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## TENSE, PROPOSITIONS, AND MEANINGS

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Many of us are willing to accept the view that whether or not a sentence token is true, and whether or not such a token expresses one among a person's beliefs is a matter of what proposition that token expresses. Put more precisely, the view I think many of us accept is this: There is a class of abstract entities (propositions), some of which are associated with (some of) the sentence tokens of natural languages. The relation a token bears to a proposition I will call *expressing*; it is understood that a (non-ambiguous) token can express at most one proposition at a time. According to this view, propositions are the primary bearers of truth: To say that a sentence token is true is to say that it expresses a true proposition. Furthermore, on this view, to have a belief is to bear a relation (belief, of course) to a proposition. A sentence token expresses a person *u*'s belief just in case there is a proposition *p* such that the token expresses *p* and *u* believes *p*. Let us call a view that allows all this a *propositionalist* view.

Two opposing propositionalist views are *temporalism* and *eternalism*. According to the temporalist, English sentences typically, but not inevitably, express propositions that can change truth value over time. The temporalist, for example, may hold that sentences such as

- (1) Nixon is president,

express the same proposition at different times; thus, the temporalist would say, the proposition (1) expresses may change truth value over time, since sentence (1) may change truth value. The eternalist holds that all English sentences are such that, if they express a proposition at a time *t*, then what they express, at *t*, cannot change truth value over time. The eternalist will say that (1) expresses different propositions at different times. For the eternalist, a sentence like (1) contains an 'implicit reference' to a time: On his view, a use of (1), at a time *t*, expresses what a use of 'Nixon is now president' expresses relative to *t*. This second proposition, however, is eternal — *viz.*, it is

either always true or always false.

In an earlier paper<sup>1</sup>, I argued that propositionalists ought to be eternalists, not temporalists: Temporalism commits us, I argued, to incorrect truth conditions for ascriptions of belief; eternalism, it seems, does not. In that paper, I did not directly address objections which the temporalist might make to eternalism. One such objection – I think the most important objection yet lodged against eternalism – is one made by David Kaplan.<sup>2</sup> A rough statement of that objection is as follows.

With respect to logical form there is, the objection begins, a syntactic and semantic parallel between sentences such as

(2) Nixon is possibly president,

and

(3) Nixon was president.

Syntactically, each ought to be represented by something of the form: Operator + sentence. (2) should be parsed as

(2') It is possible that (Nixon is president)

(3) should be parsed as

(3') It was the case that (Nixon is president).

Semantically, the parallel between (2) and (3) is this: The operators 'It is possible that' and 'It was the case that' both have semantic values that operate on *propositions*. The semantic value of 'It is possible that' maps a proposition *p* to the true iff *p* is true at some *possible* circumstance of evaluation; the semantic value of 'It was the case that' maps a proposition *p* to the true iff *p* is true at some *past* circumstance of evaluation.

If this be accepted, eternalism must be rejected. For if eternalism is true, then none of the propositions expressed by English sentences can change truth value over time. Thus, the proposition expressed by a sentence (at a particular time) is either true at every time in the past or false at every such time. Therefore, if eternalism be true, applying the semantic value of 'It was the case that' to the proposition expressed by a sentence *S*, if it does anything at all, always yields whatever truth value *S* itself has, since the proposition has the value at every past time. But this is absurd: This implies that pairs of sentences such as 'Nixon is president' and 'Nixon was president' never differ

in truth value. Eternalism cannot make semantic sense out of tensed English and must, therefore, be rejected.

If we wish to maintain both integrity and eternalism, we must reply to Kaplan. But it will not do, I think, to simply reject the claim that (with respect to logical form) there is a syntactic and semantic parallel between sentences such as (2) and (3). While the claim that there is such a parallel is not obvious, it *is* very plausible. Indeed, there is something approaching consensus, among those who worry about such matters, that Priorean tense logic, which assumes just such parallels, provides the best framework for representing tensed English.

