A Unified Tenseless Theory of Time

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ABSTRACT: Concerning the versions of the Tenseless Theory of Time, the Old B-theory has two: the Date-analysis version and the Token-reflexive version, while the New B-theory has three: the Date-analysis, the Token-reflexive and the Sentence-type versions. Each of these five versions of the B-theory has received serious attacks from the A-theorists, some of whom even claim that the tenseless theory "though still widely held, is a theory in retreat" (Craig 1996), and that "if Quentin Smith (1993) delivered the mortal blow to the New B-Theory of Language then Laurie Paul (1997) has written its obituary" (Craig 1999). In this paper, by making more precise some key notions involved in the formulation of a tenseless theory – in particular, two notions of truth conditions, two notions of meaning and two notions of translation are distinguished – I have come up with a single B-thesis for the B-theory. When charitably interpreted, the two versions of the old theory and the three versions of the new theory can all be regarded as special ways of presenting the same B-thesis, and the various A-attacks raised against these versions can then be resolved in a systematic way.

KEY WORDS: B-theory of time, *ch*-meaning, *cn*-meaning, *pt*-truth-condition, *pw*-truth-condition, *tk*-translation, *tp*-translation.

1. Introduction

Since the early decades of the twentieth century, there has been an ongoing debate between the proponents of the A-theory (tensed theory) of time and those of the B-theory (tenseless theory) of time. The former typically hold that *pastness*, *presentness* and *futurity* are real properties of events and that a mind-independent *Now* moves from the past towards the future; the latter maintain that what we have is a static time, one in which events are merely related by relations such as *earlier than*, *later than* or *simultaneous with*. While this is presumably an *ontological* debate, it seems that nearly all philosophers of time in the analytic tradition are concerned with

the relevant semantic issues. Thus while the old B-theory holds the naïve view that tensed sentences can be *translated* into tenseless sentences, and hence eliminated from natural language, the new B-theory, while conceding that such direct translatability would not be possible, maintains that the truth conditions of tensed sentences can be *described* in terms of B-relations. Still, both the tensed and tenseless theorists assume that *ontological conclusions* can be drawn from *semantic considerations*.[1] This would imply, among other things, that if B-series relations alone are sufficient for a complete description of time, then the A-series ontology should be abandoned. "Tensed sentence analysis" has therefore become a recurring theme in the philosophy of time: while the A-theorist tries to establish an A-ontology through the irreplaceability of tensed sentences, the B-theorist claims that tensed sentences can either be translated by tenseless ones (the old theory), or be given tenseless truth conditions (the new theory).

In the literature, we find diverse A- and B-positions in this ongoing debate. The A-theorists attack B-positions and the B-theorists fire back, and the B-theorists also disagree among themselves as to which version of the B-theory truly holds. While some A-theorists claim that the new B-theory of time is a theory in retreat, cf. Craig (1996), and some B-theorists reply that these A-theorists have raised irrelevant objections to their position (cf. Oaklander 1991, 2003), other B-theorists admit that certain versions of the B-theory cannot really stand. For instance, Mellor (1998) admits that the token-reflexive account which he defends in *Real Time* is problematic; Dyke, on the other hand, while embracing the token-reflexive version, admits (see Dyke 2002) that the date-analysis version Mellor subsequently adopts in *Real Time II* is unsatisfactory; Paul regards both the token-reflexive and date-analysis versions of the B-theory as being incapable of withstanding the attacks from the A-theorist Smith, and goes on to propose her sentence-type version of the theory (Paul 1997).[2]

Finally, Oaklander (2003) observes that in this debate, at least four notions of truth condition and four notions of meaning may be found. I agree with Oaklander that the failure to distinguish different notions of truth condition and meaning is partly, if not wholly, responsible for the generation of these numerous positions. Therefore, I feel that we first need to make as clear and precise as possible all of the key concepts involved in this debate. In this paper, I shall start with providing definitions for two distinct notions of truth condition.[3] Each notion of truth condition is then

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[1] In this paper, I will accept this controversial position uncritically.

[2] Oaklander (2003) even proposes a "newer" version of the B-theory.

[3] It is worth noting that Torre (2009) distinguishes "conditions for the truth of tensed-tokens" and "conditions for the truth of propositions expressed by tensed tokens", and provides three formulations for both the date-version and the token-version, depending

associated with a particular notion of meaning, and each notion of meaning is subsequently associated with a particular notion of translation. In terms of these concepts of truth condition, meaning and translation, I shall then outline a unified B-theory of time. Given certain presuppositions and depending on the way we look at it or understand it, this theory may be seen to fit any of the five existing versions of the B-theory of time.

Section 2 of the paper will be devoted to the definitions of truth condition, meaning and translation. In Section 3, I present a unified B-theory of time in terms of the notions defined in Section 2, and then in sections 3.1–3.5 I charitably re-interpret the five existing versions of the B-theory and fit them into the framework of my unified B-thesis. Furthermore, I offer, from the viewpoint of this unified account, systematic replies to the A-attacks with regard to each of the five versions of the B-theory. In Dyke (2002) and Oaklander (2003) we can find replies to some of the A-attacks on the new token-reflexive B-theory that may seem congruent to my own replies.

2. Truth-Condition, Meaning and Translation

For the past few decades, the debate between the A-theory and the B-theory has centered around the issue of making sense of tensed sentences with tenseless facts. The old B-theory holds the naïve view that, for every tensed sentence, one can find a tenseless sentence that has the same *meaning* as the former, thus *translating* the former, rendering the "tensed reality" proposed by the A-theory a sheer illusion. However, as the old B-theory did not seem to be able to stand up to the attacks of A-theorists, B-theorists came up with a "new B-theory of time": this concedes that tensed sentences indeed cannot be translated into tenseless ones, yet claims that the *truth condition* of a tensed sentence can be stated in terms of a tenseless sentence. However, it turns out that the three versions of the new B-theory do not seem to fare any better, as each of them has still proved vulnerable to the attacks of the A-theorists.

My own claim is that if we can, by always distinguishing between possible worlds and possible tokens, and between sentence tokens and sentence types, make the notions of *truth condition*, *meaning* and *translation* precise, then there is no need to abandon any version of the B-theory.

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on what one takes the truth-bearers to be. Our treatment is different from his in that i) propositions are *not* admitted into our ontology in the first place, ii) the *m-truth-condition* that Torre dismisses in his paper – according to him, "The New B-theorist should claim that neither the token-reflexive theory nor the date theory are in the business of providing m-truth-conditions" – will play an important role in our discussion here.

What we need is a set of well-defined words/phrases that allows us to articulate a precise and unified B-thesis, one which incorporates all five of the presently-existing versions of the B-theory. In Section 3, the five versions of the B-theory will be re-interpreted as special ways of presenting the same B-thesis.

Now, in subsection 2.1, I shall distinguish two notions of truth condition and then, based on these, distinguish two notions of meaning and two notions of translation in subsections 2.2 and 2.3 respectively.

2.1 Two Notions of Truth-Condition
The *pw*-truth-condition

Let us begin with the simplest model of how language works: a sentence *token* is uttered, a *world* is called upon, and then a *truth-value* is obtained. In other words, the pairing of two entities, namely a sentence token and a world under consideration, yields a truth-value. However, in reality, given a sentence token that is uttered in the real world, we are already presupposing this *world* when we have the *token*, and hence the truth value of the token is fixed once and for all. As a result, the dependency of the truth value on the state of the world cannot be readily studied. What are we to do about this?

Observe that given a sentence token that is uttered in the world, we may not know the details about the world, hence the truth-value of the token may not be available to us. For instance, let u be the token "Paul Tillich's birthday is August 20", uttered by me as I type this sentence. Even though u indeed has a fixed truth-value, this value may not be known to us.[4] In order to pin down the truth value, we will have to see what the "circumstances of evaluation" – the state of the world in its relevant respects[5] – actually are. However, if we are only concerned with grasping the meaning of a sentence token, then we do not need to know the actual state of the world in order to pin down its ultimate truth value. It suffices to know the token's *truth condition* – defined as a function that relates the possible states of the world to the corresponding truth values of the sentence token. And this truth condition precisely states the dependency of the truth value of a sentence token on the state of the world in which it is uttered.

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[4] In principle, one can claim that whenever a sentence is uttered, its truth value is "fixed". But, in practice, this claim is somehow vacuous, as we could just as well assert that your future is "fixed" because *the world will be what it will be*.

[5] Here I borrow the words of Wright (2007). What concerns us is the state of the world in *all* respects. The primary concern of that paper, however, is the role the *context of assessment* can play in determining the truth of an utterance.

I shall abbreviate a "possible state of the world" as a "possible world" in order to conform with other authors' preference for the latter term. Note that according to this definition, a "possible world" is by no means a "world" but rather a "possible state" of the world.[6] Indeed, we have only one world, i.e. the real world, but we can, given our ignorance of the actual state of this world, envisage various possible states of it. As a result, we can talk about the truth of the token u with respect to a possible world w. I shall call this sort of condition the *pw-truth-condition* of the token, where the "*pw*" here is shorthand for "possible-world". A typical *pw*-truth-condition takes the following form:

> Let u be a specific token of "Paul Tillich's birthday is August 20" uttered in the real world. For every possible world w in which u is uttered,[7] the token u is true in w if and only if Paul Tillich's birthday is August 20 in w.

