

Constructions in Natural Language that are Problematic for FOL

- Quantified Noun Phrases
- Relational Nouns
- Genitive Constructions
- Mass Nouns
- Adjectives
- Relative Clauses
- Generic truth
- Contextually-supplied domains
- Adverbs (and related prepositional phrase modification)
- Sortal predication vs. other predicates

Quantified Noun Phrases

There are three types of issues with quantified NPs:

1. How to treat quantifiers other than *there exists* and *each* ... for instance, *most*, *few*, *almost all*, *many*, ...
2. Are the so-called “stylistic variants” of the standard quantifiers *really* equivalent? E.g., is *all* really the same as *each*? Is *some* really the same as *there exists*?
3. The quantifiers of FOL are disjoint from the NPs that they allegedly quantify over. For example, to symbolize “All men are mortal” we use

$$\forall x(Man(x) \supset Mortal(x))$$

where the $\forall x$ is totally separated from the $Man(x)$. But in natural languages, they seem to be a single unit: *all men*.

Can we do this in FOL? – Restricted quantification maybe?

Generalized quantifier theory, maybe?

Relational Nouns

Here is a class of simple, monadic nouns:

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- *enemy, friend, neighbor, commander, coauthor . . .*
- *speed, rating, length, distance, . . .*

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But:



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The moral is supposed to be that these are “really” or “semantically” or “intended to be” relations.

They should be represented as the **binary** relations:

- *mother-of, father-of, brother-of, sister-of, . . .*
- *enemy-of, friend-of, neighbor-to, commander-of, coauthor-with*
...
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Note similarity with some issues regarding genitives: “John’s car” and “John’s brother”

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Do you think that there is always an algorithm to state what the “relationship” is??

Genitive (“possessive”) Constructions

These type of constructions are often handled by the possessive case in English, although the phenomenon is wider than that.

The issue is that the relationship between the possessor and the thing possessed is much more diffuse than “possessor”:

- John's wife, John's car, John's dog, . . .
- the car's steering wheel, the leaves of a tree, a hockey team's logo, . . .
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It seems that we want to put some sort of “hidden variable” that is somehow to be supplied (but how???): John's car has the hidden variable filled in with ‘x that John owns’; John's dog has it filled in with ‘x that is a pet of John's’; the Moon's craters has it filled in by ‘craters that are formed by impact on the Moon’; car's steering wheel has it filled in with ‘x is a wheel that is used to steer y’, etc.

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More about “contextual variables” later.

Mass Nouns

Water



Dogs



Failures/Success



Justice →



Mass nouns (in English, anyway) are contrasted with Count nouns:

- (Concrete) Mass Nouns: *air, water, blood, steel, ...*
- (Abstract) Mass Nouns: *curiosity, knowledge, justice, ...*
- (Concrete) Count Nouns: *person, dog, tree, book, chair, ...*
- (Abstract) Mass Nouns: *failures, beliefs, freedoms, ...*

Mass terms are hard to use with numerals, or with quantifiers like *each, every*.

Mass terms work best with measure terms like *much, a lot of, a little, sm, ...*

Mass Nouns

Consider a sentence with a mass term in subject position:

- Snow is white
- Snow is falling in Alberta
- Coffee contains caffeine
- ... (etc)



How should they be represented in FOL? Ignoring the “generic character” of *Snow is white*; it seems to be a universal quantification. The second sentence seems to be an existential sentence. Let's translate them:

$$\begin{aligned}\forall x(Snow(x) \supset White(x)) \\ \exists x(Snow(x) \wedge Falling-in(x, Alberta))\end{aligned}$$

But what are the values of x ?? Let's read the symbolisms back: “For each x , if x is snow, then x is white”; “There is some x which is snow and x is falling in Alberta”. But what is such an x ??

Adjectives

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Mickey is a large mouse.

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But:



Rhinos are large animals. Mickey is a miniscule animal.

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A standard approach within (linguistic-oriented) formal semantics is to view adjectives as “operators on noun denotations”. Whatever a noun denotes (and in classical FOL it denotes a set of entities – those members of the domain that the noun is true of).

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- *Non-standard*: These adjectives are neither standard nor alienating. They allow, but do not require, that the object is in the denotation of the noun. E.g., **alleged**, **claimed-to-be**, **seemingly-a**, . . .

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Maybe color terms?

Colour Adjective– e.g., red



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Consider ‘healthy’:

- A person is healthy because s/he *has* health.
- A diet is healthy because it *leads to* health in a subject.
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- etc.

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Relative Clauses

Well, first you have to distinguish *restrictive* relative clauses from *non-restrictive* relative clauses.

- (restrictive) Politicians who always promise prosperity are prevaricators
- (non-restrictive) Politicians, who always promise prosperity, are prevaricators
- (restrictive) The elderly senator who was caught with an underage prostitute in his hotel room will announce his retirement tomorrow
- (non-restrictive) The elderly senator, who was caught with an underage prostitute in his hotel room, will announce his retirement tomorrow

The preceding examples make it seem that one should translate both types of relative clause with **and**, and the two differ only in where the \wedge goes. So the politician sentences become:

- $\forall x((Pol(x) \wedge PromPros(x)) \supset Prev(x))$ { \wedge in antecedent}
- $\forall x(Pol(x) \supset Prev(x)) \wedge \forall x(Pol(x) \supset PromPros(x))$ { \wedge is a sentence connective}

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In the first, the rejection mentioned in the relative clause is the cause of the swearing.

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Should this be part of the translated “literal meaning” of the sentences?

Generic Truth

Generic statements are generalizations that seem to be true despite the acknowledged existence of some counterexamples. The classic example is **Birds fly**, which is deemed true despite the existence of ostriches, emus, kiwis, cassowaries, broken-winged birds, fledglings.