In this paper, I will try to hold on both to integrity and to eternalism by rebutting Kaplan. I proceed as follows. In Section I, I give a precise statement of Kaplan's objection. In Section II, I argue that eternalism can make semantic sense out of tensed English. I accept the claim that (2) and (3) are semantically similar; however, I show that we need not hold that this similarity reduces to their both containing operators on propositions. As I will show, there are distinct sorts of entities – among them the meanings of sentences – upon which tense and modal operators might plausibly be held to operate. As will become apparent, some of the treatments of tense we obtain, if we take tense operators to operate on entities other than propositions, are quite compatible with eternalism. Having shown all of this, I will argue that there is no sound reason for preferring the view, that tense operators operate on propositions, to other views. Thus, my argument, if acceptable, suffices both to rebut Kaplan and to establish that eternalism is, semantically speaking, respectable.

## I

Kaplan's objection is most easily stated and discussed if it is granted at the outset that the syntax of tensed English ought to be represented via the syntax of Priorean tense logic. Let us grant this, allowing that English tensed sentences are to be understood as being 'built up' from sentences in the simple present tense and various tense operators.<sup>3</sup> Once this is granted, the question arises: Can we give formal semantics for tense logics which are compatible with various propositionalist views? In particular, can we give a semantics for tense logic which is compatible with the metaphysical posture of eternalism?

How, the reader may be wondering, can a formal semantics be compatible or incompatible with a metaphysical view like eternalism? To answer this, we begin by noting that a semantics for a tense logic will associate, explicitly or implicitly, formal representatives of propositions with the sentences of the language. Such representatives are *intensions*, sets of whatever serve as circumstances of evaluation for sentences.<sup>4</sup> Temporalists and eternalists disagree about what entities are appropriate circumstances of evaluation, and thus disagree as to what we ought to take as intensions. For the temporalist, who believes that a proposition can assume different truth values at different times in one possible world, it is worlds at a time which are the appropriate circumstances of evaluation. Thus, for the temporalist, it is arbitrary subsets of the cartesian product of the set of worlds with the set of times that are intensions. For the eternalist, who holds that a proposition cannot change truth value over time, it is subsets of the set of worlds that play the formal role of propositions.

Not only must a semantics for tense logic associate intensions with formulae, it must, it seems, do so in a particular way. The semantics must make intensions the semantic values of atomic formulae and make appropriate functions on intensions the semantic values of the tense and modal operators. At any rate, there appears to be general agreement among philosophical logicians that a satisfactory semantics must do this. Hans Kamp, for example, has claimed that the *only* appropriate semantic values for tense operators are functions on intensions ([FP], 248) Dana Scott has said that the basic principle of modal and tense logics is that “The intension of a whole expression is determined by the intensions of its parts” ([AM], 154) — a principle that strongly suggests that atomic formulae are to receive intensions as semantic values. Kaplan himself writes

Operators of the familiar kind treated in intensional logic (modal, temporal, etc.) operate on contents [Kaplan’s term for propositions]. ... Thus, an appropriate extension for an intensional operator is a function from intensions... ([D], 22)

That this is the only adequate way to assign semantic values to expressions of tense logic seems reasonable, given the view, mentioned above, that the semantic parallel between tense and modal operators consists in their both operating on propositions. On this view, it will be recalled, a modal operator’s semantic value looks at a proposition and asks: Is it possible (necessary, actually true, etc.)? A tense operator’s semantic value looks at a proposition and asks: Is the proposition one that did (will, does now, etc.) obtain? If the

semantics for tense logic is to portray, as faithfully as possible, the way in which tensed English works, then, given the view in question, we shall want our tense operators to operate upon whatever plays the role of propositions in our formalism.<sup>5</sup>

It appears, then, that a formal semantics for tense logic will be incompatible with eternalism if it does not assign *eternalist* intensions to atomic formulae, functions on such intensions to the tense operators, as semantic values. We are now in a position to appreciate Kaplan's objection to eternalism, which is this: There is no semantics for a Priorean tense and modal logic which is compatible with eternalism (in the sense of making assignments along the above lines) which provides an even minimally acceptable representation of the logical features of tensed English. As Kaplan puts it

...if *what is said* is thought of as incorporating reference to a specific time [viz., as eternal] ...it is otiose to ask whether what is said would have been true at another time.... Temporal operators applied to eternal sentences ...are redundant. ([D], 22)

Technically, we must note that intensional operators must, if they are not to be vacuous, operate on contents which are neutral with respect to the feature of circumstance the operator is interested in. Thus, for example, if we take the content of [a sentence such as 'Nixon is president' to be eternal], the application of a temporal operator to such a content would have no effect; the operator would be vacuous. ([D], 105)

There is no doubt that Kaplan is correct about this much: No function on sets of worlds can serve as a suitable semantic value for tense operators. If the eternalist cannot avoid making such sets the semantic values of sentences, then the eternalist cannot provide a satisfactory semantics for tense logic.