Indeed, for the word "condition" to make sense there has to be something pending, and in the present case it is this "state of the world" that is there for us to find out – for knowing that we are in the world does not, in itself, tell us what the state of our world is. Therefore, various possible worlds, i.e. possible states of the world, are introduced into the picture to help us state the *truth condition* for u.

The *pt*-truth-condition

Now if, instead of being given a specific token uttered in the real world, we are considering an *unspecified* token of a sentence type, then even if we know everything about the world we may still not know the truth-value of the token, as we have no idea in what context it is to be uttered. Thus in order for a possible token to be finally associated with a truth-value, i.e. to pin down the truth-value of the token, we need to know both the *context of the token* and the *state of the world*. In this case we may speak of a *possible-token* truth-condition, or simply a *pt-truth-condition*, which typically takes the following form:

> For any possible token u of the sentence type "Paul Tillich died 45 years ago", the token u is true if and only if the death of Paul Tillich is 45 years before the time of u.

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[6] The philosophical implications of this definition remain to be explored elsewhere.

[7] And, for simplicity's sake, we shall merely say that u is uttered *in* the possible world w, rather than that w is a possible state of the world such that u is uttered in the world. In any case, there is no point in worrying about whether the token u is a so-called "transworld-identity", as we here have only one world and one token, and the token u is uttered in the world.

Note that while there is no mention of the world in this statement, we should bear in mind that, as before, possible states of the world play a significant role here. A *pt*-truth-condition here is in fact associated with a function from possible tokens to *pw*-truth-conditions, where the latter are in turn associated with functions from possible worlds to truth-values.[8]

With the exception of Laurie Paul, who (see Paul 1997) is concerned with the truth condition of a sentence *type*, most philosophers of time talk about the truth condition of a sentence *token*.[9] Now, by a truth condition they can either mean a *pw*-truth-condition or a *pt*-truth-condition. If they are concerned with a specific token uttered in a particular context, then they are interested in a *pw*-truth-condition. If they are, on the other hand, concerned that the truth-value of a token u be dependent on the context of its tokening, i.e. on where, when, and by whom it is uttered, then what they are thinking about is not an actual token u but a possible token u (i.e. "u" as a token variable) of the type U to which u belongs. And the truth-condition in question is then the *pt*-truth-condition for a token of a sentence type, one which can be prescribed via the specification of a truth-value for each possible token u of that type and for each possible world in which u is uttered.

To get a firmer grasp of the distinction between these two types of truth-condition, we can compare the notion of truth condition with the notion of "the condition of being a bachelor". The subject of the former is a sentence token and the subject of the latter is a person. While we may, on some occasions, talk about the condition of being a bachelor for a person, we may, on others, talk about the condition of being a bachelor for Joe. How are we to make sense of these conditions?

According to Kemp (1998: 485):

> if we ask under what condition an arbitrary x is a bachelor, we ask for an explanation of the concept or property *x is a bachelor*, the sense of "x is a bachelor"; but if we ask for the condition under which some *particular* Joe is a bachelor, then clearly the condition is that *Joe be an unmarried man*.[10]

Note however that "x is a bachelor" is not a well-formed sentence in itself, and the condition for an arbitrary x to be a bachelor is better thought of as being governed by "for any x, x is a bachelor iff it belongs to the set B", where B is the extension of *bachelor* which can be suitably specified. "Joe is a bachelor", on the other hand, is a well-formed sentence and it is

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[8] If the state of the world is known, then to get the truth of a possible token we would only need to know the context of its tokening.

[9] See for instance the articles in Oaklander and Smith (1994).

[10] Kemp actually identifies the truth condition of "Joe is a bachelor" with the proposition expressed by it.

concerned with the world rather than a set of individuals within it. The "condition of being a bachelor" for Joe is simply Joe's being a bachelor. And immediately this raises the issue of Joe's being a bachelor in different *possible worlds* – possible outcomes of our investigation – despite the fact that, in the actual world, whether or not John is a bachelor has a fixed truth-value already.

Our notion of the *pw*-truth-condition of a token constant is analogous to that of "Joe is a bachelor", while the *pt*-truth-condition of a token variable u is analogous to the bachelor-condition of a person-variable x. In sum, we have

1(i) $\underline{u_0 \text{ is true}}$ iff …   1(ii) $\underline{\text{A token } u \text{ of } U \text{ is true}}$ iff …

2(i) $\underline{\text{Joe is a bachelor}}$ iff …   2(ii) $\underline{\text{A person } x \text{ is a bachelor}}$ iff …

The underlined clauses of 1(i) and 2(i) are both about *the world*, and we need to have a possible world at hand in order to decide whether their respective conditions are fulfilled. The underlined clauses of 1(ii) and 2(ii) are, in contrast, not well-formed sentences. Nonetheless, if u and x are assumed to be universally quantified, then 1(ii) and 2(ii) allow us to decide whether, given a possible world w and a possible instantiation of the variables u or x, the respective clauses hold in w.

Therefore, conditions of the form "A token u of U is so and so iff …" and "A person x is so and so iff …" are actually concerned with *the sentence type U* and *the personhood* itself, rather than with a particular token and a particular person respectively. To be more specific, the *pt*-truth-condition of a token u is concerned with the type U of which u is a token, rather than the token u itself. Thus, by abusing notation, we may as well talk about the "*pt*-truth-condition" of a sentence *type*.

The *pt*-truth-condition of a sentence *type U* can be made more concrete by the following statement:

(*PT*TC) A token u_I of U uttered in a context I is true if and only if $w_I \in I(U)$, where w_I is the world in which u_I is uttered, and $I(U)$ is the set of possible worlds determined by the sense of U and the context I.[11]

As the statement takes the form "A token u_I … is true if and only if …", inevitably some philosophers of time would get the following wrong im-

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[11] Note that I have assumed that the context I itself determines a unique possible world w_I. A more general statement should be of the following form: A token u_I of U uttered in a context I is true in a possible world w if and only if $w \in I(U)$, where $I(U)$ is the set of possible worlds determined by the sense of U and the context I.

pressions: i) the truth condition under consideration is about a specific sentence token u_I ; and ii) there are two clauses here joined by the connective "if and only if", one declaring the truth of the token u_I while the other prescribes the truth condition of u_I. The point to note here, however, is that in the statement (PTTC), the term "I" plays is the role of a *variable* rather than that of a *proper name*, and consequently, unless the context I is instantiated to the effect that both "u_I" and "w_I" refer to specific entities, the clause on the left hand side of "if and only if" and the clause on the right are *not* well-formed sentences at all.

2.2 Two Notions of Meaning

Meaning is a complicated issue and one which creates many problems for philosophers, yet ideally a theory of time should be supported by a well-established, comprehensive theory of meaning. Given that the latter theory is not available presently, we can only proceed with the sketch of a minimalist theory of meaning. More precisely, we shall be content with the stipulation of two basic notions of meaning that allow us to get on with the analysis of tensed sentences.[12] For precision and simplicity we shall stick to the following principles: 1) the only meaning-bearers are sentence tokens and sentence types; 2) the meaning of a sentence token is exhausted by its truth condition; 3) the meaning of a sentence type is exhausted by the truth condition of its possible tokens. We then distinguish between the following two notions of meaning:

The *cn*-meaning of a token

The *content*-meaning[13] of a token *u*, or in short the *cn*-meaning of it, is the thing we grasp when we get hold of its *pw*-truth-condition. In other words, the meaning of a token is exhausted by its *pw*-truth-condition. In Fregean terms, the referent of a token *u* is its truth-value, and in that case the *pw*-truth-condition of *u* can be thought of as an incomplete truth-value, in the sense that one still has to know the state of the world – what the world actually is – in order to get the truth-value.

The *ch*-meaning of a type

The *character*-meaning, or the *ch*-meaning for short, of a sentence *type* is the thing we grasp when we get hold of its *pt*-truth-condition. Clearly, while the *cn*-meaning of a token corresponds to a *content* (what is said) in Kaplan's terms, the *ch*-meaning of a type thus defined is associated

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[12] In particular, we are concerned with sentential meanings only, leaving lexical meanings completely untouched.

[13] See Kaplan (1989) for the definition of content and character.

with Kaplan's *character* (that which determines the content in varying contexts).[14] Again, a *ch*-meaning can be thought of as an incomplete *cn*-meaning, in the sense that one still has to know the context in which the type is to be tokened in order to get the *cn*-meaning.

Note that as we are taking a realistic view of language, the "meaning" of a sentence type can only be described through the truth-values of its *tokens*. Entities such as "the truth-value of *There is no token now* in a prehistoric era" or "the proposition expressed by *I am not uttering anything now*" make no sense, as there is no indication as to how the italicized parts are to be uttered.

We now look at two usages of the term "meaning" in the literature of the philosophy of time, and see how they can be clarified in our terms. Firstly, some authors claim that different tokens of a sentence type can *mean* different things. For example, a token of the sentence type "It's Tuesday" uttered on July 7 *means* that July 7 is Tuesday, while a token of "It's Tuesday" uttered on July 8 *means* that July 8 is Tuesday. What they are doing here is, in our terms, associating two different *pw*-truth-conditions with the two distinct tokens and thus giving them different *cn*-meanings. The extensions of these two *cn*-meanings are simply two different sets of possible worlds.

