and Mary walks.
 - * *ate fewer than 5 bagels* is distributive: John and Mary ate fewer than 5 bagels entails John ate fewer than five bagels and Mary ate fewer than 5 bagels.
- Cumulativity. If P is Cumulative, then

$$\frac{P(a) \wedge P(b)}{P(a \oplus b)}$$

Examples

- * *walk* is cumulative: John walks and Mary walks entails John and Mary walk.
 - * *weighs 1 gram* is not cumulative: *Bag A weighs 1 gram* and *Bag B weighs 1 gram* $\not\Rightarrow$ *Bag A and Bag B weighs 1 gram* (On collective reading!)
- Semantics for Plurals. We need to refer to GROUPS:

1. One way

- (a) John and Mary met.
meet($j \oplus m$)

But consider quantification with cardinality quantifiers.

- (b) Two boys smiled. [Two x boy(x)] smile(x)

This doesn't do what we want for groups. Each time we pick a value for x , it's an individual boy: ALWAYS a distributive reading! Therefore: Not the right semantics for:

- (c) Two boys met.
[Two x boy(x)] meet(x)

How about this? [From the book]

$$[\exists X : |X| = 2 \wedge \forall y [y \in X \rightarrow \text{boy}(y)] \text{ meet}(X)]$$

Better. Kind of long winded. Suppose we just assume the predicate *boy* is cumulative (If it's true of any two individuals it's true

of the group containing them) and distributive (if it's true of a group its true of any individuals in the group). Then:

$$[\exists X : |X| = 2 \wedge \text{boy}(X)] \text{meet}(X)$$

But we need both kinds of representation to capture distributive and group ambiguities:

- (12) a. The apples (in this barrel) weigh 100 pounds
b. $[\exists X : |X| \geq 2 \wedge \text{apple}(X)] \text{weigh}(X, [100 \text{ lb}])$
c. The apples (in this barrel) weigh six ounces.
d. $[\exists X : |X| \geq 2 \wedge \text{apple}(X)] [\text{Every } x : x \in X]$
 $\text{weigh}(x, [6 \text{ oz}])$

2 Bare plurals and kinds

- English bare plurals come in two basic uses:
 - Existential uses: A claim about some specific firemen in a specific situation

- (13) a. Firemen are available.
b. Good (ignoring plurality for the moment):

$$[\exists x \text{ fireman}(x)] \text{ available}(x)$$

- Generic uses: A claim about the genre or kind: *firemen*

(14)

Firemen are altruistic.

Wrong: $[\exists x \text{ fireman}(x)] \text{ altruistic}(x)$

Wrong account: Assimilate to plurals. *firemen* denotes the maximal group of firemen. *altruistic* is a distributive predicate the way *walk* is:

- (15) a. John and Mary walk.
b. (a) \Rightarrow John walks.
c. (a) \Rightarrow Mary walks.

- (16) (14a) \Rightarrow for each member x of the group of firemen, x is altruistic.

Any objections?

- (17) a. These are the wrong truth conditions: (14a) not generally falsified by one example of a selfish fireman.
b. Roughly: Most firemen are altruistic. Typically, firemen are altruistic.

Right account: A new generic operator with a semantics something like *most*:

- (18) $[\text{Gen } x \text{ fireman}(x)] \text{ altruistic}(x)$

The program: reduced to a quantificational claim about individuals.

- (13) and (14): Similar surface forms but different logical forms. The question is: Why?

- The two uses of bare plurals can be accounted for by paying attention to the *predicates*:
 - **Individual level predicates**: predicate a **permanent** (or at least enduring) property of an individual:
 - (19) a. John is intelligent.
 - b. John is a man.
 - c. John is altruistic.
 - d. John is 6 feet tall.
 - **Stage level predicates**: predicate a **temporary** (or at least temporally bounded) property of an individual:
 - (20) a. John is drunk.
 - b. John is walking across the lawn.
 - c. John is available.
 - The distinction correlates with usability in the English THERE BE construction. Individual level predicates are not welcome.
 - (21) a. There was a man drunk in the hallway.
 - b. There were two flights available.
 - c. There was a woman walking across my lawn.
 - d. * There was a man intelligent on the phone.
 - e. * There was a fireman altruistic in the hallway.
 - f. * There was a man 6 feet tall standing before me.
- The generalization about English bare plurals is the following:

1. Bare plurals used with stage-level predicates have existential readings
2. Bare plurals used with individual level predicates have generic readings.

- There is a third kind of property besides stage level and individual level. This is the kind of property that can only be true of kinds. With bare plurals, this always yields a kind of generic reading, but it's not the kind that can be paraphrased *Most P are Q*.
 - (22) a. Old growth redwoods are rare.

- b. ? Most redwoods are rare.
- c. Dinosaurs are extinct.
- d. ? Most dinosaurs are extinct.

- Two competing accounts:

- Carlson (simplified): You can't make stage-level claims about **kinds**. The noun *firemen* is a kind of proper name for a kind (the way *psychoanalysis* is a proper name for a discipline).

1. Stage level predicates true only of stages. Stages are parts of individuals:

* available(firemen)	Incoherent
$[\exists x \text{ realize}(x, \text{firemen})]$ available(x)	
* available(john)	Incoherent
$[\exists x \text{ realize}(x, \text{john})]$ available(john)	

2. Individual level predicates true only of individuals.

altruistic(firemen)	OK
altruistic(john)	OK

3. Carlson's account does without a Generic operator/Quantifier.

a problem: Generic readings for stage level predicates

(23) a. Roaches live in the basement. [Has a generic reading, contra Carlson.]

b. There are roaches living in the basement. [evidence for stage-level]

c. Roaches are living in the basement.[evidence for stage-level]

- Diesing/Chierchia: A syntactic movement account. Generic operators can only capture NPs in Spec of IP. Individual level predicates: Subjects start there and must stay there. Stage level predicates subjects start in Spec of VP! (**Diesing's Mapping Hypothesis**). Can move to Spec of IP (upwards). Thus we get Stage- i Generic (23), but not Individual level- i stage (no downward movement)

3 Mass terms

- Reference to the **kind** with mass terms
 - (24) a. Water boils at 100 degrees Centigrade.
 - b. Oil is an increasingly scarce commodity.
 - c. Hydrochloric acid is extremely corrosive.
- Reference to hunks of stuff
 - (25) a. The water in the glass evaporated.
 - b. Water filled the tank.
 - c. The gold in that ring weighs one sixteenth of an ounce.
- Equipment, staff, infantry, forest, software: Plural or singular? Mass or count. There are syntactic tests!
 - What are the syntactic tests for mass nouns?
 1. Numerals and Singular determiners
 - (26) a. * two equipments
 - b. two pieces of equipment
 - c. * every equipment
 - d. all equipment
 - e. some equipment
 - (27) a. * two golds
 - b. two pieces/flakes/nuggets of gold.
 - c. * every gold
 - d. all gold
 - e. some gold

Subtlety: *All* by itself favors a kind reading.

 - (28) a. All gold comes from the earth.
 - b. ?? John hid all gold.
 - c. John hid all the gold.
 - d. John hid some gold.
- Semantics for mass nouns:
 - (29) a. Shelley passed the gold to Leo. [almost as in the book!]
 - b. [The M : Mass(M) gold(M)] \wedge pass(shelley, M, leo)