TENSED CHANGE AND INSTANTANEOUS EVENTS

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Tensed Change and Instantaneous Events

by

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A thesis submitted to the
School of Graduate Studies
in partial fulfilment of the
requirements for the Degree of
Master of Arts

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November 2002

St. John's Newfoundland

Abstract

This thesis begins by describing the conceptual problem with the moment of change, a problem raised by Plato in the *Parmenides*. The thesis then describes how others have dealt with this problem. The thesis argues that the 'solutions' to the problem assume a tensed theory of time and it is for this reason that the solutions are inadequate (for, the thesis argues, the initial problem of the moment of change is itself a symptom of a tensed theory of time). Finally, the thesis gives D.H. Mellor's arguments in favour of the B-theory or the tenseless theory of time and change. The thesis argues that Mellor's tenseless theory of time and change does avoids the problem of the moment of change.

Acknowledgements

I thank the Philosophy Department at Memorial for excellent instruction and for the opportunity to complete this work. Special thanks must go to Dr. Jim Bradley, my thesis supervisor, for without his input the thesis would have been impossible. Stephen Gardiner provided hours of helpful, stimulating conversation on this topic, as did the members of the Jockey Club. Jill Cumby, Mike Tilly and Ismail Negm need be thanked for providing me with a living space in which to write. Thanks is also due for my parents and their constant support.

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1 Change and the Problem with Change

Richard Sorabji begins Chapter 26 of his work, *Time, Creation and the Continuum,* by writing

> 'The train leaves at noon,' says the announcer. But can it? If so, when is the last instant of rest, and when the first instant of motion? If these are the same instant, or if the first instant of motion precedes the last instant of rest, the train seems to be both in motion and at rest at the same time, and is not this a contradiction? On the other hand, if the last instant of rest precedes the first instant of motion, the train seems to be in neither state during the intervening period, and how can this be? Finally, to say that there is a last instant of rest, but not a first instant of motion, or vice versa, appears arbitrary. What are we to do? This puzzle has a long history. It is found in Plato's *Parmenides.*[1]

David Bostock tells us this is "an interesting puzzle [Plato] develops about things that are in time." The "main thrust" of this puzzle concerns the "treatment of change."[2]

For the purposes of this chapter, "change" will mean 'an object having mutually exclusive properties at different times'. The aim of this thesis is to test the sufficiency or adequacy of this definition of change.

As a prelude to the last chapter, I shall briefly say that what is meant by 'time' will greatly affect one's conception of change. Thus the definition of change as above is insufficient. One of the terms in the definition needs definition itself: for what is time? On this matter I agree with Mellor.

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[1]Sorabji, 1983, p 401.

[2]Bostock, 1978, p 231.

> It is not enough to say that changes are things having incompatible properties at different times.[3]

As defined above, if ever the mutually exclusive states in a change be simultaneous with each other, then what is known as a "contradiction" would ensue: the simultaneous affirmation and denial of a certain property or truth claim. This suggests either one of two things: that the notion of a contradiction *is* defined temporally in so far as the notion of simultaneity is employed, or that a contradiction *can* be defined in this way.

Change, then, could be awkwardly phrased as 'a contradiction in succession'. Change as a contradiction in succession, though perhaps an awkward description, is that type of change commonly called a "*c*-change."

There are at least two different kinds of change, and there are probably many more.[4] Besides a *c*-change, another kind of change is called an *s*-change. An *s*-change is that sort of change captured by the phrase 'first this, then that.' An *s*-change occurs between "two positive states."[5] Strobach argues that the change from rest to motion is "the most prominent example" of an *s*-change. Plato himself uses the change of motion

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[3]Mellor, 1998, p 84

[4]Graham Priest, in 'To Be and Not to Be: Dialectical Tense Logic,' writes that "we should not suppose that all changes are necessarily of the same kind" (p 249). He then goes on to introduce *three* different kinds of change, α, β and γ. Priest does not name any of his three as either c-changes or s-changes. Nor am I exactly clear (yet) if any of Priest's types of change correspond to either c-changes or s-changes (though at present I am inclined to say there is no correspondence). This raises the possibility that there are no less than *five* types of change.

[5]Strobach, 1998, p 2.

to rest as his example in the *Parmenides*. In the s-change from rest to motion first we have this (rest), then we have that (motion).

In contrast a *c*-change is best characterized by the phrase 'first this, then not-this.' A *c*-change does not occur between *two* positive states. (A 'positive' state *is* '*x* being *P*'; while a 'negative' state is the denial that '*x* is *P*'). A *c*-change occurs between a positive state and its own negation. *C*-changes, then, "consist in the beginning or ending of one positive state."[6] A *c*-change for example occurs between rest and non-rest or motion and non-motion. If an *s*-change is characterized by 'first this, then that,' then a *c*-change may be characterized as 'first this, then not-this.'

For a *c*-change to occur '*x* is *P*' must hold for *x*; then '*x* is *P*' must not hold for *x*. In contrast, for an *s*-change to occur '*x* is *P*' must hold, then must '*x* is *Q*,' with the proviso that if *P* then not *Q* and vice versa. We need this extra proviso for *s*-changes - a proviso that makes *P* and *Q* mutually exclusive - we need this proviso to distinguish the (1) contradictory mutual exclusivity of the before and after states in a *c*-change from the (2) merely contrary mutual exclusivity of the before and after states in an *s*-change. In a *c*-change exactly one of *P* or not-*P* will be true and the other will be false. In an *s*-change only one of *P* or *Q* could be true (that is, *P* and *Q* are mutually exclusive); however unlike a *c*-change, in an *s*-change both *P* and *Q* could be false (that is, $\sim P$ and $\sim Q$ are not mutually exclusive.)

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[6]Strobach, 1998, p 2.

C-changes and *s*-changes differ in that for *c*-changes only one property is required while for *s*-changes at least two properties are required. Both types of change require a before and after state. The difference between *c*- and *s*-changes concerns how the after state is defined.

For *c*-changes the after state is wholly defined by means of the first state (i.e. its negation). Whereas in an *s*-change the second state is not simply the negation of the first. If my car is green and a *c*-change with respect to it being green occurs, then we still do not know what colour it is, only what colour it is not. In an *s*-change with respect to my car being green we would still know that a *c*-change with respect to green has occurred. But if we observed an *s*-change with respect to my car then we would additionally know what colour my car now is.

In effect, the before and after states in a *c*-change are defined as contradictories. While in an *s*-change the before and after states are defined as contraries. For *c*-changes true statements about either the before or after state both have the same truth condition. In *s*-changes the before and after states do not have the same truth conditions. That the before and after states in an *s*-change have different truth conditions does not mean that the states in *s*-changes are not mutually exclusive. For example, 'my car is green' and 'my car is red' cannot both be true, although both could be false. Changing from being green to being red is an *s*-change. An *s*-change's states are mutually exclusive but not contradictory. Whereas 'my car is green' is either true or false. Exactly and only one of either 'my car is green' or 'my car is not-green' is true. A *c*-change's states are mutually exclusive *and* contradictory.