Secondly, the slogan that the meaning of a sentence consists in its truth condition is regarded by many as unacceptable, because most people are convinced that the meaning of a sentence is more than its truth condition. As a typical example, Dyke (2003: 80) claims that

> Tensed meaning reveals itself when we compare a tensed sentence *token* with a *token* of the tenseless sentence that states its *truth conditions*. For any pair of sentences like this, we can see that they do not *mean* the same thing. So tensed meaning does not reside in the truth condition of tensed sentences. What we can conclude from this is that there is more to *meaning* than to *truth conditions*. [The italics are mine.]

Clearly, some tidying-up of terms needs to be done here. It is not difficult to see that the *truth condition* Dyke has in mind here is the *pw*-truth-condition of a token, while the *meaning* she has in mind is the *ch*-meaning of a type. So there is no point in claiming, as she does, that "there is more to meaning than to truth conditions" – the *pw*-truth-condition is associated with a particular token of a sentence type, yet the *ch*-meaning is associated with the sentence type itself. What needs to be emphasized here is

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[14] It is important to note that when the *ch*-meaning of a sentence type is under consideration, a token of the type actually ranges over *all* contexts of *all* possible worlds. That is, on one level we should choose a possible world for the type to be tokened, and on another we should locate a context in that possible world for the utterance of the token.

this: the *cn*-meaning of a sentence token is *completely* determined by its *pw*-truth-condition, while the *ch*-meaning of a sentence type is *completely* prescribed by its *pt*-truth-condition.

2.3 Two Notions of Translation

"Translation" is a term which features heavily in the debate between the *A*-theorist and the *B*-theorist. According to Dr. Johnson, to translate is "to change into another language, retaining the sense". To capture the spirit of Dr. Johnson, assuming that his "sense" is synonymous with "meaning", it is natural to define translation in terms of the sameness of meanings. Based on the results of the previous subsections, we come up with the following two notions of translation:[15]

The *tk*-translation of tokens

Two sentence *tokens* are said to *tk*-translate each other provided that they have the same *cn*-meaning.

The *tp*-translation of types

Two sentence *types* are said to *tp*-translate each other if they have the same *ch*-meaning.[16]

To summarize, we have

> (#) Sentence *tokens a* and *b tk*-translate each other
>   iff *a* and *b* have the same *cn*-meaning
>   iff *a* and *b* have the same *pw*-truth-condition.
> (†) Setence-*types A* and *B tp*-translate each other
>   iff *A* and *B* have the same *ch*-meaning
>   iff *A* and *B* have the same *pt*-truth-condition.[17]

Early philosophers of time used to say that "A token of 'John is hungry now' uttered at *t* can be translated by a token of 'John is hungry at *t*'", based on the conviction that these two tokens have the *same* "truth condition". But later they conceded that they were mistaken: the translation did not work – the "truth condition" of the token of "John is hungry now" uttered

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[15] Some philosophers talk about the translation of "sentences and their tokens" as if one notion of translation works for both types and tokens at the same time, cf. Smith (1993). But I believe it is not so.

[16] More explicitly, in terms of (*PTTC*), sentence types U_1 and U_2 have the same *ch*-meaning provided that for any context *I*, we have $I(U_1) = I(U_2)$.

[17] By "*A* and *B* have the same *pt*-truth-condition", I mean that possible tokens of *A* have the same *pt*-truth-condition as possible tokens of *B*, or more specifically, any given token of *A* has the same *pw*-truth-condition as a token of *B* uttered in the *same context*.

at t and the "truth condition" of the token of "John is hungry at t" are *different*, because the truth of the former is context-dependent while the truth of the latter is not. Apparently, a confusion between a *pw*-truth-condition and a *pt*-truth-condition is involved here. As I have already emphasized: i) If they are actually considering the *pw*-truth-condition of a sentence token, then how the context of a token may affect its truth value should not concern them: the two tokens do have the same *pw*-truth-condition and the same *cn*-meaning, and they do *tk*-translate each other, and that's all. ii) If they, on the other hand, do worry that the two tokens may not "mean" the same thing, because the truth-value (or, in our terms, the *pw*-truth-condition) of a tensed token is dependent on the time of utterance, while that of a tenseless token is not, then they are actually concerned with the *pt*-truth-conditions of two sentence *types*[18] and their *pt*-truth-conditions are indeed different. But then the fact that the two original tokens *happen to* have the same *pw*-truth-condition should not concern them at all.

In "The Theory of Translation", William Haas (1962: 208) makes the following remark:

> At first sight, this is what we are tempted to make of translation – an operation with three terms: two expressions, and a meaning they share. When we translate, then, we seem to establish a relation of three distinct entities, each separately apprehended: the two expressions seen on paper or heard in the air, and the meaning in the translator's mind. The meaning, presumably, we "retain" and translate; we "transfer" it from one expression to the other.

Evidently, what Haas has in mind here is the *tk*-translation of sentence tokens, and what is relevant to the translatability here is the sameness of the *pw*-truth-condition of two tokens. However, we can also consider the *tp*-translation of sentence types, as described in (†). For in this case, the *pt*-truth-condition of a sentence type can be explicitly prescribed by the (*PT*TC) of subsection 2.1, and the translatability between two sentence types is governed by the sameness of their *pt*-truth-conditions.

The following example illustrates the key difference between these two notions of translation. The guest speaker Johannes, with his English interpreter John standing besides him, utters the German token "Mir ist kalt"[19] in some context I. How should John translate the *token*? Should he opt for "He is cold", insisting that the original token and the token that translates it should have the same truth-value (or, in our terms, the same

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[18] After all, once the token is allowed to change its context, then we are concerned with "an arbitrary token of the type to which the original token belongs" rather than with "*the* token". In other words, our focus has shifted from a token to a type, and we are prescribing the *ch*-meaning of a sentence type through the employment of its tokens.

[19] The associated *sentence type* can be safely translated into English as "I am cold".

pw-truth-condition)? Or should he opt for "I am cold", insisting that this is what the speaker literally means?

Recall that the *pt*-truth-condition of a sentence type *U* can be identified with the set of all (*context*, *world*) pairs at which a token of *U* can be truly uttered. And if it is this notion of truth condition that we want to preserve in our translation of sentence types, then surely "Mir ist kalt" needs to be *tp*-translated into "I am cold". Nonetheless, some people may prefer that Johannes' token of "Mir ist kalt" be *tk*-translated into John's token of "He is cold" instead, as the two tokens happen to have the same *pw*-truth-condition. There is in fact *no conflict* between these two translations, because one is concerned with the translation of sentence types while the other is concerned with the translation of sentence tokens. For the latter, we only require that the two particular tokens, possibly uttered in different contexts, are associated with the same set of possible worlds; for the former, however, we require that any two tokens of the two sentence types are associated with the same set of possible worlds, provided the tokens were uttered in the same context. Two tokens can *tk*-translate each other without the types to which they belong *tp*-translating each other. Similarly, two types can *tp*-translate each other without every pair of their tokens *tk*-translating each other.

It is important to note that once someone has adopted the restricted sense of translation between sentence tokens, he/she should no longer worry about the fact that "Mir ist kalt" and "He is cold" may have different *pw*-truth-conditions in other contexts, for the sameness of *pw*-truth-condition here has been claimed only for *the two specific tokens* of "Mir ist kalt" and "He is cold" in question. Similarly, if John chooses to translate the token "Mir ist kalt" into his token "I am cold" type-theoretically, then he should not worry about the fact that his token fails to preserve the original *pw*-truth-condition of Johannes' token. Because what he claims is not that "this token *tk*-translates that token", but that "the type to which this token belongs *tp*-translates the type to which that token belongs".

An interesting fact to observe here is that many translators prefer to do it the latter way – they expect the audience to understand the translation *type*-theoretically – and most people in the audience indeed have no difficulty understanding his/her token of "I am cold"; when uttered in the *same context*, a token of "Mir ist kalt" and a token of "I am cold" would have the same truth-value (or, in our terms, the same *pw*-truth-condition).

3. A Unified Thesis for the B-theory

Equipped with the notions defined in the preceding section, we may state the thesis of the B-theory of time as follows: the *ch*-meaning of a tensed sentence type can be completely described in terms of a *tenseless pt*-truth-

condition. To be more specific, the *ch*-meaning of the sentence type "*e* is occurring now", where for simplicity *e* is assumed to be an ideal event with no temporal duration,[20] can be described by the following *pt*-truth-condition:

> **[B-Thesis]** Let *u* be any possible token of the type "*e* is occurring now". Then, *u* is true iff the time of utterance of *u* equals that of *e*.[21]

This *pt*-truth-condition is "tenseless" in the sense that no tensed facts are referred to and no tensed phrases are employed in the thesis. Here we must keep in mind the point that the type "*e* is occurring now" is not "used" but only "mentioned", in particular, the tensed phrase "is occurring now" is not being used here.

With regard to this formulation, we note that in the process of describing the meaning of a sentence type, there is no particular token that we need to pay special attention to. Rather, we have a variable "*u*" whose value runs through all possible tokens of the type. In other words, unlike some of the existing versions of the new B-theory, this B-thesis does not assume, on the left side of the "iff", any information about the token *u*, such as the date of *u* or any property of it. Therefore, the tenseless criterion for the truth of the token *u* will have to be stated on the right side of "iff", and this criterion should be stated in terms of some features of *u* – such as the time of utterance of *u* – that are essential for the determination of its truth value.

Note also that questions such as "Does *the* B-sentence really translate the A-sentence?", "Does *the* B-sentence really have the same meaning as the A-sentence?" or "Does *the* B-sentence really have the same truth-condition as the A-sentence?" are all meaningless here, because there is simply *no* well-formed B-sentence on the right side of the connective "iff" – the "*u*" here is merely a *variable*. The B-thesis in effect adopts a tenseless meta-language to provide a *ch*-meaning for a tensed sentence type.