We may sum up Kaplan's objection as follows. An adequate formal representation of tensed English will be one, the syntax of which is that of tense logic, and the semantics of which (i) assigns, as semantic values, the formal representatives of propositions to the atomic formulae of the language, and (ii) assigns functions on the sort of entity assigned to atomic formulae to the tense operators. If eternalism is true, then it is eternalist intensions which are the formal representatives of propositions. But it is impossible to give an adequate formal representation of tensed English (in accord with the above requirements) if eternalist intensions are the formal representatives of propositions. Thus, if eternalism is true, it isn't possible to give an adequate formal representation of tensed English. So much the worse, Kaplan concludes, for eternalism.

## II

Essential to Kaplan's argument is the claim that the semantic values of sentences, in a formalism representing tensed English, must be the formal representatives of propositions. This claim is, in part, justified by the view that tenses in English must be understood as operating on propositions. It is this claim which I wish to challenge. It is at least as plausible to suppose that tenses (as well as operators such as 'It is logically possible that') operate on the linguistic meanings of sentences, entities which are distinct from propositions. Once this is admitted, Kaplan's objection must be rejected. For the objection *requires* us to say that an adequate formal representation of tensed English will be one in which the tense operators operate on (representatives of) propositions. Furthermore, as I will show, some of the treatments of tense which result, when we take the tenses to operate on meanings, are quite compatible with eternalism. The eternalist can, Kaplan's objection notwithstanding, make semantic sense out of tensed English.

For the moment, I will ignore eternalism altogether, discussing instead the question of whether, on temporalist grounds alone, there is some reason for preferring the view that tenses operate on propositions to the view that they operate on meanings. Given that it is Kaplan's objection which is under discussion, it is fair, I think, to assume that the temporalist would accept Kaplan's identification of linguistic meaning with *character*.<sup>6</sup> Given such an identification, what is the difference between a proposition and a meaning?

Roughly, the character of a sentence *S* is the function or rule which takes a (possible) context (of utterance) to the proposition that *S* expresses in the context. For example, the character of the sentence 'I am taking a bath' is the function which associates with each context *c* the proposition that the agent of *c* would express, were he to utter 'I am taking a bath' (with assertive intent, and not as part of a larger sentence, etc.). Given that the meaning of an expression is what the competent speaker knows, when he understands the expression, the identification of linguistic meaning and character is not implausible. Such an identification, in effect, identifies knowing the meaning of a sentence with knowing what proposition a particular use of the sentence would express, given knowledge of various aspects (who is speaking, what time it is, etc.) of the context of utterance. Note that on this view, linguistic meanings and propositions are two completely different sorts of entities; thus, the view that an operator operates on propositions is a *different* view from

one on which the operator operates on meanings.

If we hold that tenses operate on meanings, what will we say about complex tensed sentences such as 'Nixon was president'? Roughly this: The semantic value of such a sentence is the result of applying a function from meanings to meanings (that associated with 'It was the case that') to the meaning of 'Nixon is president'. We would say that the complex sentence is true, taken relative to a context  $c$ , exactly if its semantic value – its meaning, constructed as indicated above – yields, when applied to  $c$ , a true proposition.

Formalizing such a view presents no great problems. Let us compare a treatment of tense on which temporalist intensions are taken as the semantic values of sentences with one on which temporalist sentence meaning are taken as such values, and then ask if there is some reason to prefer the first treatment to the second. We begin by outlining how Kaplan himself treats tense, presenting a propositional simplification of Kaplan's logic of demonstratives. In order to make things as simple as is practical, we confine the syntax of the language to sentence letters and the sentential operators ' $P$ ', ' $N$ ', and ' $\diamond$ ', the intended interpretation of which are, respectively, 'It was the case that', 'It is now the case that', and 'It is logically possible that'.

A  $P$ -model for this language is a triple  $\langle W, T, V \rangle$ , where  $W$  and  $T$  are non-empty, disjoint sets,  $T$  the set of negative and positive integers. (These sets play the roles of worlds and times, respectively.)  $V$  assigns semantic values to the sentence letters and to the sentential operators.  $V$ 's assignments to sentence letters are straightforward – such assignments are temporalist intensions, subsets of  $W \times T$ .