Given the definitions of *c*- and *s*-changes, an *s*-change is composed of or can be

analyzed as a serial conjunct of two *c*-changes. If there is a change between two positive states, say *G* and *R*, then the first positive state must have ended, while the second state must have begun. In other words, the *s*-change from *G* to *R*, a 'first this (green), then that (red)' change, can be analyzed as a conjunct two *c*-changes consisting of '*G*, ~*G*, ~*R*, *R*,' (i.e. as 'first this (green), then not this (green); not that (red), then that (red)').

When Strobach applies these definitions to the example of motion and rest he concludes "the *s*-change between rest and motion, e.g., consists of a *c*-change between rest and non-rest and the *c*-change between non-motion and motion."[7]

C-changes are more problematic for the moment of change in so far as they are more fundamental (i.e. in so far as *s*-changes can be expressed in terms of two *c*-changes). It is *c*-changes, then, that will be of prime focus in this thesis.[8]

1.1 Plato's *Parmenides* and the Moment of Change

With the above definitions and remarks in mind the aim or goal of this first chapter is to focus directly upon Plato's text, the *Parmenides* (155e-157b), so that we come to understand the conceptual issue presented by Plato concerning change and time. The immediate goal of this chapter is to understand why change could be thought to be problematic or puzzling.

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[7]Strobach, 1998, p 2.

[8]It would be a mistake, however, to think that addressing the conceptual problem of the moment of change solely in terms of *c*-changes is sufficient such that *s*-changes can be forgotten about, or treated simply as a complex of two *c*-changes. *S*-changes and any other forms may still need some special treatment on their own, but these are beyond the scope of this thesis.

To achieve the immediate goal we will proceed in two steps. First, by showing how the moment of change can be isolated. Once the moment of change is isolated then, secondly, we will see why the moment of change may be conceptually problematic or puzzling. I say 'may' be conceptually problematic or puzzling rather that 'is,' for there are those who think that change is not puzzling at all. For G.E.L. Owen

> There is nothing physically startling in most changes and nothing logically startling in any of them.[9]

But whether or not Owen's statement can be assented to remains to be seen.

When we initially focus upon Plato's *Parmenides* we will not be investigating nor interpreting Plato's doctrine of change and time. Nor shall we consider or interpret Plato's other works on change and time, such as the *Timaeus*. There are many interpretations of Plato's analysis of change and time. These multiple interpretations generate much controversy. The goal of this chapter is not to investigate Plato *per se* or to engage in any of the controversial debates about what Plato thought. There are many excellent books on these controversies to which reference can be made.[10] These debates about Plato can be treated independently of the conceptual problem that Plato raises about

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[9]Owen, 1975, p 124.

[10]See, for example, A.E. Taylor's *Plato: The Man and His Work*; Colin Strang's and K.W. Mills' 'Plato and the Instant.' *Proceedings of the Aristotelian Society*, Suppl. Vol. #48, 1974, p 63-79. See also Niko Strobach's *The Moment of Change: A Systematic History in the Philosophy of Space and Time*, Chapter 1, p 20 - 46. For a comparison of Plato and Aristotle on change and time see G.E.L. Owen's 'Tithenai ta Phainomena,' in *Articles on Aristotle*, Vol.1, 'Science,' edited by Jonathan Barnes, Malcolm Schofield and Richard Sorabji, Duckworth, London, 1975, p 113-126.

change, the problem of the moment of change.[11] It is this problem that Strobach calls "one of the oldest problems in the philosophy of space and time: how is the change from one state to its opposite to be described?"[12]

In so far as Plato articulates the conceptual issue associated with change in the self-contained arguments about change in the *Parmenides* at (155e-157b),[13] to that extent the *Parmenides* will provide a good starting point for our investigation of the conceptual issue. How Plato actually deals with the conceptual problem he raises, how his treatment relates to his larger philosophy, and what in the end Plato's final opinion on change and time are, are beyond the scope of this chapter. We will return to Plato's *treatment* of the conceptual *problem* in Chapter Two.

Nor should we think that Plato's puzzle applies only to the change from motion to rest or from rest to motion. Charles Hamblin rightly points out that the conceptual problem "is not one that is characteristic of changes of motion as distinct from other kinds of change."[14] We must not let ourselves be taken away by the fact that in order to point out the conceptual problem with change Plato's *example* of a change is the change from

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[11]We can, then, distinguish between the conceptual problem raised by Plato and Plato's solution or means of addressing this conceptual problem.

[12]Strobach, 1998, preface, p x.

[13]The passage from 155e to 157b in the *Parmenides* on the conceptual problem with the moment of change has been treated by countless others as an isolated, separated or self-contained argument about change in general apart from the rest of the dialogue and from the rest of Plato's philosophy. A.E Taylor, for example, in *Plato: The Man and His Work*, calls this passage an "appendix" (Taylor, 1966, p 366). Strobach refers to this same passage as a "digression" (Strobach, 1998, p 20). Bostock shares Taylor's term when he calls the passage an "appendix" (Bostock, 1978, p 231).

[14]Hamblin, 1969, p 400. This problem or puzzle is not to be dissolved by thinking that change is instead a gradual process occurring over an extended period of time as opposed to a sudden instantaneous switching for, continues Hamblin, "gradual changes raise the problem as much as sudden ones do."

motion to rest.

Colin Strang, author of *Plato and the Instant*, supports the claim that the conceptual problem made manifest in the example may be generalized for other changes. "All that is said [in the *Parmenides*]," writes Strang, "applies indifferently" to change as such and to anything capable of change.[15] Strobach too makes this point. "What is said about rest and motion may as well be presented in terms of an arbitrarily chosen property *F*."[16]

That Plato's puzzle - the conceptual problem of change from motion to rest - is applicable for change in general should not be a controversial point. Plato's own text supports the generalization. Plato writes, "will the case not be the same in relation to other changes?" "Yes, so it appears" is the reply.[17]

As stated above, the first step will be to see how the moment of change is isolated. Following the isolation of the moment of change we will, secondly, see why change may be conceptually problematic or puzzling.

1.2 Isolating the Moment of Change

Plato arrives at the moment of change by means of a four-part argument.

The first part of the argument is a straightforward logical claim, namely, the 'law' or 'principle' of non-contradiction: an object cannot have at the same time two mutually

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[15]Strang, 1974, p 73.

[16]Strobach, 1998, p 28.