Let *e* be a given event, and *P* be the set of all possible tokens of the sentence type "*e* is occurring now". Let $t(x)$ denote the time of *x*, where

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[20] Thanks are due to an anonymous referee who, in his comment on an earlier version of this paper, reminded me that an event with temporal duration may incur further complications to the thesis.

[21] Here, by one time "equaling" another I mean that, assuming a non-relativistic picture of space-time, the two times under consideration are the same, that is, the time $t(u)$ of the token *u* and the time $t(e)$ of the event *e* refer to the same temporal location. Later, I shall introduce the identity symbol "=" to assert the identity of two times. I thank an anonymous referee for his comment on an earlier version of this paper, suggesting such a clarification of terms.

x here can be either an event or a token. Then the B-thesis can be written symbolically as:

[B-Thesis] (symb) $\forall u\ [u \in P \Rightarrow (u \text{ is true iff } t(u) = t(e))]$.[22]

The B-thesis can be further analyzed through the description of the *cn*-meanings of the tokens. The *cn*-meaning of a sentence token *u* of "*e* is occurring now" is given by the following *pw*-truth-condition: for any possible world *w* in which *u* is tokened, *u* is true in *w* iff *u* is simultaneous with *e* in *w*. By specifying the *pw*-truth-condition for each token, the B-thesis can then be spelled out in greater detail:

[B-Thesis] (full) $\forall u\ \forall w\ [u \in P \supset [(u \text{ is true in } w) \equiv (t_w(u) = t_w(e))]]$.

Here *w* stands for a possible world, and $t_w(x)$ denotes the time (or temporal location) of *x* in *w*.

We shall now see that, for the five existing versions of the B-theory, if one can suitably interpret – in terms of the terminology introduced in the previous section – the notions of "translation", "meaning" and "truth condition", then each of these can be regarded as but a particular way of presenting the same B-thesis.

3.1 The Old Date-analysis Version

As characterized by Quentin Smith in the Introduction to Part I of *The New Theory of Time* (Oaklander and Smith 1994: 18), the old tenseless theory of time

> … is the theory that tensed sentences or tokens are translatable into tenseless sentences, and therefore that tensed sentences do not ascribe any temporal determinations not ascribed by tenseless sentences.

A typical claim of the old theory is the following thesis concerning the translatability of a tensed sentence into a tenseless one:

[Old Date-analysis] The sentence "*e* is occurring now", tokened at *t*, can be *translated* into "*e* occurs at *t*".

Evidently what the old theorist asserts here is, in our terms, the translatability between two sentence *tokens*. And what governs this translatability is the sameness of *cn*-meanings, while the latter is in turn governed by the sameness of the associated *pw*-truth-conditions.

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[22] Note that here, instead of the material conditional $\supset$, I use $\Rightarrow$ to stand for the conditional "if… then…", and instead of the material bi-conditional $\equiv$, I use "iff" to stand for the bi-conditional "if and only if". This is to make it clear that the evaluation of such conditionals involves a set of possible worlds rather than just one world.

Now, what is wrong with the old tenseless theory of time according to this interpretation? Nothing is wrong with it. The *pw*-truth-condition for the token "*e* is occurring now", tokened at *t*, is indeed identical to that of a token "*e* occurs at *t*" uttered in any context. However, if this is indeed the case, why then is it that nearly everyone today thinks that the old theory should be abandoned? Let's look at Mellor's (1981: 78) reason for the failure of the old date-analysis version first:

> … the truth conditions of tenseless sentences are not token-reflexive. No tenseless sentence, therefore, can have tokens whose truth conditions are everywhere and always the same as those of a tensed sentence, because, by definition, the latter vary from place to place or time to time, and the former do not. That is why no tenseless sentence can mean the same as the tensed one does.

What is Mellor's claim here, in our terms? He is, in effect, saying that because tokens of a tensed sentence *type* may have different *pw*-truth-conditions, while tokens of a tenseless sentence *type* may not, a tenseless sentence *type* cannot *translate* a tensed sentence *type*. Clearly Mellor himself is confused and fails to distinguish between (a) the notion of translation between sentence tokens that was used in the thesis of the old theory, and (b) the notion of translation between sentence types which was employed by him to explain the failure of the old theory. Mellor is indeed right in claiming that the type "*e* occurs at *t*" does not *tp*-translate the type "*e* is occurring now", as the tokens of the former all have the same *pw*-truth-condition while those of the latter do not, yet this fact does not imply that *the* token "*e* is occurring now" tokened at *t* has a different *pw*-truth-condition from that of any token of "*e* occurs at *t*", and it is this difference in *pw*-truth-conditions that is needed to refute the old theory.

Again, let P be the set of all possible tokens of the sentence type "*e* is occurring now" and $t(x)$ be the time of x; then symbolically the old date-analysis thesis can be charitably interpreted as:

[Old Date-analysis] (symb) Given that $u \in P$ and $t(u)=t$, u can be *tk*-translated into "*e* occurs at *t*".

One can either think of u as a particular token of interest to us, and re-gard "$u \in P$ and $t(u)=t$" as a presupposition; or one can think of "u" as a token variable which is governed by a universal quantifier $\forall u$, and in this case "$u \in P$ and $t(u)=t$" becomes the antecedent of a conditional. In either case, the *tk*-translatability is merely claimed for an instantiated token u, for which the assumption $t(u)=t$ is indisputable.

In sum, if we are interested in the *tp*-translation of sentence types, then no tenseless sentence *type* can translate a tensed sentence *type*. However,

if the old tenseless theory of time is *merely* concerned with the *tk*-translatability between a tensed *token* and a tenseless *token*, then inasmuch as the tokens under consideration indeed have the same *pw*-truth-condition, namely that the time t equals the time $t(e)$ of e, the old date-analysis thesis can sustain itself by sticking to this restricted sense of translation. Furthermore, as, by assumption, the t here equals the time $t(u)$ of the utterance of u, the *pw*-truth-condition is reduced to $t(u)=t(e)$; therefore this version of the old theory can be seen as a special way of presenting the B-thesis.

3.2 The Old Token-reflexive Version

The other version of the old theory that we shall look at is:

> **[Old Token-reflexive]** The sentence "*e* is occurring now" can be *translated* into "*e* is simultaneous with this utterance".

Again, the old theorist here is claiming that a tensed sentence can be translated by a tenseless sentence. And once again, we need to decide whether he/she is talking about the translation of tokens or of types.

If it is tokens that this thesis is concerned with then, given any token of "*e* is occurring now", its *pw*-truth is precisely that prescribed by a sentence "*e* is simultaneous with this utterance" uttered *in the same context*, and they *tk*-translate each other. Note that, however, unlike the date-analysis version discussed earlier, the context of the utterance of the tenseless token under consideration here matters, and if the context of the tenseless token is not specified as being identical to the context of the original tensed token then there is no point in asserting that the two tokens *tk*-translate each other.

If it is types that this thesis is talking about, then one has to make sure that "*e* is occurring now" and "*e* is simultaneous with this utterance" have the same *ch*-meaning so that they can translate each other. According to our notion of translatability between sentence types, two sentences *tp*-translate each other if and only if they have the same *ch*-meaning, and if and only if they have the same *pt*-truth-condition. Therefore, this version of the old theory amounts to saying that, for any possible token u of the type "*e* is occurring now", u is true iff any corresponding token v of "*e* is simultaneous with this utterance" uttered in the *same context* would have been true. The clause to the right of "iff" asserts that the time $t(e)$ of e equals $t(v)$ while presuming that the time $t(v)$ of the token v equals the time $t(u)$ of u. And it ends up yielding the same condition, namely $t(u)=t(e)$, that is prescribed in the B-thesis.

This token-reflexive version of the old-theory, nonetheless, faces the notorious problem of tokenless truth[23] raised by the A-theorist. Consider the sentence "There is no utterance now". The corresponding tenseless sentence is presumably "There is no utterance simultaneous with this utterance". Yet, according to the A-theorist, the former is possibly true while the latter is necessarily false: thus they have different meanings and cannot translate each other. This seemingly powerful argument has, together with Mellor's concession of the failure of the other version of the old-theory, driven the B-theorist to abandon the old theory and to formulate a new B-theory of time. However, from a naturalistic viewpoint, the problem of tokenless truth poses no threat. As I have stressed earlier, the truth-value of the sentence type "There is no utterance now" makes sense only when the type is to be *tokened*. Thus, the A-theorist's assumption that *There is no utterance now* may be true is simply groundless. On the one hand, if *There is no utterance now* is to be understood as a "thought" or a "proposition", then a well-defined notion of thought or proposition should be developed first; however, based on a naturalistic standpoint, we have not introduced and will not introduce such entities into our picture.[24] On the other hand, if it is to be understood as a sentence type then, in order to be connected with the real world, it has to be *tokened*, but then any token of it is bound to be false.

Let P and $t(x)$ be as before, and let Q be the set of all possible tokens of the sentence type "e is simultaneous with this token"; then the token-reflexive version of the old theory can be expressed in our terms as

[Old Token-reflexive] (symb) Given that $u \in P$, $v \in Q$, and $t(u)=t(v)$, u can be *tk*-translated into v.