To the operators,  $V$  assigns, relative to each time, functions from intensions to intensions. These assignments must be made relative to times because of the presence of the indexical operator ' $N$ '. ' $N$ ' is to represent the English indexical 'now'; on Kaplan view (with which the eternalist agrees), sentences containing 'now' express different (eternally true) propositions at different times. Thus, different functions on propositions must be associated with 'now' (and its formal representative) relative to different times. In the interests of standardization, we say that all of the operators receive their assignments relative to a time.

Let  $X = (\mathcal{P}(W \times T))^{\mathcal{P}(W \times T)}$ . Relative to every time,  $V$  assigns to ' $P$ ' the function  $f$  in  $X$  such that  $\langle w, t \rangle$  is in  $f(p)$  iff for some  $t'$  less than  $t$ ,  $\langle w, t' \rangle$  is in  $p$ . Relative to a time  $t$ ,  $V$  assigns to ' $N$ ' the  $f$  in  $X$  such that, for any  $t'$ ,  $\langle w, t' \rangle$  is in  $f(p)$  iff  $\langle w, t \rangle$  is in  $p$ . Relative to every time,  $V$  assigns to ' $\diamond$ ' the

$f$  in  $X$  such that  $\langle w, t \rangle$  is in  $f(p)$  iff for some  $w'$ ,  $\langle w', t \rangle$  is in  $p$ .

Suppressing reference to a model, we define the semantic value of a formula  $A$ , relative to a time  $t$  – written  $A_t$  – as follows. If  $A$  is atomic, then  $A_t$  is  $V(A)$ . Otherwise, where  $A$  is the result of prefixing an operator  $O$  to a formula  $B$ ,  $A_t$  is the result of applying whatever  $V$  assigns to  $O$ , relative to  $t$ , to  $B_t$ . We say that a formula  $A$ , taken relative to a time  $t$ , is true at a world time  $t'w$  iff  $\langle w, t' \rangle$  is in  $A_t$ . A formula  $A$  is said to be  $P$ -valid iff, for any  $P$ -model  $\langle W, T, V \rangle$ , for any  $t$  in  $T$  and  $w$  in  $W$ ,  $A$ , taken relative to  $t$ , is true at  $tw$ .<sup>7</sup>

Such semantics are standard and straightforward. Semantics in which sentences receive representatives of meanings as semantic values are no less straightforward. Such representatives will be functions from whatever we choose to represent contexts to intensions. In the case currently under consideration, times are the appropriate representatives of contexts, since the only aspect of context which effects what proposition a sentence of our language expresses is time. Thus, temporalist sentence meanings are, for our purposes, represented by functions in  $(\mathcal{P}(W \times T))^T$ , which we call  $M_t$ .

We now define an  $M_1$ -model for our language. It is a triple  $\langle W, T, V \rangle$ , where  $W$  and  $T$  are as before.  $V$  assigns to each atomic a constant function in  $M_t$ . (These assignments are constant functions because the atoms of tense logic are supposed to represent simple English present tense sentences free of demonstratives and indexicals, such as 'Nixon is president'. On the view of the temporalist, such sentences are to be understood as expressing the same proposition relative to every time. Thus, assignments to atomics ought to yield the same intension, no matter to what time they are applied.) To the operators,  $V$  assigns members of  $(M_t)^{M_t}$ :  $V(P)$  is the function  $f$  such that  $\langle w, t \rangle$  is in  $f[g]$  ( $t'$ ) iff for some  $t''$  less than  $t$ ,  $\langle w, t'' \rangle$  is in  $g(t')$ .  $V(N)$  is the  $f$  such that  $\langle w, t \rangle$  is in  $f[g]$  ( $t'$ ) iff  $\langle w, t' \rangle$  is in  $g(t')$ .  $V(\diamond)$  is the  $f$  such that  $\langle w, t \rangle$  is in  $f[g]$  ( $t$ ) iff for some  $w'$ ,  $\langle w', t \rangle$  is in  $g(t)$ .