[17]Plato, 1926, p 299-301.

exclusive properties. This means that a thing cannot both be and not-be; it cannot be moving and not-moving (i.e. be moving and be at rest). A thing cannot be red and not-red; nor could a proposition be both true and false, etc.. Plato writes,

> Can [an object], when it partakes of being, not partake of it, or partake of it when it does not partake of it? No, it cannot. Then it partakes at one time and does not partake at another; for that is the only way in which it can partake and not partake of the same thing.[18]

In other words, both the before and after state in a *c*-change cannot share the same t_n. Of a *c*-change, either one or the other state shall hold (either *P* or ~*P*). Plato, we will see, takes great care to preserve the sanctity of the principle of non-contradiction. Major conceptual problems associated with the moment of change concern the sanctity of this principle.[19]

Although Plato expresses the first part of the argument in terms of partaking and not-partaking of being, the principle of non-contradiction is not limited or restricted to being as such. The principle can be generalized to cover any and all properties whatsoever.

Strobach supports this conclusion about the first part of the argument. "Whatever

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[18]Plato, 1926, p 297.

[19]The sanctity of the principle of contradiction is where Graham Priest, in *To Be and Not to Be: Dialectical Tense Logic*, will differ from Plato and from the historical tradition of thought in general. And it is this very principle that A.E. Taylor says suffers a "portentous result" in the *Parmenides*. Though, Taylor adds, "it is quite certain that Plato never dreamed of denying the law of contradiction." Taylor's argument indicates nicely the fact that we can treat (1) Plato's exposition of the conceptual *problem* (which is, at least according to Priest, *actually*) portentous for the principle of contradiction, from (2) Plato's solution to the conceptual problem, which some have interpreted so as to show that, according to Plato, both the law of non-contradiction and the law of excluded middle hold. This interpretation of Plato's argument is not without controversy; it requires specialized interpretations of key parts of Plato's text, and are thus beyond the range of this chapter investigating the conceptual problem.

is true of partaking in being may well be assumed to be true of any property."[20] This assumption about the extension of the principle of contradiction is in line with the claim that "what is said about rest and motion may as well be presented in terms of an arbitrarily chosen property *F*."[21] The principle of non-contradiction applies equally to any arbitrary property *F*. Strobach summarizes the content of the first part of the argument when he writes "nothing ever both does and does not have the same property simultaneously."[22]

Bostock describes this first part of the argument as the claim that "at any one time, *x* is not both *F* and not-*F*."[23] What is more, if a thing at one time has a property *F* and at another time does not have the property *F*, then the difference obtaining in terms of *F* and not-*F* implies that the two times at which a thing is *F* and not-*F* are not the same time. Thus a car is not at rest and not at rest at the same time. (x, Rx, t_1) and $(x, \sim Rx, t_1)$ are impossible and contradictory while (x, Rx, t_1) and $(x, \sim Rx, t_2)$ or (x, Mx, t_2) imply that $t_1 \neq t_2$.[24]

The second part of the argument is rather straightforward as well. It is, like the first claim, a logical qualification. This qualification is that all objects in time are either in motion or not in motion. Or more generally, for all objects and any given property *P*,

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[20]Strobach, 1998, p 27.

[21]Strobach, 1998, p 28.

[22]Strobach, 1998, p 28.

[23]Bostock, 1978, p 231. The relation of this expression to the definition of a c-change should not be lost.

[24]Strobach calls such a temporally indexed definition of the law of non-contradiction a "specialized" definition for time. See Strobach, 1998, p28.

these objects can only be either *P* or not-*P*. This means that, for any proposition, that proposition can only be either true or false. It must be one or the other without another alternative. Plato writes "there is no time in which anything can be at once neither in motion nor at rest."[25] This means that all propositions will be for Plato only either true or false (but not both, as per the first part of the argument). In other words, for any *c*-change that an object can undergo, that object is either in the state before the *c*-change or the state after the *c*-change.

Bostock interprets the claim to mean "at any present moment *x* is either *F* or not-*F*."[26] Owen's formulation is practically exactly the same as Bostock's. Owen writes "there is no time in which a thing can be neither A nor not-A."[27] The second part of the argument is thus a version of the 'law' or 'principle' of the excluded middle. Owen, who says that Plato's "argument relies heavily on the law of the excluded middle," stresses the impact of this second claim when he writes that by the "law of the excluded middle not only is there no period but there is no point of time at which a thing can be neither A nor not-A."[28]

The first two parts of the argument are the cornerstones of classical or traditional logic. Together these mean that "truth and falsity are *exclusive* and *exhaustive*."[29]

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[25]Plato, 1926, p 299.

[26]Bostock, 1978, p 231. Again, the relation of this expression to the definition of a c-change should not be lost.

[27]Owen, 1975, p 122.

[28]Owen, 1975, p 123.

[29]Priest, 1981, p 252. Emphasis mine.

That truth and falsity are "exclusive" is captured by the first part of the argument: If a proposition (p) is true, then that this same proposition (p) is also false is ruled out or excluded by the fact that is (p) true. And, *mutatis mutandis* vice versa. It would be contradictory if (p) was both false *and* true. Thus, for any object capable of undergoing a c-change with respect to some property F, the before and after states could not ever be simultaneous with each other.

That truth and falsity are "exhaustive" is captured by the second part of the argument - the law of the excluded middle. "Exhaustive" in this context means that with respect to any proposition (p), (p) is either true or false such that 'true' or 'false' are the only possible determinations for the status of (p). 'True' or 'false' completely denote all the possible determinations of (p).[30] Thus, for any object capable of undergoing a c-change with respect to some property F, either the before or after state will be.

The third part of the argument is: if there is an object with a quality at one time and without that quality at another time, then that object must have changed from having one quality to having another. The third part of the argument is that "it cannot change without changing."[31]

Bostock argues that this claim means "if at one time x is F, and at another time x

[30]Some people, however, distinguish between a proposition's 'truth value' - either 'true' or 'false' - and a proposition's "statement-value" - either 'true' or 'false' or 'neither true nor false'. This means that all truth-values are statement-values but not vice versa. The notion of a statement value, however, is obviously not in line with the second part of the argument. The notion of a statement value violates the principle of the excluded middle, for the statement value 'neither true nor false' is a third value. Whereas if the principle of the excluded middle holds then there are only two possible values, the third having been ruled out.

[31]Plato, 1926, p 299.

is not-*F*, then there must be a time during or at which *x changes* from one to the other."[32] The third part of the argument distinguishes (α) the *state* an object is in, say *P*, from the (β) *changing* of the object's state, ΔP. The 'changing' rather than either the before or after states, is what is important to take notice of here. 'Change' in this sense means the coming to be of the mutually exclusive states, rather than simply as a successive difference of mutually exclusive states.

That this part of the argument - that it cannot change without changing - appears simple and self-evident does not mean that it is not of the utmost importance nor uncontroversial. The very meaning of 'change' is at issue here.