Here we note that the *pw*-truth-condition of v is governed by $t(v)=t(e)$, which, when combined with the presupposition $t(u)=t(v)$,[25] yields $t(u)=t(e)$, which is the same requirement as that for the B-thesis. Conversely, given the B-thesis, one finds that for any u and v satisfying the presupposition, u has the same *cn*-meaning as v, and they *tk*-translate each other. Therefore this version of the old theory can be seen as a special way of presenting the B-thesis.

Conceding that the translatability thesis of the old theory is at fault, instead of clarifying and charitably interpreting the notion of translation

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[23] See Sattig (2006: 13–14) for instance.

[24] It is the responsibility of those who envisage such entities to come up with precise definitions of them. But as none of them has so far made the effort to do so, we have no obligation to assume any understanding of these abstract entities.

[25] Again, the presupposition $t(u)=t(v)$ is indisputable.

involved in the thesis as I just did, the B-theorists were quick to find a fallback position: despite the fact that tensed sentences or their tokens are not translatable into tenseless sentences,[26] so far as the meaning of tensed sentences can be adequately captured by tenseless characterizations of the truth conditions of their tokens, the tenseless view stands. We shall examine the three main strands of the new B-theory in turn in the next three subsections.

3.3 The New Date-analysis Version (Smart)

J. J. C. Smart (1980) claims that the "truth condition" of a tensed sentence utterance can be given by

> **[New Date-analysis]** Any token of "*e* is occurring now", uttered at *t*, is true if and only if *e* occurs at *t*.

This departs from the old B-theory in that the tenseless clause "*e* occurs at *t*" on the right hand side of "if and only if" *states* the truth condition of the tensed token rather than *translates* it.

Now, how does this date-analysis thesis relate to our B-thesis? In the B-thesis we are considering all possible tokens, yet the date-analysis thesis here is seemingly concerned only with the set of possible tokens uttered at *t*. We can see the date-analysis thesis as an alternative form of presenting our B-thesis in two ways: 1) the "*t*" here is thought of as a proper name, and the date-analysis thesis is concerned with the set of possible tokens that are uttered at that particular time *t*; 2) the "*t*" here is a variable, and the date-analysis is in effect stratifying the set of possible tokens with time *t*.

In the first case, one is concerned with the set of possible tokens of "*e* is occurring now" uttered at a particular time *t*. This is analogous to the reduction of the B-thesis to the date-analysis version of the old theory, except that the new date-analysis thesis here is concerned with the set of possible tokens at *t*, while the old theory is only concerned with a particular token uttered at *t*. Nevertheless, so long as we are concerned only with tokens uttered at *t*, the *pw*-truth-condition for each *u* can still be described by "*e* occurs at *t*", where *t* here simply denotes the time *t(u)*, and there is no problem with this formulation.

In the second case, for any time *t*, we consider all possible tokens of "*e* is occurring now" uttered at *t*. In other words, at any given time *t*, *t(u)* equals *t*. As the time *t* varies, every possible token *u* will eventually be run through, and for each instance *t*, the analysis for the *pw*-truth-conditions of tokens uttered at *t* simply repeats that of the previous case.

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[26] See, for instance, Oaklander and Smith (1994).

We can symbolize the latter interpretation as follows:[27]

[New Date-analysis] (symb)
 $\forall u \forall t \, [(u \in P \, \& \, t(u)=t) \Rightarrow (u \text{ is true iff } e \text{ occurs at } t)].$[28]

Note that "e occurs at t" can be written simply as $t(e)=t$.

 This interpretation is essentially our B-thesis except that the definite description $t(u)$ in the B-thesis is now presupposed to be co-referential with a referential expression t in the antecedent of the conditional. Furthermore, u is a variable, and by "the truth condition" of a *variable u* we refer to the *whole sentence* starting with $\forall u$ in which "u is true" appears, rather than merely referring to $t(e)=t$.

 We shall now briefly review a line of attack on this theory and some possible ways of defending the theory, and see how our interpretation of the thesis can help us resolve this debate. In the irrelevance-of-absolute-location objection,[29] Smith (1987) argues that Smart's thesis is false, as there is some possible world w in which the utterance, say u, and e occur simultaneously (and thus in which u is true) but at some time t' different from t. Therefore, e's occurrence at t is not a necessary condition for the truth of u. In response to Smith's attack, Oaklander suggests that to resolve the problem, one could require that the truth condition be world-indexed (Oaklander 1991). Smith then draws our attention to the fact that the world-indexing of the truth condition would lead to the following unwanted result[30] (if Henry is indeed ill on 28 July 1940 in world w):

> "Henry is ill" as spoken by John on 28 July 1940 in w is true in w if and only if the sun is 93 million miles from the earth in w.

In response to Smith's complaint that the date-analysis theorist does not seem to be forthcoming on this matter,[31] Mozersky (2001: 405) claims that "his argument fails if one allows that temporal indexicals such as 'now' rigidly designate their time of utterance…"

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[27] When t is a constant, we get the reduced version $\forall u \, [(u \in P \, \& \, t(u)=t) \Rightarrow (u$ is true iff $t(e)= t)]$.

[28] Hereafter we shall abuse notation by allowing t to stand for a time expression in English – our meta-language – as well as a constant (or variable) in the symbolic language, an object language. The story for u is similar.

[29] I borrow Le Poidevin's term; cf. Le Poidevin (2003).

[30] See Smith (1994: 74) and Chapter 2 of Smith (1993).

[31] In Smith (1999: 235), we find the following interesting passage: "I remain somewhat mystified as to why Mellor thinks the much-criticized date-analysis theory can be simply assumed (as he assumes it in *Real Time II*) without any attempt at an argumentative defense of this theory."

What can our interpretation of the date-analysis thesis say about Smith's objection?

1) Take t to be a proper name. Call it t_0 for clarity. Now, consider all possible tokens u of "e is occurring now" uttered at t_0. Any token u uttered at t_0 is true if and only if e occurs at t_0, and so is any token of "e occurs at t_0". Thus they have the same *pw*-truth-condition. The reason Smith's objection fails is that we are considering *only* those possible worlds for which the time of utterance of the tokens is t_0. To be more precise, in $\forall u \forall w \; [(u \in P \; \& \; t_w(u){=}t_0) \supset ((u$ is true in $w) \equiv (t_w(e){=}t_0))]$, it is clear that possible worlds in which u is uttered at a time t' different from t_0 are simply not of interest to us here.

2) Take t to be a variable. The idea here is that the thesis is concerned with the prescription of a "truth condition" for possible tokens of a tensed sentence *type*. The truth condition is prescribed by associating all possible tokens of this type with their respective truth-values. In this interpretation, not only do we *not* really have a token "e is occurring now" at hand, but the "t" is also *not* the proper name of a particular time. We should, as the subject of interest is a sentence type rather than a token of it, regard the terms for tokens and times that appear in the prescription of the truth condition as *variables* rather than *proper names*. With this understanding clearly in mind, all of Smith's, Oaklander's and Mozersky's discussions can be easily seen to be missing the point. After all, if there is no token u and time t for us to start with, then it makes no sense to claim that "e's occurrence at t is not a necessary condition for the truth of u". In fact, as t is itself a variable, "e occurs at t" is not even a well-formed sentence, as it is commonly thought to be.

It is worth noting that Dyke, an important figure in the B-camp, admits (see Dyke 2002) that the date-analysis version of the B-theory is unsatisfactory. In that paper, she first observes that if date expressions of the date-analysis truth condition are definite descriptions of times, then Smith's above-mentioned objection is valid, but if they are rather "names of times" then Smith's argument fails.[32] She then concedes that Smith's argument against this latter interpretation in Smith (1993) *may* succeed provided we allow Smith some crucial assumption, but claims later that "there is another, more decisive objection to the date theory":

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[32] Note that here we understand the date expression t as either a proper name or a variable.

If we let Sxy represent the relation "x is simultaneous with y", Tx represent the predicate "x is true", and e represent the event referred to by the sentence in question, the date theory can be written:

(1) For any token u of "The volcano is now erupting" uttered at t, u is true if and only if the volcano *erupts* simultaneously with t.

(1*) $(u)(t)(Sut \supset (Tu \equiv Set)$

(2) a uttered at t_1 is true if and only if the volcano *erupts* simultaneously with t_1

(2*) $Sat_1 \supset (Ta \equiv Set_1)$

The requirement of the date theory to specify the time of utterance in the statement of truth conditions results in the bi-conditional occurring as the consequent of another conditional. It follows that it is possible for the antecedent of (2*) to be false and the consequent true, while the statement as a whole is true. (Dyke 2002: 335)

Dyke concludes that "date-involving truth conditions do not state the correct truth condition for tensed sentences, since they leave it open for the tensed token to be true while the appropriate relation between the token and the date specified does not obtain" (Dyke 2002: 336). What can we say about Dyke's analysis? I think Dyke here is guilty of translating the innocent statement (2) into some (2*) which fails to capture the meaning of (2), and then attributing the failure of (2*) to that of the date version.

Adopting the terminology we have introduced earlier, we can interpret Dyke's (2) in the following four ways:

(i) Both "a" and "t_1" are proper names
     In this case, (2) *presupposes* that a is actually uttered at t_1, in other words, for a token a uttered at some time different from t_1, (2) simply makes no sense.[33] The correct symbolization of (2) should then simply be "Ta iff Set_1", meaning that the *pw*-truth-condition of *the* token a uttered at t_1 is the same as the *pw*-truth-condition of Set_1.