Continuing to suppress reference to a model, we define the semantic value of a formula  $A$  as follows: If  $A$  is atomic, then the semantic value of  $A$  is  $V(A)$ . Otherwise, where  $A$  is the result of prefixing an operator  $O$  to a formula  $B$ , the semantic value of  $A$  is  $V(O)$  applied to the semantic value of  $B$ . A formula  $A$  is true, taken relative to a time  $t$ , at a world time  $t'w$  iff the semantic value of  $A$ , applied to  $t$ , has  $\langle w, t' \rangle$  as a member. A formula  $A$  is said to be  $M_1$ -valid iff for every  $M_1$ -model  $\langle W, T, V \rangle$ , for every  $w$  in  $W$  and  $t$  in  $T$ ,  $A$ , taken relative to  $t$ , is true at  $tw$ .

There seems to be no cogent reason for the temporalist to prefer the representation of tensed English which our first semantics yields to that given by the second. First of all, the two semantics yield precisely the same theory of the consequence relation: It is easy enough to prove that a formula is *P*-valid iff it is *M*<sub>1</sub>-valid.<sup>8</sup> Secondly, both semantics validate the intuition that there is a semantic parallel between tense and modal operators. The only difference here is that the first semantics represents the parallel by having these operators operate on (the representatives of) propositions; the second semantics represents them as operating on meanings. Thirdly, both of our semantics are propositionalist: That is, both of them associate representatives of propositions with the formulae of the language in such a way as to validate the propositionalist claim that a sentence is true (relative to a time) iff the proposition associated with it (relative to that time) is true. Finally, the picture of how tensed English 'works' associated with our second semantics is no less satisfactory than that associated with the first. That is, there seems to be nothing about the logical form of tensed English which can be explained, on the assumption that tenses operate on propositions, that cannot also be explained on the assumption that they operate on meanings.

Given these facts, it is extremely difficult to see how a prejudice for propositions as semantic values is to be justified. So far as I can see, there is no cogent criterion, for judging whether a semantical framework yields an adequate representation of a fragment of English, which is such that our first semantics satisfies the criterion, but our second semantics does not. Thus, we ought to reject Kaplan's objection to eternalism. For, as we have noted, the objection *requires* us to prefer semantics for tense logic in which tenses operate on intensions. Such a preference, however, is simply not justified.

It remains to be shown that the eternalist can provide a semantics for tense logic which is compatible with his metaphysical views. I will argue that he can, provided that he adopts the view that tenses operate on sentence meanings. The eternalist, however, must represent meanings somewhat differently from the way in which a temporalist such as Kaplan represents them.

To see why this is so, we begin by noting that the eternalist is motivated to adopt eternalism by the following intuitions concerning tensed English: (i) English tensed sentences are, in general, to be understood as containing an 'implicit reference' to a time. For example, 'Nixon is president', on the view of the eternalist, expresses, relative to a time *t*, the same proposition as

is expressed, relative to  $t$ , by 'Nixon is now president'. (ii) Sentences containing the indexical 'now' express, relative to any time, a proposition that cannot change truth value over time. Given that the eternalist accepts (i) and (ii), he is committed to the view that the *character* of the simple present tense sentence 'Nixon is president' is identical to the character of 'Nixon is now president'.

Now, it would seem that sentences with the same meaning ought to be intersubstitutable *salva veritate*. Given that this is so, an eternalist cannot identify meaning with character. Consider, for example, the pair of sentences

- (1) Mary believed that Nixon was president.
- (2) Mary believed that Nixon would be president now.

It is plausible to suppose that these two sentences are to be represented by sentences of the form of

- (1')  $P(mB(S))$
- (2')  $P(mB(N(S)))$

respectively, where ' $P$ ' and ' $N$ ' are the past tense and now operators '... B...' represents '...believes that...', ' $m$ ' represents 'Mary' and ' $S$ ' represents 'Nixon is president'. If the eternalist identified meaning and character, he would then be required (given the above cited principle) to say that (1') and (2') – and, therefore, (1) and (2) – could never diverge in truth value. For (2') differs from (1') only by having ' $N(S)$ ' where (1') has ' $S$ ' – and *these* sentences have the same character. Thus, given an identification of meaning and character, (2) is obtained from (1) by substitution of sentences with identical meaning. Of course, the pair of sentences can diverge in truth value. Thus, the eternalist cannot identify the linguistic meaning of a sentence with its character.