The third part of the argument demands that when we are trying to explain change we cannot in the end say that change is illusory or only apparent: if there is or has been a change; that is, if there is an object with mutually exclusive properties at different successive times (i.e., if there is a 'change' in the first sense), then there must have been a 'change' in the second sense, an act or event of changing, the coming to be of successive difference.[33]

The third claim argues that we cannot explain away or fail to include an account of change in the second sense. We cannot, for example, say that the change from (x, Rx, t_1) to (x, Mx, t_2) is actually or only (x_1, Rx_1, t_1) then (x_2, Mx_2, t_2). In this latter case we still have two mutually exclusive properties rest and motion and two different times.

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[32]Bostock, 1978, p 231. The emphasis on '*changes*' is mine.

[33]This point means that we must not confuse the *process* of changing - the coming to be of the difference between states - with the *product* of that process of change, the successive difference between the old and the new state. Crispin Sartwell reinforces the distinction in his 'Process and Product: A Theory of Art.' *The Journal of Speculative Philosophy*, Vol. VI, No. 4, 1992, p 301-316.

But in this latter case we also have two different objects, x_1 and x_2. That there is x_1 and x_2 in (x_1, Rx_1, t_1), (x_2, Mx_2, t_2) precludes the notion of 'change' in the second sense altogether. 'Change' in this latter case has been replaced with and wholly reduced to a simple succession of different objects (i.e. x_1 and x_2) with different properties at different times. If, say, x_1 is my car and x_2 yours, then neither your car nor my car changes if at one o'clock my car is stopped and yours at three is moving.

To say that an object cannot change without changing means that 'to change' is not the same as having a simple succession of difference. If we analyse 'change' in terms of a mere succession of differences then there is no 'is changing' or event or process of changing occurring at all. One way that change in the second sense can be analysed away is to not have *the same object* at the two different times with mutually exclusive properties, an object that undergoes changing. Analyzing change as mere succession of differences keeps the product of a change but omits the process of changing, the process that produces the product.[34] This means, G.E.L. Owen writes in *Tithenai ta Phainomena*, "change is not to be talked away."[35] The third part of the argument demands that we explain, rather than explain away, changing. One way that changing can be explained away is to confuse change with a simple succession of different objects with different

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[34]Though it is by far beyond the scope of this thesis to engage in a further analysis of Plato's text, on this point about change (qua product) and change (qua process) I think Plato's text is more than clear. When Plato writes that "it cannot change without changing" the Greek reads "άλλ' ούδε μην μεταβάλλει ανευ του μεταβάλλειν." The "του μεταβάλλειν"is clearly a verb in the infinitive and thus denotes the process, activity or event of changing. The translator has made Plato's infinitive into a participle. Change, for Plato, seems to be a mixture of μεταβάλλει, μεταβάλλειν, μεταβάλλον. 'It is changing,' 'to change,' and 'a change' are each separate. It is the process or verb that would be omitted if change is analysed as simple succession of difference. The importance of this should not be lost for, as we will see, it is by means of the process of changing that Plato isolates the moment of change.

[35]Owen, 1975, p 123.

properties at different times.

That Plato wished us to make the distinction between change and simple succession can be seen in the passage stipulating the first part of the argument. This first part is that quoted above regarding the notion of contradiction. There we saw that Plato wrote "it [an object] partakes at one time and does not partake at another; for that is the only way in which it can partake and not partake of the same thing."[36] This first part of the argument would not have been offered by Plato if he wished to argue that 'change' is actually and only succession of different objects with different properties at different times. For if a contradiction is an object partaking and not-partaking at the same time, and if we analyse change as (x_1, Rx_1, t_1), (x_2, Mx_2, t_2), then there would be no contradiction occurring if ever (x_1, Rx_1, t_1) and (x_2, Mx_2, t_1) or (x_1, Rx_1, t_2) and (x_2, Mx_2, t_2) were the case. There is no contradiction if my car is stopped at one o'clock while your car is moving then. The presence of an x_1 and x_2 in the analysis would preclude the possibility of a contradiction from obtaining even if x_1, Rx_1 and x_2, Mx_2 shared the same t_n.

That Plato stated what I call the 'first' and 'third' part of the argument as he did strongly implies that Plato did not want to analyse change by means of a simple succession of different objects with different properties at different times. Had Plato so wished to analyse change in this way he would not have had to worry about the possibility of a contradiction ever occurring. Nor, then, would the argument need its first part for an analysis of change reducing it to simple succession would make the first claim redundant.

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[36]Plato, 1926, p 297.

With respect to change and succession, we can say that all changes are successive but not all successions are changes. The first and third parts of the argument point to this fact and demands that we do not confuse simple succession with actual change. For though change is successive change is not simply succession.

Plato in the *Parmenides* defines change in a manner much like Russell does in chapter LIV of *The Principles of Mathematics*. There Russell writes that

> Change is the difference, in respect of truth or falsehood, between a proposition concerning an entity at a time T and a proposition concerning the *same entity* at another time T'.[37]

Additionally, Newton-Smith defines change in the same way in his work, *The Structure of Time*. There Newton-Smith writes that change means that "something has such-and-such a property (or, lacks such-and-such a property) at one time and then later the same thing lacks that property (or, possesses that property)."[38]

The important similarity between Plato, Russell, and Newton-Smith concerns the notion that it must be *the same entity* at both times. It is this same entity that changes in the first sense, and when it changes it is changing in the second sense.

Mark Heller, in 'Things Change,' describes this definition of change as a "triadic" definition. Plato's, Russell's, and Newton-Smith's definitions of change are triadic. This means, says Heller, that

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[37]Russell, 1964, p 469. Emphasis mine.

[38]Newton-Smith, 1980, p 14. This definition of change, we learned in Chapter One, is what Mark Heller called a triadic definition. We also learned that Russell shares this definition.

> For an object to change, on this proposal, is for the triadic having relation to hold between that object, a given property, and a given time but not to hold between *that same object*, that same property, and some other time.[39]

D.H. Mellor also accepts the triadic definition of change such that it must be *one and the same* entity at both times in order for a change to be a change rather than a mere succession of different things with different properties at different times. Mellor writes, "different entities [i.e. x_1 and x_2] differing in their properties do not amount to change." "Change," continues Mellor, "requires *one and the same* changing thing to have both the incompatible properties concerned."[40] That there is one and only one entity at both times is, says Mellor, "the prime requirement for change."[41] Thus Plato, Russell and Mellor all agree on this point.[42]

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[39]Heller, 1992, p 697. Emphasis mine. Heller in this paper is arguing for a "temporal parts ontology." With this sort of ontology in the change (qua succession) (x_1, Rx_1, t_1), (x_2, Mx_2, t_2), x_1 and x_2 are considered to be "temporal parts" of the object x, where a 'temporal part' is wholly analogous to a 'spatial part.' Heller is defending a temporal parts ontology from the claim that such an ontology implies "that nothing is really changing - all that is happening is that one item [i.e. x_1] is being replaced by another [i.e. x_2] with different properties" p 699. A temporal parts ontology is open to the objection that it reduces change to succession by omitting 'to change' from the analysis. It omits the event of changing while admitting only what would be the product of that event, namely the difference in x at t_1 when compared to x at t_2. Heller is denying that a temporal parts ontology precludes change. Mellor, in *Real Time*, chapter 7, p 110, will argue against Heller's position and a temporal parts ontology precisely for the reason that it reduces the change of a *thing* (singular) to a succession of *things* (plural). Mellor argues that a temporal parts ontology is ok for events, but not for things. Events can have temporal parts, but things do not. For Mellor, if things had temporal parts then change would be explained away. Nor would we be able to distinguish between change and spatial variation. We return to Mellor's arguments in Chapter Three.