(ii) "a" is a variable while "t_1" is a proper name
     In this case, (2) is concerned with the truth of possible tokens of "The volcano is now erupting" uttered at a particular time t_1. The correct symbolization of (2) is then (u) $(Sut_1 \Rightarrow (Tu$ iff S$et_1)$. Note that "a", as a variable, has been replaced by the dummy index "u".

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[33] For instance, the sentence beginning "The 'I have a dream' token of Martin Luther King uttered in the year 2000 is true if and only if…" is simply incomprehensible.

(iii) "*a*" is a proper name while "t_1" is a variable

In this case, (2) is concerned with the truth of a token of "The volcano is now erupting" whose time of utterance is unknown. The correct symbolization of (2) is then (t) (Sat ⇒ (Ta iff Set). Here, t_1 has been replaced by the dummy index "t".

(iv) Both "*a*" and "t_1" are variables

In this case, (2) should be translated into $(u)(t)$(Sut ⇒ (Tu iff Set), which is similar to Dyke's (1*), except that I have used ⇒ and "iff" instead of ⊃ and ≡ to make it clear that there is one further level of quantification that has not been spelled out, namely the quantification over possible worlds. When it is written out in full, we should have something like $(u)(t)(w)$(Sut_w ⊃ (Tu_w ≡ Set_w) instead of Dyke's (1*).

Apparently, none of these interpretations suffers from the problem that Dyke indicates. I think the main reason that the A-theorist and some of the B-theorists, such as Dyke, are led to the conclusion that date-analysis is problematic is this: the role that some presupposition – a *stipulated* relation between the token and the time under consideration – plays in the date-analysis thesis has been overlooked.

The statement of the date-analysis thesis – namely, any token of "*e* is occurring now", tokened at *t*, is true if and only if *e* occurs at *t* – does *not* care about the cases for which the time of the token $t(u)$ differs from the date *t* specified. Thus there is no point in conceiving, as Smith is fond of doing in Smith (1993), *ad hoc* possible worlds in which a token *u* of "*e* is occurring now" is true (because it is simultaneous with *e*), yet the time of *u* (and of *e*) is different from the date *t*. In logical terms, we can say that the quantification over possible worlds lies within the scope of quantification over tokens and dates, and the clause "token *u* is uttered at date *t* in world *w*" can be found in the antecedent of the main conditional.

3.4 The New Token-reflexive Theory (Mellor)

In *Real Time*, Mellor presents a token-reflexive version of the new tense-less theory of time which can be summed up by the following thesis:

[New Token-reflexive] Any token *u* of "*e* is occurring now" is true if and only if *u* is simultaneous with *e*.

This token-reflexive version of the B-theory differs from our B-thesis only in that, on the right side of "if and only if", it has "*u* is simultaneous with *e*"; in the B-thesis we have $t(u)=t(e)$, where $t(u)$ and $t(e)$ stand for the time

of utterance of u and the time of e respectively. Indeed, $t(u)=t(e)$ can be seen as a rephrasing or an explanation of "u is simultaneous with e". The reason we prefer to write $t(u)=t(e)$ is to make it clear that the information relevant to the truth of u is the time of its utterance and the time of e. This, however, does *not* mean that we need to know the exact dates of u and e in order to know the truth of u. What is essential in order for us to know the truth of u is that we have a way to compare the temporal locations of the two.

The u here, again, can play either the role of a constant or that of a variable. When u is taken to be the name of a particular token, the token-reflexive thesis asserts that u has the same *pw*-truth-condition as "$t(u)=t(e)$", which in turn has the same *pw*-truth-condition as a token v of "e is simultaneous with this utterance" uttered in the same context as u; this is because $t(v)=t(u)$ would make $t(u)=t(e)$ and $t(v)=t(e)$ equivalent, and we then would get the old token-reflexive version. And if we let t denote the time $t(u)$, then the *pw*-truth-condition can be described by any token of "e occurs at t", and we then get the old date-analysis version.

If, on the other hand, u is taken to be a variable, then the *pt*-truth-condition of u associates the truth of u with the truth of "u is simultaneous with e" and the latter can again be described in our terms as $t(u)=t(e)$, where $t(e)$ here refers to the time of a special event e, and the token-reflexive version can again be thought of as a presentation of our B-thesis. Nevertheless, the sentence type "e is occurring now" *cannot* be "translated" by "$t(u)=t(e)$", because the latter is not a well-defined sentence at all – it involves an unbound variable u.

We then get:

[New Token-reflexive] (symb)
$$\forall u\, [u \in P \Rightarrow (u \text{ is true iff } t(u)=t(e))].$$

Note that according to this interpretation, the new token-reflexive version is precisely the B-thesis that was introduced at the very beginning of the present section.

Now we need to consider Smith's two main objections[34] to the token-reflexive version of the new B-theory.

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[34] It is, however, a third issue brought out by Smith in Chapter 3 of Smith (1993) that has forced Mellor to concede that the token-reflexive theory has been successfully refuted. Mellor (1998: 34) admitted that "'There are no tokens now' refutes all token-reflexive accounts, A- and B- alike, of what makes A-propositions true." However, as I have remarked in subsection 2.1, we can disregard this problem based on the realistic requirement that we only talk about truth-values for sentence tokens.

1. The Inconsistency Objection

Smith claims that Mellor's theory is self-contradictory. He proceeds roughly as follows. On the one hand, Mellor admits that the truth conditions of tensed sentences are different from those of tenseless sentences – thus his call for a new theory. On the other hand, Mellor's account does imply that they have the same truth condition – thus the contradiction. Consider, for instance, a token *U* of "It is now 1980". According to Mellor, the sentence token *U* is true if and only if it occurs in 1980. Now consider another token *T* of "*U* occurs in 1980", whose truth condition is evidently that *U* occurs in 1980. Do *U* and *T* then have the same truth condition? From,

> (1) *U* is true if and only if *U occurs in 1980*, and
> (2) *T* is true if and only if *U occurs in 1980*,

we seem to have an affirmative answer to this question. But then, according to Smith, Mellor is again picking up the old theory that he has abandoned, namely that *U* and *T* have the same meaning and thus translate each other. If he claims that he is actually proposing a new theory, he falls into a self-contradiction.

What can we say about Smith's charge? In our terms, it is clear that what Mellor claims in this version of the new theory is that *U*, as a particular token, has the same *pw*-truth-condition as *T*. However, when he abandons the old theory, he is observing that the *ch*-meaning of the *type* "It is now 1980" described by (1), i.e. the *pt*-truth-condition of a token *U*, is different from the *ch*-meaning of the *type* "*U* occurs in 1980" described by (2), i.e. the *pt*-truth-condition of *T* – because the truth of *U* is token-dependent but the truth of *T* is not. To be more precise, the *pt*-truth-conditions of *U* and *T* are given by (1)′ and (2)′ respectively, meaning that they are *different pt*-truth-conditions.[35]

> (1)′ Any token *U* (of "It is now 1980") is true if and only if *U occurs in 1980*,
> (2)′ Any token *T* (of "*U* occurs in 1980") is true if and only if *U occurs in 1980*.

Note that (2)′ does not make sense if the "*U*" is considered to be an *unbound* variable, as that would be analogous to saying that a token *T* of "*x* is a bachelor" is true iff *x* is a bachelor, without quantifying over the variable *x*, i.e. the *x* in sight is only *mentioned* rather than *used*. Therefore,

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[35] For a *pt*-truth-condition, we need to consider (1)′ as a whole rather than look only at the right hand side of the "if and only if". The case for (2)′ is similar.

we should see the quantification over T as being inside the scope of a quantification over U. To be more specific, (2)′ can be seen as merely a copy of the underlined consequent that lies within

> $\forall U$ (U is a token of "It is now 1980" $\Rightarrow$ $\underline{\forall T}$ [$\underline{T}$ is a token of "$\underline{U}$ occurs in 1980" $\Rightarrow$ ($\underline{T}$ is true iff $\underline{U}$ occurs in $\underline{1980}$)]).

At each instance of the quantification, U takes as its value a particular token of "It is now 1980". Once U represents a particular token of "It is now 1980", the *pt*-truth-condition for a token T of "U occurs in 1980" becomes a *constant* function (that is, a token-independent function) from possible tokens of "U occurs in 1980" to truth values, and the truth-value is determined by whether the U indeed occurs in 1980.

There is hence no inconsistency here. In sum, if "U" and "T" are taken to be proper names (token constants) of particular sentence tokens, and what Smith has in mind are their *pw*-truth-conditions, then U and T do have the same "truth condition". And the two tokens "translate" each other, at the token level, as they have the same *pw*-truth-condition that U *occurs in 1980*. However, this is *consistent* with Mellor's worry about the old B-theory: when "U" and "T" are thought of as token variables of their respective types, they do not share the same *pt*-truth-condition. Basically, Smith is confusing two notions of truth conditions: the *pt*-truth-condition that is essential for determining the *tp*-translatability of sentence types, and the *pw*-truth-condition that accounts for the inter-translatability of two tokens uttered in certain contexts.

Note that Oaklander has a similar reply to Smith's objection. Oaklander (1991: 30) suggests that "there is no inconsistency in claiming that tensed and tenseless sentence *types* have tokens with different truth conditions, while also claiming that tensed and tenseless sentence *tokens* themselves have the same truth conditions". By resorting to a passage from *Real Time*, in which Mellor claims that the truth-conditions of the *tokens* of a tensed sentence also vary, Smith *seems* to have successfully rebuked Oaklander's defense of Mellor. But it is not so,[36] as evidently what Oaklander has in mind here is the *pw*-truth-condition of a *constant token*, while what Smith's Mellor is concerned with is the *pt*-truth-condition of a *variable token*,[37] and there is nothing incompatible here.