How, then, does the eternalist analyze linguistic meaning? I propose that he identify (sentence) meaning with functions which map a context *and* a time to a proposition. Such an identification can be justified as follows.

Note, first of all, that for the eternalist the role of the tense operator 'now' is quite different from the role played by the other tense operators. The eternalist may (indeed, ought to) say that operators such as 'It was the case that' and 'It will be the case that' map a meaning to a distinct meaning, and, in general, when applied to a sentence  $S$  yield a sentence expressing a proposition distinct from that expressed by  $S$ . But the eternalist cannot very well say this of 'now'; as we have already stressed, for the eternalist, pairs of sen-

tences such as 'Edwina is dancing' and 'Edwina is now dancing' express, relative to a time, the same proposition.

On the view of the eternalist, the function of the operator 'now' is to 'freeze' the content of a sentence to which it is prefixed, allowing the sentence to continue to express, when embedded within a temporal operator, the proposition the sentence expresses when it is not so embedded.<sup>9</sup> Consider again the sentences

- (1) Mary believed that Nixon was president.
- (2) Mary believed that Nixon would be president now.

the logical form of which is represented by

- (1')  $P(mB(S))$
- (2')  $P(mB(N(S)))$ .

Sentence (1) is used to make the claim that, at some time in the past, Mary believed what was expressed, *at that time*, by the sentence 'Nixon is president'. Sentence (2) is used to report the fact that at some time in the past Mary believed what is *now* expressed by 'Nixon is president'. In order to ascribe the correct belief to Mary in (2), we prefix 'Nixon is president' with the tense operator 'now', as is reflected in the representation of (2). (Of course, when I talk about prefixing operators, I'm not talking about English surface grammatical structure.)

Assuming that this is the correct analysis of the semantic role of 'now' in English, what consequences does it have for the representation of the meaning of tensed English sentences? Supposing that Kaplan's intuitions about sentence meaning are on the right track, what we have said thus far suggests that a representation of meaning for tensed sentences must do two things: It must first reflect the intuition that to know the meaning of a sentence is (in part) to know a function which takes a context to the proposition that the sentence expresses in the context. Secondly, it must allow the operator 'now' the ability to 'freeze' the content of those sentences to which it is prefixed, allowing such sentences to continue to express, when embedded, the same proposition they express when they are not so embedded.

A representation of meanings as functions from contexts and times to propositions does both of these jobs. This is most easily seen by considering an eternalist semantics for the language discussed above.

I begin a presentation of this semantics with an intuitive characterization

of how it works. Recall, first of all, that it is times which we are using to play the role of contexts. Thus, we will represent functions from times and contexts to propositions by members of  $(\mathcal{P}(W))^{T \times T}$ , with the first argument representing a time, the second a context.

That such functions must be two-placed is made necessary by the presence of the indexical 'N'. If we didn't have such an operator in our language, we would be able to make do with functions in  $(\mathcal{P}(W))^T$  as representatives of meanings. In this simpler case, we could take such functions as the semantic values of sentences, the value of such a function, relative to a time, being the proposition the sentence expresses, at the time. Associated with 'P' would be a function from  $(\mathcal{P}(W))^T$  into itself: It would, intuitively, shift us backwards in time, asking: Is the meaning I'm looking at one which *did* yield a truth?

However, with the indexical 'N' in the language, we must complicate matters. For we don't wish the semantic value of 'P' to, in effect, ask if the meaning of a sentence of the form  $\ulcorner N\phi \urcorner$  is one that *once* yielded a truth; rather, we want our logic to have the result that prefixing 'P' to a sentence of the form of  $\ulcorner N\phi \urcorner$  doesn't generate something with a truth value different from that of  $\ulcorner N\phi \urcorner$ .

Thus, we use our functions in  $(\mathcal{P}(W))^{T \times T}$  to represent sentence meanings. The first argument is used, in effect to keep track of what time occurrences of 'N' denote; the second argument, representing contexts, associates a proposition with a sentence in a context, given a value for the first argument. By associating the appropriate functions on meanings with 'P' and 'N', we achieve the result that 'P' when it looks at a sentence which doesn't have an 'N' prefixed, shifts backwards, asking if the meaning did yield a true proposition; when 'P' looks at a sentence of the form  $\ulcorner N\phi \urcorner$ , it does not do this.

