

## Foreword

Peter Ludlow

One of the central problems in the semantics of natural language has been the problem of accounting for the semantics of "opaque" or "hyperintensional" environments. To illustrate the problem, consider the contrast between (1) and (2).

- (1) a. Max met [<sub>NP</sub> Judy Garland]  
b. Max met [<sub>NP</sub> Frances Gumm]
- (2) a. Max believed [<sub>S</sub> that Judy Garland was a fine actress]  
b. #Max believed [<sub>S</sub> that Frances Gumm was a fine actress]

If it is true that Judy Garland is Frances Gumm, then (1a) entails (1b). Indeed, as a general rule, coreferring terms can be substituted for each other without affecting the truth value of the sentence in which they occur. The examples in (2) constitute an exception to this general rule. (2a) may be true, but it needn't follow that (2b) is true. Let us say that opaque environments are precisely those environments (like (2)) where substitution of coreferring terms fails.

Part of the task of semantics is to determine the "semantic values" of the constituents of natural language sentences. Ordinarily, semanticists would like to say that the semantic value of a referring expression is the thing that it refers to. But notice that the semanticist apparently cannot say this in the face of (2). 'Judy Garland' and 'Frances Gumm' both refer to the same individual, hence they have the same semantic value, hence we would expect that the terms should be intersubstitutable without semantic effect. However, as the examples in (2) show, that expectation is wrong.

The semantic value of referring expressions is not the only problem facing the semanticist. It is also unclear what semantic values should be assigned to the embedded clauses of belief reports. Consider (3), for example

- (3) [<sub>S</sub> Galileo believed that [<sub>S</sub> the earth moves]].

Intuitively, (3) expresses a relation between Galileo and some sort of object, but what sort of object? One early proposal was that (3) expressed a relation between Galileo and the clause itself – in other words, between Galileo and (4).

(4) [s the earth moves]

But this does not seem plausible, since (4) does not carry as much information as the belief report intuitively does. For example, pointing at the moon, I might utter (5).

(5) [s Galileo believed that [s that moves]]

But I might also utter (5) when pointing at the sun. The problem is that if the content of the belief attribution in both cases is simply the syntactic object in (6),

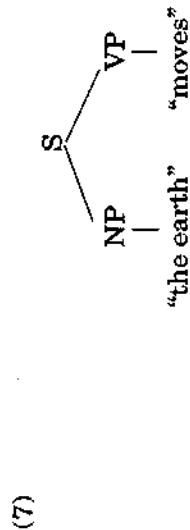
(6) [s that moves]

then these two belief attributions are not distinguished in the semantics.

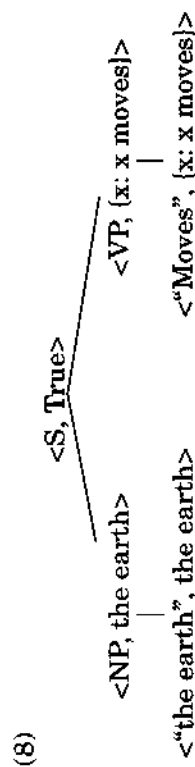
There have been many responses to this problem in the semantics literature over the last three decades. One response has been to argue that propositional attitude reports like (3) express relations between agents and sets of possible worlds (for example, the set of all worlds in which the earth moves). Another response has been to argue that an attitude report like (3) expresses a relation between Galileo and a Russellian proposition consisting of the earth itself and the property of moving. There are also, of course, variations on these two proposals.

In recent literature, however, a number of authors (e.g. Higginbotham (1986, 1991), Segal (1989), Larson and Ludlow (1993), and Larson and Segal (1995)) have suggested an alternative proposal in which the familiar semantic problems arising with propositional attitude verbs might be resolved by taking such verbs to express relations between agents and interpreted logical forms (ILFs). ILFs are phrase markers whose nodes are paired with semantic values.

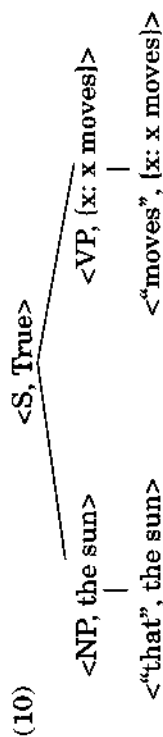
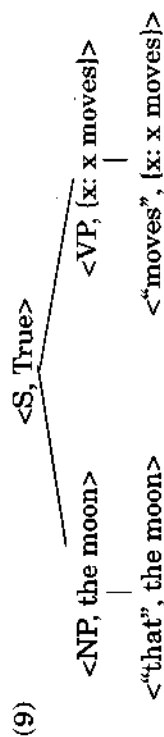
For example, the ILF for “the earth moves” would be the syntactic phrase marker in (7) (abstracting from detail here),



with semantic values assigned to each node of the tree. We might therefore represent the ILF as follows, where each node is paired with its semantic value.