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[36] I thank an anonymous referee for this journal for asking me to clarify this point.

[37] Paul (1997) mentions in a footnote that David Lewis suggested a resolution of Mellor's problem along this line of taking tokens as variables. But she did not explore it further.

2. Failure of the Logical Entailment Objection

Smith claims that the token-reflexive truth conditions of sentence tokens are incapable of explaining logical entailments between tensed sentences. Consider, in addition to a token U of "It is now 1980", another token V of "1980 is present". According to Smith, clearly U logically entails V. However, according to Mellor, the truth conditions of U and V are *U occurs in 1980* and *V occurs in 1980* respectively, and it is not at all clear how these truth conditions are to be related to each other. Smith's objection can be summed up as

Premise 1. Logically, U and V entail each other, where
U is a token of "It is now 1980" and V is a token of "1980 is present".

Premise 2. Yet they have different truth conditions, as
(&) U is true if and only if *U occurs in 1980*;
(@) V is true if and only if *V occurs in 1980.*

Therefore**,** their truth conditions cannot explain the entailment relationship between the two.

Oaklander's (1991) reply is that U and V indeed have the same truth condition, as for both of them *the token is true iff the year of its utterance is 1980*. However, as Smith (1994) insists, once the occurrences of "it" are replaced by the names of the relevant tokens, the appearance that they have the same truth condition vanishes. L. A. Paul takes sides with Smith on this matter (cf. Paul 1997).

Now we shall see how this objection of Smith can be resolved in our terms.[38] As always, we need to be clear about what sorts of entities we take U and V to be.

Firstly, we can choose to regard "U" and "V" merely as two particular tokens uttered in certain contexts in space-time. In this case, there is no ground for us to say that they *logically* entail each other. This can be seen as follows. If we arbitrarily choose a token U and a token V so that at least one of them, U say, is true, then chances are that the other, i.e. V, is not true. Without requiring that the token V be uttered in the same context as U, the probability that it is uttered at the same time as U is zero, and so long as U and V are not uttered at the same time, their respective *pw*-truth-conditions are different. Therefore, there is no reason why the *pw*-truth-conditions

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[38] The reader is also referred to Mozersky (2000), Mozersky (2001), Dyke (2002) and Dyke (2003) for similar yet different ways of replying to Smith's objections to the new B-theory.

of these two particular tokens *U* and *V* should be the same. Thus, Smith's first promise is false, and this is by all means consistent with the fact that his second premise may be true under this interpretation.[39]

Secondly, we can choose to regard "*U*" and "*V*" as two token variables and talk about the logical equivalence of the types to which they respectively belong. According to this interpretation, it is the *types* "It is now 1980" and "1980 is present" that are logically equivalent to each other, in the sense that they have the same *pt*-truth-condition. In other words, *any* token *x* of either type is true iff *x* is in 1980,[40] where the "*x*" here plays the role of a token variable rather than that of a token constant. And Smith was misled by the *prima facie* difference of his so-called "truth conditions" of *U* and *V*, which appear on the right hand sides of (&) and (@), when he concluded that these truth conditions are different. As I have emphasized earlier, the *pt*-truth-condition of a *token variable U* is given by (&) *as a whole* – unless paired with the clause on the left hand side of (&), the "truth condition" "*U occurs in 1980*" is simply meaningless. Thus premise 2 fails and Smith's objection does not hold.

3.5 The Sentence-type Version (Paul)

L. A. Paul concedes (see Paul 1997) that indeed a token-reflexive truth condition cannot explain the logical equivalence of "It is now 1980" and "1980 is present". She even provides an example to further illustrate this point: "It is now 1997" logically implies "1996 is past", yet the *tokening* of the former does not imply the *tokening* of the latter, and therefore the entailment relation is not explained. She observes however that:

> … the truth conditions of the types are that *"It is now 1997" is true iff the time of its context of evaluation is 1997*, and that *"1996 is past" is true iff the time of its context of evaluation is later than 1996*. The truth conditions together with our definition of entailment explain the entailment relation, since a context with a time of 1997 is by definition a context with a time that is later than 1996, and so when "It is now 1997" is true, "1996 is past" must also be true. (Paul 1997: 64)

She then proposes a third version of the new tenseless theory in which the analysis of truth conditions is done for sentence *type*s instead of sen-

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[39] If we are forced to consider the case where the two tokens *U* and *V* happen to be tokened at the same time, then Premise 2 fails.

[40] We have something like this: for any token *U* of "It is now 1980" and any token *V* of "1980 is present" uttered in the *same context*, *U* is true iff *U* is in 1980, and iff *V* is in 1980, and iff *V* is true. Note that again there is no particular token constant in question here. Both "*U*" and "*V*" play the role of a token variable rather than the role of a token constant.

tence *tokens*. Moreover, to meet the "*there are no tokens now*" challenge,[41] she brings *contexts* instead of *tokens* into play.[42] The main thesis of her account is

> **[Sentence-type]** For any context *c*, the sentence type "*e* is occurring now" is true with respect to *c* if and only if *e* is occurring in *c*.

By making it explicit that, in the prescription of a truth condition, the subject under consideration is a sentence type rather than a sentence token, Paul's thesis has greatly reduced the chance that the reader will be misled by the word "token" – which features heavily in the previous two versions of the new B-theory – into thinking that she/he has two particular tokens at hand. As remarked by Smith (1999: 234), "Paul avoids sentence tokens and thus does not run into the above-discussed problems about the relations of sentence tokens to times, events or other sentence tokens." Indeed, Smith acknowledges that

> L. A. Paul has formulated a third and novel "sentence-type" version of the tenseless theory that she shows escapes the problems with the two traditional versions of tensed sentences, and argues that her new account escapes the criticisms put forth in Smith (1987, 1993), in Oaklander and Smith (1994) and elsewhere. I agree that her new theory escapes these criticisms, but I also believe there is a new set of criticisms that her theory does not escape. (Smith 1999: 233)

Smith's criticism is mainly based on a tenser's attempt to introduce tensed truth conditions into Paul's thesis. According to Smith, if a token of the "event-type" *Jane having nightmares* occurred last night at 11 p.m., then the sentence type "Jane's nightmares are presently occurring" is not *now* true with respect to last night, since last night is *no longer* presently occurring, and thus this context fails to include a condition (*presently occurring*) specified by the sentence type. Basically, in saying that a certain present-tense sentence type S *is* true with respect to a certain context *c*, Smith asks us to see the "is" as an *is* (present tense) rather than an *is* (tenseless).[43] Thus Paul's context *c* should include the exemplification of the *A*-property of presentness for *S* to *be* (present tense) true with respect to *c*. However Paul, as a detenser, simply has no obligation to follow Smith's lead and reply to his criticism.

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[41] See Chapter 3 of Smith (1993).

[42] Note that a token variable in our sense runs through, in effect, all "possible contexts of use" in Montague's terms, cf. Montague (1974), and I see no reason to abandon the usage of tokens in our account, as Paul apparently did in her theory.

[43] See MacFarlane (2003) for an elaborate discussion of the distinction between a context of utterance and a context of evaluation.

Anticipating a reaction of this sort, Smith claims that if one insists on a *tenseless* evaluation of a sentence type with respect to a context, then

> …the original intent of her new and "third" version of the tenseless theory of time is lost. With this change to her theory, "the time of the evaluation of the sentence-type" plays the same logical role as "the time at which the token of the sentence-type occurs" and this not only vitiates Paul's project of formulating truth condition sentences that do not refer to tokens (or their logical analogues, such as evaluations of a sentence-type), but also encounters the standard problems of the token-reflexive and date-analysis versions of the tenseless theory of time. (Smith 1999: 243)

Smith then brings to bear on this third version the same criticisms he has used with the previous two versions of the new theory. Smith finds that Paul's formulation of the sentence-type theory is a perfect place to introduce into the picture, on the one hand, a "context of evaluation" which, according to Paul, can be directly specified by the phrase "with respect to" – rather than having to be determined by the utterance of a token – and, on the other hand, an "is" that is always in the present tense. And these allow him to turn Paul's theory into an A-flavored theory. But once it becomes clear that Paul need not buy Smith's A-theoretical interpretation, he insists that a tenseless reading of her theory can simply be reduced to the previous versions of the new theory and cannot withstand his attacks.

In effect, Smith leaves Paul with two choices: either she accepts his A-theory-flavored truth-condition, or she returns to the two versions of the new theory that she has already abandoned. Either way means that Paul's new B-theory fails. I agree with Smith that if Paul refuses to accept his A-interpretation of her account, then her account is not much different from the two versions that she has abandoned. However, what we have been doing in the preceding subsections is precisely to give, through the formulation of a unified B-thesis, new insights into the two existing versions of the B-theory so that they can withstand Smith's attacks.

What can we say about Paul's theory then? First of all, it succeeds in reminding us that in the business of providing tenseless truth conditions for tensed sentences, the true subject of concern is a *sentence type* rather than a sentence token. Secondly, Paul overdoes it to the extent that she completely throws out the notion of "tokens" though this is a perfect tool to help us pin down the meaning of a sentence type. She introduces a "context of evaluation" c into her picture, and asks one to add the phrase "with respect to c" in order to evaluate a sentence type. The problem, however, is this: given a context c, how are we supposed to evaluate the

very statement that appears on the left hand side of the bi-conditional in Paul's thesis,[44] namely,

The sentence type "*e* is occurring now" is true with respect to *c*.