[40]Mellor, 1981, p 111. Emphasis mine.

[41]Mellor, 1981, p 111.

[42]Strobach in *The Moment of Change* does not emphasise this point when he offers his definition of change. See p 1-2. Though of change he says of the two mutually exclusive properties "their obtaining simultaneously would be a contradiction." That the contradiction is a possibility suggests that for Strobach, like for Plato, Russell and Mellor, the object in both the before and after state must be identical qua identity (though obviously not identical qua set of properties).

The fourth part of the argument in the *Parmenides* is that "it does not change from rest while it is still at rest, nor from motion while it is still moving."[43]

The fourth-part of the argument builds upon the distinction generated by the third claim, namely, the distinction between (α) the state an object is in, S_n, and (β) the changing of the object's state, ΔS_n. The fourth part is concerned with the 'changing' in the second sense. It deals with when this changing can be thought to occur and what status the object must have at or during this time. In other words, this fourth claim relates change in the second sense to change in the first sense.

The meaning of the fourth part of the argument is as follows. When an object is in a state, S_1, it is not yet in the state that it is about to become, S_2. Nor after becoming a state, say S_2, is an object still in the state it was, namely S_1 (for S_1 and S_2 are mutually exclusive and thus only successive). Furthermore, and it is here where the fourth part of the argument is of acute importance, when an object is becoming its following state, $\Delta S_{1>n>2}$; when, that is, it is changing its state (ΔS) from the before (S_1) to the after (S_2) state, it cannot yet be in that following state, namely S_2. Nor when it is changing its state can an object still be in the state that it was, namely S_1. In other words, if an object is changing its state, ΔS, then it has already (at least minimally) changed and cannot therefore still be in the state that it was, S_1. And if an object is changing its state then it cannot yet be in the state that it is about to become, S_2, for as soon as an object comes to be what it is about to become then that object must have already changed. But if an object has already changed then it will have already become what it became, and this

[43]Plato, 1926, p 299.

implies that it would not in fact actually or still be changing.

Strobach argues the fourth part of the argument means that "an event of changing cannot take place while the old state still obtains; but when the new state already obtains it cannot take place either."[44] The fourth part of the argument limits when the changing from the before to the after can be thought to take place. Changing cannot occur when the before state is, for then the change would not yet have occurred. Nor can changing occur when the new state obtains, for by the time the new state obtains the changing must already be complete.

Owen writes that the fourth part of the argument means that

> When it changes from rest to motion it cannot be either at rest (for then the change would be still to come) or moving (for then the change would be past).[45]

David Bostock clearly expresses the fourth claim when he writes that

> While x is changing from being not-F to being F, i.e. while x is becoming F, x is not (yet) F. While x is changing from being not-F to being F, i.e. while x is becoming F, x is not (still) not-F.[46]

When x in the change from not-F to F is not yet F nor not still not-F then x is changing then. For "if a change occurs somewhere within a stretch of time then there must, it would seem, be at least one moment within that stretch such that at that moment

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[44]Strobach, 1998, p 6. Strobach says that this premise is of the utmost importance. How one deals with this premise is, says Strobach, "one of the most interesting questions concerning the moment of change."

[45]Owen, 1975, p 123.

[46]Bostock, 1978, p 231. Notice should be taken of the 'yet' and the 'still'.

the change either occurs or is occurring."[47] Change in the second sense must be present and active at some moment, rather than either merely potential and yet to come to be or already completed and thus non-active and past.

By means of the fourth part of the argument, which is a limitation upon when an event of changing may be thought to be taking place, Plato isolates the moment of change (qua event of changing).

The moment of change is, then, a temporal intermediate between the old state and the new state at which change (qua event of changing) takes place. And this event is the means by which the difference between the old and the new state comes to be. Owen calls this temporal intermediate a "*tertium quid.*"[48] This means that in a change there are at least three temporal determinations: t_1 is the date at which the object is in its old state. $t_{1>n>2}$ is that date at or during which the object either changes or is changing its state. While t_2 is the date at which the object is in its new state. These three temporal determinations correspond to the states S_1, $\Delta S_{1>n>2}$, and S_2 such that $S_1 \neq \Delta S_{1>n>2} \neq S_2$.

With respect to any arbitrary object x, for x to change its state, ΔS, x must be continuous or identical through the interval $(t_1, t_{1>n>2}, t_2)$ while there must be a discontinuity in at least one property composing the states of x in the interval $(t_1, t_{1>n>2}, t_2)$.

In summary, the isolation of the moment of change in Plato's conceptual puzzle involves the following four claims:

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[47]Bostock, 1978, p 236.

[48]Owen, 1975, p 123.

(1) Both the before and after states cannot occur in the same object at the same time.
(2) There are only two possible states for an object in time, *F* or not-*F*.
(3) It cannot change with out changing.[49]
(4) "To change" cannot occur when the old state still is nor when the new state has become.

The moment of change is isolated by means of these four claims. And this moment is seen to be different than either the before or after state. Now why, given (1) to (4), there are conceptual difficulties about change shall be our focus.

1.3 The Conceptual Problem with the Moment of Change

Owen writes that if we accept the above four claims then it "baffles us to say when it makes the change from one to the other."[50] What is baffling is not only when the change takes place: the status of the object's state when it is changing is also baffling. This argument showing why a change from one state to another is potentially baffling requires that we consider the entire set of claims (i.e. (1) to (4)) used to isolate the moment of change.

If, according to (1), an object cannot be both *F* and not-*F* at the same time; and if, according to (2), an object can only be *F* or not-*F* at any time; and if, according to (4), an object cannot be either *F* or not-*F* when it is changing from *F* to not-*F*, changing that,

[49]This claim could be construed as the claim that a thing can undergo a μεταβάλλον if and only if μεταβάλλει is true of it at or for some time.

[50]Owen, 1975, p 123.

according to (3), cannot be omitted from the analysis, then when an object is changing that object is in a most problematic position: This object cannot be either *F* or not-*F* according to (4). According to (2) it cannot be neither *F* nor not-*F*. It must be one or the other without alternative, something incompatible with (4). While according to (1) that object cannot be both *F* and not-*F*.

