

PRIOR AND THE BARCAN FORMULA

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Two recent discussions of Prior's criticism (in Chapter III of [3]) of the Barcan formula contain serious confusions. Consequently, the issue has received more attention than it deserves.

In his account of Prior's criticism, Gerald Massey [2] claims that Prior's rejection of the traditional method of handling tense distinctions in logic was motivated by his rejection of the Barcan formula,

$$(1) \quad CM\Sigma x\phi x\Sigma xM\phi x.$$

But, as Massey pointed out, it is only when (1) is interpreted tense-logically that the legitimacy of the formula can be questioned, for then it seems to have false instances like

(2) If it either is, has been or will be the case that someone is flying to Mars, then there is someone who either is flying or has flown or will fly to Mars.

However, if the quantifiers of (1) are read *tenselessly*, as they presumably are intended to be in ordinary quantification theory, the formula is perfectly innocuous as it comes to the plain

$$(3) \quad C\Sigma t\Sigma x\phi xt\Sigma x\Sigma t\phi xt,$$

which is a thesis of quantification theory. Thus, it is only by reading the quantifiers as expressing *tensed* existence that (1) is found to be objectionable. Consequently, Massey argued, Prior must already have been committed to the tense logic program *before* he began reflecting on (1). Thus Prior's motivating argument begs the question and leaves us with no reason for abandoning the traditional treatment of tenses.

But Prior never doubted the legitimacy of (1) as a thesis of ordinary quantification theory, that is, never doubted the legitimacy of (3). With regard to (3), he wrote:

Intuitively, there can be no getting away from it—if there is a time of which it is timelessly true that something ϕ 's at it, then quite unquestionably there is an object of which it is timelessly true that it ϕ 's at some time. ([3], p. 27)

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Obviously, then, it was not suspicion about the Barcan formula which led Prior to do tense logic; he knew perfectly well that it was only when (1) is interpreted as (2) that it is objectionable. His criticism of the Barcan formula was intended merely as a criticism, as a viable tense logic, of the S5-like system that he had just finished constructing. Massey is thus correct in supposing that Prior was already committed to the tense-logic program before reflection upon (1), but the *motivation* for doing tense-logic came from elsewhere—from his commitment to indeterminism and an ontology of non-permanent individuals, for example.

In a more recent paper, Tobias Chapman [1] attempts to reveal a more fundamental flaw in Prior's criticism. Chapman argues that where the *M* of (1) is read $\Sigma t \dots t \dots$ as in (3), where the *t*'s stand for times, there are three possible interpretations of the quantifiers. They could be read as (i) all tensed, (ii) all tenseless, or (iii) a mixture of both. The first interpretation is supposedly incoherent as it suggests we read the tenseless form $\Sigma t \dots t \dots$ as tensed. (ii) is also rejected, for if all the quantifiers are tenseless, the formula is unobjectionable. The only possibility that remains is the mixed bag theory where a quantifier is tensed or tenseless depending on what sorts of objects its variables take as values. Presumably, since times lead a timeless existence, Σt is tenseless while Σx is tensed. But now, according to Chapman, under the most natural reading of (3) the formula comes out true:

(4) If there is a time at which a presently existing thing ϕ 's, then there is now something such that at some time or other it ϕ 's.

The "natural" reading of tensed quantifiers is, presumably, to read them all as present-tensed.

What Prior really intended, Chapman points out, is for the antecedent of (3) to be read as "There exists a time such that *at that time* there is something which ϕ 's", while the consequent remains as in (4). But we cannot allow $\Sigma t \Sigma x \phi x t$ to mean what Prior wants it to mean for then the quantifier, Σx , becomes tenseless in the sense that $\Sigma t \Sigma x \phi x t$ would mean "a ϕ -er exists at some past, present or future time." Hence, under interpretation (iii), either the Barcan formula comes out true (as in (4)) or the interpretation is equivocal.

However, Prior never intended the *M* of (1) to be read simply as $\Sigma t \dots t \dots$. He insisted that the tense-logical interpretation of the Barcan formula was not (3) but

(5) $C \Sigma t U t \Sigma x \phi x \Sigma x \Sigma t U t \phi x$.

"The operator *M* is not equated with the quantifier Σt , 'For some *t*', but rather with the operator $\Sigma t U t$, 'For some *t*, at *t*' . . ." ([3], p. 35). (5) then comes to 'If for some *t* at *t* there is something which ϕ 's, then there is an *x* such that, for some *t*, *x* ϕ 's at *t*', and this makes the relevant distinction that Chapman insists that Prior needs. The important distinction is between

(6) $\Sigma t \Sigma x U t \phi x$

(for some t , there is something (presently existing) which ϕ 's-at- t) and

(7) $\Sigma t U t \Sigma x \phi x$

(for some t , at t there is something which ϕ 's). And clearly, given Prior's tense-logical interpretation of M , it is (7) which is the antecedent of the Barcan formula and which allows false instances to (5) in the manner of (2).

Prior, of course, does read his existential quantifiers as implicitly present-tensed (unless governed by another operator as in (7)). Indeed, restricting the range of the quantifiers to presently existing individuals is just what doing quantified tense logic is all about, as Prior originally conceived it. Hence, because it is (5) and not (3) which is the relevant tense-logical interpretation of the formula for Prior, Chapman's criticism is beside the point.

REFERENCES

- [1] Chapman, T., "Prior's criticism of the Barcan formula," *Notre Dame Journal of Formal Logic*, vol. XVI (1975), pp. 116-118.
- [2] Massey, G., "Tense Logic! Why Bother?," *Noûs*, vol. 3 (1969), pp. 17-32.
- [3] Prior, A. N., *Time and Modality*, Clarendon Press, Oxford (1957).

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