A more precise explanation of the workings of an eternalist semantics for tense logic is as follows. An  $M_2$ -model for this language is again a triple  $\langle W, T, V \rangle$ , with  $W$  and  $T$  as before. To the atoms,  $V$  assigns members of the set  $M_e$  of eternalist meanings, the set  $(\mathcal{P}(W))^{T \times T}$ . These assignments obey the restriction that if  $f(\langle t_1, t_2 \rangle) = p$ , then, for all  $t_3$ ,  $f(\langle t_3, t_2 \rangle) = p$ . To the operators of the language,  $V$  assigns members of  $(M_e)^{M_e}$  as follows:  $V(P)$  is the  $f$  such that  $[f(g)](\langle t_1, t_2 \rangle) = p$  iff for some  $t_3$  less than  $t_2$ ,  $g(\langle t_1, t_3 \rangle) = p$ .  $V(N)$  is the  $f$  such that  $[f(g)](\langle t_1, t_2 \rangle) = p$  iff  $g(\langle t_1, t_1 \rangle) = p$ .  $V(\diamond)$  is the  $f$  such that  $[f(g)](\langle t_1, t_2 \rangle)$  is  $W$ , if  $g(\langle t_1, t_2 \rangle)$  is non-empty, and the null set otherwise.

Continuing to suppress reference to a model, we define the semantic value of a formula  $A$  as  $V(A)$ , if  $A$  is atomic; otherwise, where  $A$  is the result of prefixing  $0$  to  $B$ , the semantic value of  $A$  is  $V(0)$  applied to the semantic value of  $B$ . We say that a formula  $A$ , taken relative to a time  $t$ , is true at a world  $w$  iff  $w$  is a member of the semantic value of  $A$  applied to  $\langle t, t \rangle$ . (Note that we now take worlds *simpliciter* as the circumstances of evaluation, for it is an eternalist interpretation of tense logic which is under discussion.) A formula  $A$  is  $M_2$ -valid iff for every  $M_2$ -model  $\langle W, T, V \rangle$ , for every  $t$  in  $T$  and  $w$  in  $W$ ,  $A$ , taken relative to  $t$ , is true at  $w$ . Note that this determines the same set of validities as our previous semantics.<sup>10</sup>

Representing meanings as we have in these semantics accounts for the intuition that (part of) knowing the meaning of a sentence is correctly associating with the sentence a function from contexts to propositions. For the semantic value of a sentence in the language is here a function in  $(\mathcal{P}(W))^{T \times T}$  which is such that, applied to  $\langle t, t \rangle$ , it yields the proposition expressed by the sentence relative to  $t$ . Our representation also accounts for the way that 'now' 'freezes' the content of sentences to which it is prefixed. To see this, let  $N$  be the semantic value of ' $N$ ',  $P$  the semantic value of ' $P$ ', and  $M$  any function in  $(M_e)^{M_e}$ . Note that  $N(M) = P(N(M))$ .

Making use of this last semantics, the eternalist is able to give a coherent semantical account of tensed English in line with his metaphysical views. His account cannot be faulted by the temporalist for its representation of the consequence relation, for the eternalist offers us the same set of validities which the temporalist offers. The account validates the intuition that there is a semantic parallel between tenses and the logical modalities – both are taken to operate on the meanings of sentences. The account is propositionalist: The formalism associates, relative to times, a representative of a proposition – an eternalist intention, a subset of  $W$  – with each formula, with the result that a sentence is true, relative to a time, iff the associated proposition is true. Finally, the picture of how tensed English 'works' associated with the semantics is no less intelligible than that provided by either of the temporalist semantics considered above. Indeed, save for the difference between the representation of linguistic meaning required by the differing views of the eternalist and temporalist, the picture of tensed English associated with our  $M_2$ -models seems to be, at base, that associated with  $M_1$ -models.

I conclude that the eternalist can make semantical sense out of tensed English. Whether eternalism or temporalism is the preferable propositionalist

view ought to be decided, not on the basis of their accounts of tensed English, but on the basis of their differing accounts of the truth conditions for ascriptions of belief. For it is here that there is a substantive difference between the two views – the views must associate distinct objects of belief with sentences such as ‘Nixon is president’.

As I have argued elsewhere, here eternalism clearly has the upper hand: It is not committed to the validity of fallacious arguments such as

Edwina believed that Nixon was up to no good in the White House, and she still believes that.

