

PRIOR ON THE SEMANTICS OF MODAL AND TENSE LOGIC

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In celebrating Arthur Prior we celebrate what he gave to the world. Much of this is measured by what others have made of his ideas after his death, and it is right that this should be so, since a philosopher's greatness is marked by his legacy. My focus however will be a little different. I want in this talk to look at what Prior himself thought he was accomplishing. In particular I want to investigate Prior's attitude to the semantic metatheory of the logics that he was interested in, specifically modal and tense logics. Even a brief glance at Prior's writings shews a lack of interest in metalogic. His earlier writings of course predated the development of the possible worlds model theory for modal logic, and its generalisation to intensional logic, often called 'modal logic' in a wider sense of that term. For this reason there is little explicit discussion there of model theory. His later work did span the semantic developments pursued by Kripke and others, and while he has a few comments, it is hard to get a clear statement of his views. What I propose to do therefore is list a number of features possessed by the current possible worlds semantics — where by that I mean a semantics in which the indices are called 'worlds' though they could be moments of time, states in the execution of a computer program, or whatever. I shall use these features to compare them with Prior's views on these particular questions. The features I shall list are related, though many are independent, and it is this which makes it a not insignificant task to get a unified view from Prior's work.

In looking at Prior's logical writings we have to remember the time frame. Beginning in the early 1950s, at the height of the ordinary language movement, and emerging in the John Locke lectures in 1956, it continued until his death in 1969. It was during this period that the possible worlds semantics was being developed for modal logic. Prior was writing throughout the whole period, and his own work contributed to it, yet, despite this, his attitude was increasingly ambivalent. As early as 1952 we find a 'possible worlds' account of modality in *In what sense is modal logic many-valued?*:

It is not so easy to find a sense for 'p has the modal value x' as it is to find a sense for 'p has the same modal value as q'; but we might say that the modal value of a proposition is the set of possible states of affairs in which, and in which only, the proposition in question is true. (p. 140)

and a few pages later (p. 142.):

Let us again simplify matters, and suppose that there are only two possible states of affairs. This gives rise to four modal values that a proposition may have — it may be true in neither state of affairs (Value 1), true in the first but not the second (value 2), true in the second but not the first (Value 3) and true in both (Value 4), (If true in neither, it will have a modality of impossibility in this ‘modal universe’; if true in both, one of necessity).

He then shews how to tabulate this in a four valued ‘modal value table’ from which we may determine values for all formulae of modal logic. I shall look at Prior’s attitude to the following important themes in current studies of logics of time and modality:

1. **Metalinguistic truth:**

Model-theoretic semantics provides interpretations to sentences of formal languages, typically in terms of their truth conditions. Truth in these models is metalinguistic. It is the truth of a sentence, not of a ‘proposition’; i.e. it is not about what it is for it to be true *that* something is the case.

2. **Meaning and truth conditions:**

Following Wittgenstein 1922, meanings themselves can understood in terms of truth-conditions, which are normally expressed in an extensional (set-theoretical) metalanguage. The indices are the key to permitting an intensional language to be interpreted extensionally. In the semantics of intensional languages truth is relative to a sequence of ‘indices’ (times, worlds and so on).

3. **Semantics and translation:**

Semantics describes the object language in terms of a metalanguage. It is not the same as translating an object language into another object language.

4. **Recursiveness:**

The meanings of complex expressions depends on the meanings given to the simple parts and the syntactic combination rules.

5. **Predicate logic:**

The semantics of both modal and non-modal (first order) predicate logic involve the postulation of domains of individuals which form the range of the quantifiers. In tense and modal predicate logic there are principles which govern the extent to which these

domains are restricted by the index at which a formula's truth or falsity is being evaluated. This affects the validity or otherwise of principles like the Barcan Formula, and the question of the truth status of a formula at a time or world with respect to things which do not exist at that time or world.

The plan of the talk will be to go through these features of current model-theoretic semantics and examine places in Prior's writings which indicate his attitude to these issues. I hope that this will help us gain some idea of what *Prior* thought he was doing in his logical work, and see how his own views relate to what *we* think we are doing when we engage in semantical studies of intensional logic.

What we shall see is that Prior had reservations about all of the features I have listed. Among these reservations were doubts about the value of modelling intensional phenomena by means of an extensional account of indexical truth. Such reservations were increased by his scepticism of the value of set theory as providing genuine insight into the logic of time and modality. Along with that went an increasing reluctance, as the years went by, to allow any real metaphysical status to the entities which play such a large role in current semantics, entities such as propositions, possible worlds, or even instants of time; mainly because he thought of them as 'abstract', and thought of abstract entities as 'logical fictions'. One of the most revealing sources of his views is in his critical notice of Tarski's work on truth (in *Mind*, 1957) where, in my view, he anticipates Hartry Field's later diagnosis of what Tarski did achieve, as opposed to what Tarski and others thought he had achieved. Most significant perhaps is Prior's apparent lack of sympathy with the Tractarian view that meaning is to be understood in terms of truth-conditions, and with that the aim of establishing a recursive specification of how the truth conditions of whole sentences can be determined from the meanings of their simple parts.

There are many aspects of Prior's thought I will not consider. One is his views on determinism. Although these views led to the examination of a non-standard tense/modal logic in which bivalence was given up Prior's views here involve traversing a quite different kind of territory from that involved in his views about metalogic. In particular the talk will contain no discussion of the system Q presented in chapter 5 of *Time and Modality*, and considered further in Prior's later works. Similarly I will not consider his many writings about the semantical paradoxes. One development which is mostly subsequent to Prior's death is the development by Richard Montague of the claim (influenced by Chomsky's work on syntax) that the semantics of natural languages can be treated by means of an underlying structure based on intensional logic. While one might make some conjectures about what Prior's attitude to this sort of thing would be, we cannot, obviously, produce any work in

which he reacted to it.

I see the present talk as the initial stage of a longer work attempting to evaluate Prior in the context of the ordinary language philosophy of his time. Prior I believe was a philosopher whose aims and values were much closer to ordinary language philosophy that might at first appear. But that work requires a consideration, not just of Prior's own writings, but also of the writings of the many philosophers he was engaging with, and is a task for another time and place.

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