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We've looked at one direction that research has gone into giving an account: Priest's system $C+$ of *ceteris paribus* conditionals.

There are a number of related attempts in the literature, the best one of which (imho) is by Pelletier & Asher (1997, 2012).

Contextually Supplied Domains

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Is that right?? You said that there exists no beer anywhere in the universe?!?

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How, or even *can*, this be incorporated into the logic?

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Consider indexicals: I, you, her, him, it, here, now, that, ...

The usual approach in FOL is to allow these to have their value set by context. It becomes part of the translation process that their “contextual values” just be incorporated into the translation. Jason Stanley (2000) [also Stanley & Szabó, 2002] argues that all nouns come with a variable whose value is to be set “in context”, just like the regular indexicals.

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But in cases like your fridge’s having no beer, the contextual variable is assigned an appropriate value, such as “in the fridge”.

and then the translation becomes (something like):

$\neg \exists x (\textit{BeerIn}(x, y) \wedge \textit{FridgeOf}(y, \textit{me}))$

“Jones did it slowly, deliberately, in the bathroom, with a knife, at midnight.”

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Note that the ‘it’ seems to refer to an entity x that is characterized in a number of ways: Jones did x slowly, Jones did x deliberately, Jones did x in the bathroom, Jones did x at midnight.

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But what could the x be?

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Davidson’s answer: an event. It is an event that is characterized by the adverbs of the initial English sentence.

Events are thus to be in the domain, and therefore can be quantified over:

$$\exists x (ButterToast(x) \wedge Agent(x) = j \wedge Slow(x) \wedge Location(x, b) \wedge Deliberate(x) \wedge \exists y (Knife(y) \wedge Instrument(x, y)))$$

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If you don't do something like this, it seems impossible to account for the inference from "Jones deliberately buttered a piece of toast slowly in the bathroom at midnight" to "Jones buttered a piece of toast" or to "Something got buttered in the bathroom at midnight" or to "Something happened in the bathroom"(etc.)

Davidson, D. (1967) "The Logical Form of Action Sentences"

Parsons, T. (1990) *Events in the Semantics of English*

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John swam the channel quickly

All swimmings of the channel are crossings of the channel

≠ John crossed the channel quickly

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(Possibly related also to sortal predicates... see below)

Sortal Predication

Sortal predicates (and the corresponding sortal universals and sortal concepts) are notions due to P.F. Strawson *Individuals*, 1959. The idea is that there are predicates that

- provide a criterion for counting items of that kind (hence can't apply to arbitrary parts of the items)
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The first two criteria are related (counting requires being able to tell apart)

The last two criteria are related (the essence gives information about what its continuing existence depends on)

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Strawson called the latter **feature-placing universals**. And though he didn't discuss it, he presumably would make the same sort of distinctions with **phase feature-placing universals** and **restricted feature-placing universals**

Sortals and Relative Identity

Some philosophers, notably Peter Geach, have argued that identity is relative and not absolute. One cannot say ' a and b are the same' but rather only ' a and b are the same F ', where F is a sortal predicate. Evidence for this is supposed to be things like 'this is the same gold as that' can be true, but 'this is the same statue as that' not be true because 'this' designates a statue while 'that' designates some coins. Or: two different committees can be made up of the same people, so 'this is the same group of people as that' is true, but 'this is the same committee as that' is false.

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Geach recommended that all identity is subscripted: $a =_F b$ means " a is the same F as b ". This doctrine has not been widely accepted.

See: H. Deutsch "Relative Identity" in SEP.

N. Griffin (1977) *Relative Identity*

H. Noonan (2004) "Identity" in SEP

J. Perry (1970) "The Same F " *Phil. Review*

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There have been attempts to make a formal system that will represent the types of intuitions mentioned. These are called **sortal logics**.

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1. **Many-sorted logics**: Divide the domain up into disjoint classes of entities, and introduce typographically distinct variables (and names?) for each one of these classes. So if we distinguish trees from buildings in the domain, and use variables t_1, t_2, \dots for trees and b_1, b_2, \dots for buildings we might translate “Every building has trees in front of it” as $\forall b_1 \exists t_1 \text{ InFrontOf}(t_1, b_1)$

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But a problem is that these “really” just are alternative notations for classical FOL, and do not capture anything special about sortals.

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Even though the FOL translations are equivalent.

$(\exists x(B(x) \wedge V(x)))$ and $\exists x(V(x) \wedge B(x))$

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- every sortal is either ultimate or else is a restriction of an ultimate sortal

(Very Partial) Sortal Bibliography

- Cocchiarella, N. 1977 "Sortals, Natural Kinds and Re-identification" *Logique et Analyse*
- Feldman, F. 1973 "Sortal Predicates" *Noûs*
- Freund, H. 2000 "A Complete and Consistent Formal System for Sortals" *Studia Logica*
- Freund, H. 2004 "A Modal Sortal Logic" *J. Phil. Logic*
- Grandy, R. 2009 "Sortals" in SEP
- Gupta, A. 1980 *A Logic for Common Nouns*
- Krifka, M. 2004 "Four Thousand Ships Passed Through the Lock" *Ling. & Phil.*
- Lowe, E.J. 2009 *More Kinds of Being: Individuation, Identity and Logic of Sortals*
- Mackie, P. 1994 "Sortal Concepts and Essential Properties" *PQ*
- Stevenson, L. 1975 "A Formal Theory of Sortal Quant." *NDJFL*
- Wallace, J. 1965 "Sortal Predicates and Quantification" *Jour. Phil.*
- Wiggins, D. 2001 *Sameness and Substance Renewed* (revised, and revised again, versions of his 1967 and 1980 book)
- Zimmerman, D. 1998 "Criteria of Identity and the 'Identity Mystic' " *Erkenntnis*