Thus, Edwina believes that Nixon is up to no good in the White House.

The temporalist is committed to the validity of such arguments (See [TE]).

In this paper, I have argued that the propositionalist view I have called eternalism is consistent with the view that the semantics for tensed English is to be represented via Priorean tense logic, a representation which, among other things, requires that tenses and logical modalities be interpreted as having similar semantics. I have done this by showing that one can take tenses and modalities to operate on meanings, entities distinct from propositions. Since there are good reasons for propositionalists to be eternalists in the first place, the moral of this piece is clear: Propositionalists who wish to represent tensed English using tense logic should resign themselves to the idea that tenses operate on the meanings of sentences, not upon the propositions (i.e., the objects of belief) those sentences express.<sup>11</sup>

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#### NOTES

<sup>1</sup> In [TE]. References to this and to other works will, generally, be indicated, parenthetically, in the text.

<sup>2</sup> Kaplan poses this objection in [D]. Part of that work – but not that part in which Kaplan poses the objection which I will discuss – has been published as [LD].

<sup>3</sup> A discussion of the tense-logical way of looking at English can be found in A. N. Prior's ‘Changes in events and changes in things’ in [TT].

<sup>4</sup> Two things need to be noted here. First of all, it is, of course, true that propositions can be represented as the characteristic functions of sets of circumstances. I will, for simplicity, ignore this fact. Second of all, Kaplan himself accepts the view that, within the context of ‘traditional’ semantics for tense and modal logic, intensions are indeed the appropriate representatives of propositions. (See [D], *passim*.)

<sup>5</sup> This last assertion is controversial. Some philosophical logicians seem to feel that the

*only* role of semantic values is that of effecting an appropriate distribution of truth values to sentences within a formalism; on their view, the purpose of formal semantics is not to portray the 'semantic reality' (if such there be) of the fragment of English being formalized.

Kaplan, so far as I can see, disagrees with this latter view; so do I. At any rate, Kaplan seems to suppose that there is a *correct* way to represent tensed English – a representation in which tenses look at propositions. Given this assumption, it does make sense to speak of a formal representation of English as accurately reflecting (or failing to accurately reflect) the semantics of tensed English.

<sup>6</sup> The notion of character is discussed in [D] and in [LD]; the reader is referred to these works for a fuller discussion. For the sake of simplicity, I ignore some of Kaplan's conceptual apparatus in explaining the notion of character. In particular, I do not make use of Kaplan's technical notion of an occurrence of an expression in a context.

<sup>7</sup> The definition of validity adopted here is Kaplan's own; see [LD].

<sup>\*</sup> A proof would proceed by first noting that the sets of  $P$ -models and  $M_1$ -models can be bijected into one another: Map a  $P$ -model to the  $M_1$ -model in which atomics are assigned the constant function to whatever they are assigned in the  $P$ -model. A trivial induction then shows that a formula is true in a  $P$ -model iff it is true in the image of the  $P$ -model in the bijection.

<sup>9</sup> This fact about 'now' was, to my knowledge, first discussed in print by Prior in [N].

<sup>10</sup> The proof proceeds more or less as that in Note 8; begin by bijecting the sets of  $M_1$  and  $M_2$ -models.

Some readers may have the feeling that my  $M_2$ -models are 'really'  $M_1$ -models in disguise (and that  $M_1$ -models are 'really'  $P$ -models). How, the reader may ask, can such trivial-seeming reformulations of one semantics establish any interesting philosophical point?

I must stress that, in an important sense, these semantics are *not* trivial reformulations of one another. They show that, semantically, English tenses are capable of a number of different interpretations – as being propositional operators or as being operators on meanings. The semantics are designed to reflect *distinct* views about the workings of tensed English. If the data about tensed English (minus, perhaps, data about tensed ascriptions of belief, like that discussed in [TE]) does not seem to force one of these interpretations upon us, then this is a problem for Kaplan. For Kaplan's objection to eternalism, I believe, begins with the assumption that such data does force one interpretation of the semantics of tensed English upon us.

<sup>11</sup> I would like to thank Edmund L. Gettier for his valuable comments on and criticisms of earlier drafts of this paper. I also thank Harold Levin for discussions and suggestions on the topics discussed in this paper.

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