Such objects in effect represent a semantic value together with its linguistic “mode of presentation”. Unlike the naive syntactic theory discussed above, ILF theories, by including the semantic values, can distinguish both of the beliefs reported as “Galileo said that that moves”, because the two different acts of pointing pick out different semantic values (the moon in one case and the sun in the other). Thus, in the case where I point at the moon, we get the ILF in (9). In the case where I point at the sun, we get the ILF in (10).



ILF theories thus provide an alternative to the treatments of propositional attitude constructions that traditionally make use of possible world semantics, Russellian propositions, or Fregean senses. Because they eschew these resources, ILF theories are more *austere* –

they attempt to cover as much (or more) of the data with fewer theoretical resources. Furthermore, because of their austerity, they can be embedded in extensional semantics for natural language of the kind envisioned by Davidson (1967) and developed in detail by Larson and Segal (1995). That is, ILF theories may make it possible to construct extensional meaning theories for natural languages.

But, of course, the ILF strategy is programmatic. To date, ILFs have been applied in a rigorous way to propositional attitude constructions like (3), but there are other sorts of well known opaque environments. How can ILF theories be extended to those other environments? It is also fair to ask what sort of criticisms ILF theories might run into (if not the same criticisms that other theories encounter). The goal of this special section is to canvass some of the new applications of ILF theories, as well as some of the criticism aimed at ILF theories.

Turning to the matter of new applications, one of the opaque environments that ILF theories shall have to account for are "quotational" environments, like sentence (11).

(11) Ralph said "the man in the brown hat is a spy"

Clearly this environment is opaque; one cannot substitute the name 'Orcutt' for 'the man in the brown hat' even if they are the same person (suppose that Ralph does not know that the man in the brown hat is Orcutt). The problem with quotational environments is that on the one hand, they are sensitive to the expressions we use, yet on the other hand many quotational environments require that words in the quoted environment also be interpreted – that they have genuine semantic values. The paper by Dan Seymour argues that ILF theories are therefore ideal for handling quotational environments in natural language – indeed ILF theories in their current form can be directly applied to these constructions.

Another opaque environment is that corresponding to "intensional transitive constructions". Examples of these constructions include (12)-(13).

(12) Ralph seeks a unicorn

(13) Ralph is hunting for a hippogriff

These cases appear to pose problems for ILF theories, particularly the version advocated by Larson and Ludlow (1993), because there is no apparent clause from which one can build an ILF. Or is

there? Marcel den Dikken, Richard Larson and I pursue the idea that despite appearances, cases like (12)-(13) are really propositional attitudes in disguise. If this is right, then the extension of ILF theories to these environments will be trivial.

While the ILF theory can be extended, it can also be attacked. Robert May and Robert Fiengo raise doubts about the ILF theory as developed in Larson and Ludlow (1993). In their view, the appeal to objects as constituents of ILFs may be superfluous, and argue that certain technical moves in the Larson and Ludlow paper may be poorly motivated. For example, they argue that there are problems with those cases in which the same name is used to express different senses (as for example, when the same name is used for two different fictional entities). They suggest that the move advocated by Larson and Ludlow, expanding the lexicon by use of diacritics, will just not work.

The contributors mentioned thus far include two philosophers and four linguists, reflecting a certain interdisciplinary character to research on ILFs. Indeed, the theory has been interdisciplinary from the beginning, attracting both philosophers and linguists. But why?

The fourth contribution, from Gabriel Segal, sheds some light on this question. According to Segal, ILF theories promise to help us naturalize longstanding philosophical questions that date to the end of the last century. Segal lays out a battle plan by which "the problem of the attitudes" may be parcelled into subproblems and the various subproblems spun off to the natural sciences, with ILF theories playing a central role in the plan. If Segal is right, then the problem of the attitudes will be naturalized, just as in previous centuries physics and biology were. Along the way Segal proposes certain modifications to the ILF theory, perhaps suggesting the theory remains very much a moving target.

Obviously, the selections here don't exhaust the work currently being done on ILF theories. Hopefully, however, they will give some idea of the intellectual territory, as well as some idea of the research methodologies and technical resources that have been employed to date in exploring this new terrain.

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