The argument demonstrates the conceptual problem that occurs at the moment of change, the *tertium quid* - the $\Delta S_{1>n>2}$ interposed between S_1 and S_2. Parts (1), (2) and (4) of the argument used to isolate the moment of change conflict with each other at the moment of change (that which (3) states must not be omitted). Premise (4) argues that the object when it is changing from motion to rest cannot be either in motion nor at rest. (2) argues that an object can *only* be in motion or at rest at any time. And part (1) of the argument prevents us from saying that when an object is changing the object is both in motion and at rest.

The *tertium quid* - the moment of change - is most problematic. For such a thing is demanded by parts three and four of the argument. In addition, part four implies a certain description of the object at this moment, namely that it is not in motion nor at rest. However, the second part of the argument, the notion of the excluded middle, rules out both the *tertium quid* as such and the description of the object that this *tertium quid* implies (i.e. that it is not in motion nor at rest).

In summary, Plato's puzzle raises a conceptual problem about the moment of change by defining what a change is. In so defining it differentiates a change from changing, and both from simple succession. By means of changing the moment of change is isolated. Isolating the moment of change demands an account of the 'when' of

this moment as well as an account of the object's status at this moment.

The conceptual problem of the moment of change occurs and becomes most acute when an account of the 'when' of this moment as well as an account of the object at this moment is given in light of the claims used to isolate the moment of change. The conceptual problem results from the fact that the very argument used to isolate the moment of change is the very argument that seems to make such a moment unintelligible. This set of considerations is what leads to Sorabji's desperate sounding question: What are we to do?

Charles Hamblin argues that the conceptual problem raised by Plato in the *Parmenides* will not be addressed by ever finer observation of objects changing from motion to rest or vice versa. The problem of change in time "is not," argues Hamblin, "an empirical problem."[51] Strobach continues on the import of observation, supporting Hamblin's claim about the inability of observation to settle wholly conceptual difficulties. Strobach adds, however, that there is nothing mysterious about our observations of motion, rest, or the change from one to the other.

> We know what it *looks* like when a car is simply standing there; and we know what it looks like when it is moving. So also we know what it looks like when it is first simply standing there, and then moving.[52]

This means that neither microscopes nor telescopes will avail us of the conceptual

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[51]Hamblin, 1969, p 400. This problem or puzzle is not to be solved by thinking that change is a gradual process occurring over an extended period of time, as opposed to a sudden instantaneous switching for, continues Hamblin, "gradual changes raise the problem as much as sudden ones do."

[52]Strobach, 1998, p 3.

problem. Of course, some might say that because we know what we observe we need not treat the question of what we know any further. These are those people who *think* "what is happening is obvious."[53] What we obviously observe, however, is different than both what we think and what we think we observe. The problem then is not to observe, but to think about what we observe so that we "find a satisfactory conceptual treatment of *what we observe*."[54]

"Neither," continues Hamblin, "is it one of how to describe the facts in ordinary English."[55] Plato's puzzle and the conceptual issues it raises will not be solved by fancy but merely linguistic analysis.

Nor should we think that the conceptual problem associated with Plato's puzzle might be solved with a simple, direct appeal to logical principles such as, for example, the principle of non-contradiction. Strobach argues that the conceptual problem of the moment of change will bring us "into conflict with the most fundamental laws of traditional logic."[56] This conflict of conceptuality will bring us to the "edge of logical anarchy."[57] Of using these fundamental, traditional or classical, logical laws to address the conceptual problem associated with Plato's puzzle, Graham Priest argues that "the principles of classical logic cannot...be invoked without begging the question."[58]

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[53]Strobach, 1998, p 2.

[54]Strobach, 1998, p 2.

[55]Hamblin, 1969, p 400.

[56]Strobach, 1998, p 3.

[57]Strobach, 1998, p 28.

[58]Priest, 1981, p 252. To address Plato's puzzle and the conceptual problem of the moment of change Priest argues that the principle of non-contradiction should be abandoned. Priest offers in place of traditional

The two goals of this chapter are now complete: we have (1) discovered how the moment of change can be isolated and we have (2) seen why such a moment of change can be puzzling.

We need now, in Chapter Two, to see how others have dealt with this conceptual problem.

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traditional logic what he calls a "dialectical tense logic." This logic, says Priest, "allows a rigorous proof that change entails contradiction...[such that] true contradictions are realized in some changes." Priest's position, though controversial, is not radically novel. For a discussion of how a "real contradiction is accepted in nature" according to philosophers of the 14th century see Simo Kuuttila's and Anja Inkeri Lehtinen's 'Change and Contradiction: A Fourteenth-Century Controversy,' *Synthese* 40, 1979, 189-207. The 14th century argument that contradictions exist is different from Priest's 20th century argument. The 14th century argument appeals to a distinction between an "instant of time" and an "instant of nature." I have yet to find such a distinction in any of the modern treatments of change and time. Priest's argument, in contrast, does not depend on an ontological distinction between an instant of time and an instant of nature. Priest instead limits his argument to formal, albeit 'paraconsistent', logic. In his 1981 work, for example, he "specifies a formal logic which accommodates this possibility...[that] there are some changes from p being true to $\sim p$ being true where true contradictions are realized." Priest thus denies the principle of non-contradiction. Whereas, in contrast, in the 14th century arguments outlineded by Kuuttila and Lehtinen the law of non-contradiction is not violated when contradictions are realized in some changes.

2 Addressing Plato's Puzzle

The completion of the two goals of the first chapter, namely, (1) to discover how the moment of change can be isolated and (2) to see why such a moment may be puzzling leads, naturally, to the goals of the Second Chapter.

We need now see how the conceptual problem of the moment of change has been dealt with by others.

To begin with solutions to the problem, we must keep in mind Chapter One where it was stated that an analysis of language alone, further observation alone, or a direct appeal to logic alone will not solve the problem.

Observation, we learned in chapter one, seems to be wholly unambiguous: we know that what we see - or, at the least, we know that what appears to be seen - is change and becoming. Charles Hamblin agrees that there is no "mystery about what *happens* when changes take place."[59] The lack of ambiguity or mystery in observation means that "from a certain point of view this problem is a very trivial one."[60] But that from the point of view of observation the problem appears to be trivial does not mean that the problem does not remain in full force for, adds Hamblin, "it can hardly be suggested that the solution to our problem is to be sought by closer observation of accelerating vehicles."[61]

The first important point here, so far as solutions to the conceptual problem of the moment of change are concerned, is to introduce the placement of an epistemological

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[59]Hamblin, 1969, p 410.

[60]Hamblin, 1969, p 410.

limitation upon the capacity of observation to settle the conceptual questions arising about change.

The second, and much more important point pertains to the *degree* of this epistemological limitation of observation.