Is it really the sentence *type* "*e* is occurring now" that we are evaluating here? Or are we here concerned with a *token* of it that is uttered *now*, while the verb "is" in question is in the present tense? Smith has tried his best to force the latter interpretation upon the reader, but we have seen that we need not grant him this A-theoretic interpretation. In any case, it remains unclear as to how Paul is to make sense of the "true with respect to *c*" without telling people how the context of evaluation *c* is to be introduced into this picture and be related to the sentence type, so that the task of determining the truth value can be carried out. So far as I can see, and Smith (1999) thinks this is plausible, the most natural way to relate *c* to a sentence type is to let it be the context of a possible token *u* of the type. Then Paul's thesis reduces to

[Sentence-type] (symb)
   $\forall c$ [(*u* is uttered in *c* and $u \in P$) $\Rightarrow$ (*u* is true iff $t(u)=t(e)$)].

Note that in the antecedent of the main conditional, *u* is described as a possible token of "*e* is occurring now" uttered in context *c*, and thus the time of the context $t(c)$ is the same as the time of the token $t(u)$. It is clear then that the quantification $\forall c$ can simply be replaced by $\forall u$, and then the thesis becomes $\forall u$ [$u \in P \Rightarrow$ (*u* is true iff $t(u)=t(e)$)], which is nothing but the B-thesis.

In sum, as Smith rightly observes, if one insists on a *tenseless* evaluation of a sentence type with respect to a context, then there need to be some token-like entities that can relate the type to the context of its evaluation, and, without the introduction of a "Now" into the picture, there is simply no point in distinguishing between a context of utterance of a type and a context of evaluation of it. And in that case, we may as well simply grant the tokens of a sentence type the role that they have been playing in the earlier two versions of the B-theory – as fixing both the context of utterance and the context of evaluation. Paul (1997: 63) stresses that "it should be possible to evaluate whether or not a type is true with respect to a context without requiring that tokens of the type be produced in that context", and that therefore the problem that "No tokens are being produced now" can be solved more easily in her account. However, I maintain that Paul's mechanism for specifying a context for the sentence type is mys-

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[44] Certainly we cannot just say that the truth condition is determined by "*e* is occurring in *c*", as this would simply make Paul's thesis a trivial statement. Rather, it has to be given an independent truth condition.

terious, unless by "with respect to *c*" she merely means "when tokened at *c*", and so far as I can see, the latter is the only realistic way in which a sentence type could become incarnated in the world.

Indeed, Paul's notion of a context and my notion of a token are not the same thing – the latter preserves the information about the type while the former does not. But what is essential for a tenseless theory of time is the prescription of meanings for tensed sentence *types*. The variable introduced into the *pt*-truth-condition statement, be it a context variable or a token variable, plays only an auxiliary role in helping us to pin down the *ch*-meaning of a sentence type. As I have explained, so far as each token-denoting term "*u*" that is involved in a truth condition statement is handled with care, either as a token constant or as a token variable, all of Smith's objections to the earlier versions of the new B-theory can be successfully resolved.

4. Conclusion

Over the past few decades the B-theorists of time have come up with many versions of the B-theory, each of which has received attacks and criticisms from both the A-camp and the B-camp. One reason that some of the B-theorists have subsequently failed to defend their theses is that, misled by some A-theorists, they have taken a token variable *u* to be a *token constant*, or taken a date variable *t* to be a *date constant*, without replacing the notion of *pt*-truth-conditions with that of *pw*-truth-conditions. If one can stick to the principle that every notion involved in the statement of the B-thesis needs to be carefully defined and carefully used, and that due care needs to be given to distinguishing variables from constants, then the resulting B-thesis as described in this paper can withstand and indeed can resolve all previous attacks leveled by the A-theorist.

Specifically, we have demonstrated in the previous section that all the five main strands of the B-theory of time can be seen as special ways of presenting the same B-thesis, and with their respective theses suitably interpreted, they can all withstand the A-attacks. According to the analysis in the last section, we can group the five existing versions of the tenseless theory into the following two theses:

- $\forall u \ [u \in P \Rightarrow (u \text{ is true iff } t(u) = t(e))]$
  – Old token-reflexive, New token-reflexive, and Sentence-type

- $\forall u \forall t \ [(u \in P \ \& \ t(u)=t) \Rightarrow (u \text{ is true iff } t(e)=t)]$
  – Old date-analysis and New date-analysis

And it is a simple exercise in logic to show that the second thesis is logically equivalent to the first. Thus we reach the unified B-thesis

[B-Thesis] (symb) $\forall u \ [u \in P \Rightarrow (u$ is true iff $t(u) = t(e))]$.

Furthermore, by specifying how possible worlds fit into this picture, we get the detailed version of the B-thesis[45]

[B-Thesis] (full) $\forall u \ \forall w \ [u \in P \supset [(\ u$ is true in $w) \equiv (t_w(u) = t_w(e))]]$.[46]

References

Craig, W. L. 1996. "The B-theory's *tu quoque* argument", *Synthese* 107, 249–269.

——. 1999. "On truth conditions of tensed sentence types", *Synthese* 120, 265–270.

Dyke, H. 2002. "Tokens, dates and tenseless truth conditions", *Synthese* 131, 329–351.

——. 2003. "Tensed meaning: a tenseless account", *Journal of Philosophical Research* 28, 65–81.

Haas, W. 1962. "The theory of translation", *Philosophy* 37, 208–228.

Jokic, J. and Q. Smith (eds.) 2003. *Time, Tense and Reference* (Cambridge, Mass.: MIT Press).

Kaplan, D. 1989. "Demonstratives", in J. Almog, J. Perry and H. Wettstein (eds.), *Themes From Kaplan* (Oxford: Oxford University Press), 481–563.

Kemp, G. 1998. "Meaning and truth-conditions", *The Philosophical Quarterly* 48, 483–493.

Le Poidevin, R. 1998. "The past, present, and future of the debate about tense", in Le Poidevin (ed.), *Questions of Time and Tense* (Oxford: Oxford University Press), 13–42.

——. 2003. "Why tenses need real time", in Jokic and Smith (2003: 305–324).

MacFarlane, J. 2003. "Future contingents and relative truth", *The Philosophical Quarterly* 53, 321–336.

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[45] Here it is interesting to observe that the date-analysis thesis can be similarly presented as

    [Date-analysis] (full) $\forall u \ \forall t \ \forall w \ [(u \in P \ \& \ t_w(u)=t) \supset ((u$ is true in $w) \equiv (t_w(e)= t))]$.

Note that the clause "u is true in w" lies within the scopes of $\forall u$, $\forall t$ *and* $\forall w$, and is in the consequent of a conditional whose antecedent contains the requirement $t_w(u)=t$. Therefore, when considering the truth condition of u, we are *not* entitled to cast any doubt on the condition $t_w(u)=t$ based on our wild imagination of possible worlds. Furthermore, given that the [B-Thesis] (full) holds, "u is true in w" can be replaced by $t_w(u)= t_w(e)$, and then the Date-analysis thesis reduces to the truism: $\forall u \ \forall t \ \forall w \ ((u \in P \ \& \ t_w(u)=t) \supset ((t_w(u)= t_w(e)) \equiv (t_w(e)= t)))$.

[46] Thanks are due to all the anonymous referees that have made comments on this paper.

McTaggart, J. M. E. 1908. "The unreality of time", *Mind* 18, 457–474.

Mellor, D. H. 1981. *Real Time* (Cambridge: Cambridge University Press).

——. 1998. *Real Time II* (London: Routledge).

Montague, R. 1974. "Universal grammar", in *Formal Philosophy: Selected Papers of Richard Montague*, ed. by R. H. Thomason (New Haven: Yale University Press), 222–246.

Mozersky, J. M. 2000. "Tense and temporal semantics", *Synthese* 124, 257–279.

——. 2001. "Smith on times and tokens", *Synthese* 129, 405–411.

Oaklander, L. N. 1991. "A defense of the new tenseless theory of time", *Philosophical Quarterly* 41, 26–38.

——. 2003. "Two new versions of the B-theory of language", in Jokic and Smith (2003: 271–303).

Oaklander, L. N. and Q. Smith (eds.) 1994. *The New Theory of Time* (New Haven: Yale University Press).

Paul, L. A. 1997. "Truth conditions of tensed sentence types", *Synthese* 111, 53–71.

Sattig, T. 2006. *The Language and Reality of Time* (Oxford: Clarendon Press).

Smart, J. J. C. 1980. "Time and becoming", in P. van Inwagen (ed.), *Time and Cause: Essays Presented to Richard Taylor* (Dordrecht: Reidel).

Smith, Q. 1987. "Problems of the new tenseless theory of time", *Philosophical Studies* 52, 371–392.

——. 1993. *Language and Time* (New York: Oxford University Press).

——. 1994. "The truth conditions of tensed sentences", in Oaklander and Smith (1994).

——. 1999. "The 'sentence-type version' of the tenseless theory of time", *Synthese* 119, 233–251.

Torre, S. 2009. "Truth-conditions, truth-bearers and new B-theory of time", *Philosophical Studies* 142, 325–344.

Wright, C. 2007. "New age relativism and epistemic possibility: the question of evidence", *Philosophical Issues* 17, 262–283.