There are those who will so minimize the import of observation they will deny outright the evidence of observation. These people claim that what we observe (i.e. change) is not what we observe. These people claim that if we think we observe change and time then we err. This means that for some the way things appear to us in observation is not the way things are in reality. It is of course the latter rather than the former that is desired by philosophy for as Socrates remarked

> All reject the appearance and demand the reality.[62]

Solutions to the conceptual problem of the moment of change fall into either one of two camps: there are those who (1) deny or reject the reality of change and time altogether irrespective of the fact that as Zwart notes, according to the "exigencies of observation...change and becoming [are] probably *the most conspicuous* features of reality."[63] This first camp denies the 'exigencies of observation' and rejects the reality of all change and time. For this first camp, reality is not as it appears to be.

In contrast, the second camp (2) offers a conceptual analysis of change and time

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[61]Hamblin, 1969, p 410.

[62]Plato, *The Republic*, 502c-509c.

that harmonizes with, or effects a compromise between, our observations and our thought or logic. This second camp admits of many different analyses in its treatment of the moment of change. We will consider these after we deal with the arguments of the first camp, the 'there is no-change' camp.

2.1 There is No-Change

Plato's puzzle leaves us in a peculiar position. In so far as we believe observation is a source of knowledge, we know what happens when an object changes. But in so far as we wish to offer a logical or conceptual analysis of the moment of change our observations are less than useless. What's more, when we engage in a logical or conceptual analysis of change and time our logic may fail, leading to Strobach's logical anarchy. Or, alternatively, our logic may lead to a rejection of the reality of *all* change and time whatsoever. This latter alternative, perhaps best described as a logical dictatorship, is the tack taken by the camp of no-change.

If there is a conflict or an opposition between observation and logic, then what is needed to address Plato's puzzle is accurately stated by Zwart in *About Time*. We need to come up with some "compromise," Zwart writes, "between the exigencies of thought (which [is] unable to account for change and becoming) and the exigencies of observation (for which change and becoming [are] probably the most conspicuous features of

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[63]Zwart, 1976, p 17. Emphasis mine.

reality)."[64]

The no-change camp argues that no such compromise can be made. And this camp argues that if and when our logic and our observations are in conflict, then so much the worse for our observations.

Observations - especially scientific ones employing highly refined modes of measurement - must occur in a presupposed conceptual framework, one at least sufficient to ensure accurate and consistent measurement. These concepts cannot themselves go unanalyzed nor be defined by the observations themselves. Zwart emphasizes this point about the relation between concepts and observations as it arises, for example, with definitions of time in empirical physics.

Zwart writes that empirical physics "*cannot* give a definition of time all by itself."[65] Continuing Zwart writes "such a definition would have to be preceded by a philosophical analysis." In this philosophical analysis the "*concept* of time would be examined."[66] This philosophical and conceptual analysis would be wholly unlike empirical physics for "it goes without saying," writes Zwart, "that such an [philosophical] analysis would be completely outside the scope of physics."[67]

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[64]Zwart, 1976, p 17.

[65]Zwart, 1976, p 10. The emphasis on 'cannot' is Zwart's.

[66]The emphasis on 'concept' is mine.

[67]Zwart, 10, 1976. Given the epistemological limitation of observations to define the empiricist's "fundamental notions" (p 10) in terms of which observations are themselves first characterized, the empirical doctrines of modern physics have not eliminated the problems of time and change for, writes Zwart, "Einstein's famous analysis was not an analysis of the *concept* of time, *but only* an analysis of the *process* of measuring time." The concept remains as elusive as ever: for the process of measuring and what is measured are two different things. "What time really is and what quantity is really measured by a clock" are the questions that physics cannot answer. Such conceptual problems, continues Zwart, are "insoluble by purely physical methods." This applies no less to the problem of the moment of change.

In support of Zwart and in support of the limitation of observation or empirical methods to decide all the questions about change and time, Robin Le Poidevin uses the example of the debate between 'closed' and 'linear' time. In closed time every time is both before and after every other time, including itself. Time on this model is symmetric and reflexive, whereas in linear time, time is asymmetric and irreflexive. This dispute, says Le Poidevin, "is not an empirical dispute...a decision between closed and linear time would have to be based upon *a priori* considerations." The *a priori* component is necessary to decide the issue for the reason that "any empirical observation we made would be compatible both with the hypothesis that time is linear and with the hypothesis that time is closed."[68] Thought and thought alone, says Le Poidevin, decides the debate between linear and closed time.

The no-change camp denies the reality of all change and time on the grounds that thought and its concepts alone must decide the question about the reality of change. Such concepts are necessary if observations are to be intelligible. Thought and logic for the first camp, however, cannot make change logically intelligible. Change is contradictory and, according to the first camp, what is contradictory cannot exist. We cannot therefore actually be observing change. For the first camp it only appears *as if* we are observing change.

Although in extreme opposition to the 'exigencies of observation,' the first camp is ancient. It has a long history pre-dating even Plato's articulation of the conceptual problem of the moment of change in the *Parmenides*. But this does not mean that there

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[68]Le Poidevin, 1993, p 159.

cannot be found current examples of people who deny the reality of change and time.

The ancient position which denies all change and time is called Eleaticism. According to the Eleatics, writes Zwart, "*all* change is only apparent and the world is in reality absolutely changeless."[69] This 'all' is meant to operate over *absolutely* everything, even our (only apparently) successive, subjective observations or empirical experience of change and time. This extreme position about change, time and the unchanging nature of the world derives, says Zwart, "from our inability to make change and movement *logically* understandable."[70]

If we accept that there are the 'exigencies of thought' and the 'exigencies of observation,' then the first camp's rejection of the reality of all change and time is based upon the *a priori* claims of thought and of logic alone. So such a rejection of change does not just greatly limit or demote the importance of observation for knowledge. Denying the reality of all change and time additionally demands the stronger claim that what appears to us in observation is categorically false and wholly unindicative of what is actually the case. Far from just being simply useless for knowledge, observation for the first camp leads us to error. This means not that observation yields neither truth nor falsity (i.e. is useless); rather, observation for the no-change camp only yields falsity.

Parmenides (the man, not Plato's dialogue of the same name), Zeno and Mellisus represent the ancient origin of the no-change camp or the Eleatic school of thought about change and time. For this school of thought both change and time are, says Baird, "not

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[69]Zwart, 1977, p 16.

[70]Zwart, 1977, p 16. Emphasis is mine.

possible." For Parmenides "the path of truth leads us to see that being is one and cannot be created, destroyed or changed." For Zeno his "paradoxes were designed to prove that plurality and change are not possible...Being is one seamless unchanging whole." For Mellisus, "like Parmenides, Mellisus believed that being is one seamless unchanging whole and, like Zeno, he [Mellisus] presented *ad absurdum* arguments to show the impossibility of plurality and change."[71]

The Eleatic argument points out and accepts that our perception and observations *appear* to show change. But the change that is present in what appears in perception, the argument runs, is not indicative of what is actually the case, even in the case of our subjective perceptions and observations.

The Eleatic claim regarding the illusion or the appearance, as opposed to the reality, of change and time is fully appreciated by a current member of the camp of 'no change:' J.E.M. McTaggart. In *The Nature of Existence*, McTaggart writes that

> Nothing really changes. And nothing is really in time. Whenever we perceive anything in time - which is the only way in which, in our present experience, we do perceive things, we are perceiving it more or less as it really is not.[72]

McTaggart claims the belief that change and time are real results from an "illusory perception." If we "regard ourselves as perceiving things in time" then we are

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[71]Baird, 2000, p 19-28.

[72]McTaggart, 1968, p 22-23.

"perceiving them *erroneously*."[73]

To come to know that if we believe in change and time then we are in error McTaggart argues we need to realize that this belief entails that one "never escapes from contradiction."[74] A failure to acknowledge the illusory, erroneous nature of perception and the unreality of time would place us, as Parmenides says, amongst the "dazed, undiscriminating hordes, who believe that to be and not to be are the same and not the same."

To join the camp of 'no-change' of Parmenides and the like we must, argues Parmenides, avoid using "an aimless eye or an ear or a tongue full of meaningless sound" to guide us to knowledge. Nor, continues Parmenides, should we judge on the basis of "habit, born of much *experience*." Rather, says Parmenides, we must "judge by reason."[75]

This means that if observation or experience as distinct from reason or logic are in dispute, then so much the worse for our observations. For the Eleatics as for McTaggart the 'exigencies of thought' trump those of observation.

The argument of the no-change camp proceeds as follows: if contradictions cannot be; and if, according to Parmenides and McTaggart, change and time are contradictory, then change and time cannot be, regardless of what we think we are observing. The result

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[73]McTaggart, 1968, p 22-23. Emphasis mine.

[74]McTaggart, 1968, p 22-23. The contradiction would accrue, argues McTaggart, whether we define time as "relations" or "qualities," as "A-series"(tense) or "B-series" (dates), it does not matter which. The exact details of McTaggart's argument are not necessary to describe here. We will deal with these arguments in detail in Chapter Three. What is necessary to note for the purposes of this chapter is the fact that McTaggart appeals to the *logical* principle of non-contradiction in order to ground his conclusion.

[75]Parmenides, see Baird, 2000, p 21.

of an Eleatic style analysis and the subsequent rejection of change and time is that "the real nature of the universe differs very much from the nature which it appears *prima facie* to possess."[76]

The argument of the first camp has a four-part structure.

(1) It gives negative epistemological import to observation.
(2) Logic, reason or *a priori* thought ground its conclusion.
(3) The principle of non-contradiction is absolutely binding or inviolable.
(4) When change is submitted to a logical analysis change is found to be contradictory.

There are those who do not think that logic trumps observations. This means that some people reject (1). Some have claimed that in light of our observations so much the worse for our logic.

Graham Priest, for example, with his 'dialectical tense logic', claims to *prove* - contra Parmenides - that to be and not to be are the same and are not the same. This means that Priest when he analyses change knowingly recommends what Strobach calls 'logical anarchy,' namely the idea that "there are some changes from p being true to $\sim p$ being true where a contradiction is realized."[77] For Priest, contradictions can and do exist. Priest, then, rejects (3) and much as he rejects (2). We will see that Mellor, for example, rejects (4).

The Eleatic anti-change argument is, then, discreditable on the following points.

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[76]McTaggart, 1968, p 193.

[77]Priest, 1981, p 249.

(α) The distinction between reality and *prima facie* appearance and the negative characterization of observation. This distinction is useless and does not address nor prevent the questions concerning the moment of change from arising.
(β) The appeal to classical logic's principle of non-contradiction.
(γ) The analysis or characterization of change as contradictory.

If we, to deal with the first point, take McTaggart's claim that "whenever we perceive anything in time - which is the only way in which, in our present experience, we do perceive things, we are perceiving it more or less as it really is not," then we see that according to McTaggart there are at least two things: (1) the 'way we perceive it to appear' and (2) the 'way it is'.

Now, in 'reality' there is neither change nor time. But, according to the way things *appear*, there is change and time. We must reject the latter and demand the former. The numerical difference between (1) and (2) requires that we assume that the 'way things appear' along with the 'way it is' both equally exist. For if our perception of change did not exist then we could not perceive it as we do - as changing in time. While if the 'way it is' did not exist then it would not be let alone be the way it is.

The distinction between 'appearance' and 'reality' does not settle the dispute for the reason that a change in that which appears (i.e. observations) is a change nonetheless in what is. If there is a change in what appears and if appearances are real in so far as they exist as appearances (i.e. in so far as phenomenology is possible), then to that extent the distinction between reality and appearance is useless for deciding questions arising from a conceptual analysis of the changes that we observe to occur. In other words, even if McTaggart is correct and we perceive the world more or less as it really is not, this does not eliminate change.

Zwart supports the claim that "it does not matter whether all this change and becoming which we observe is real or only apparent." What is "essential," say Zwart, "is that *something* changes; whether this something is real or only an appearance is not important." The reason why the distinction between reality and appearance is useless to decide the questions arising regarding the moment of change is that "a change in appearance is a change too." This means that a change in appearances or observations is no less a change in 'reality' than is a 'real' change in the 'real' reality. Change is not less than change "even if one were to locate this change of appearance entirely in the mind." Zwart therefore supports the claim that it is "utterly pointless to postulate another timeless reality behind the transient reality we observe around us."[78] Change remains in so far as we accept the (minimal claim) that there is at least the appearance of a changing and transient world.

Priest, in support of the irrelevance and uselessness of the distinction between appearance and reality for the conceptual problems associated with change, presents change entirely from the perspective of a "phenomenological example."[79] In the light of this example, McTaggart's attempt to discredit the reality of change by arguing that perception is erroneous and illusory is seen to be an insufficient reason against the reality of change. One can, with Priest's example, raise all the questions about change without making any appeal or reference to any perception or any observation.

In Priest's phenomenological example there is not an "independent physical

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[78]Zwart, 1976, p 19.

[79]Priest, 1981, p 252.

state"[80] at all. In this example, therefore, we need not worry about whether or not what we observe is an image of the real or the real itself. For Priest we can, as was stated in Chapter One, generalize the problem of the moment of change from a physical, observable example (e.g. the change from motion to rest) to some arbitrary property *F*. This arbitrary property *F* can be defined in terms of the change from not-knowing to knowing the solution to a problem. Priest argues that in this case the "epistemological state is all there is."[81] Priest writes

> For days I have been puzzling over a problem. Suddenly the solution strikes me...Now, at the instant the solution strikes me, do I, or do I not know the answer? There appears to be no good reason for saying one rather than the other. All I know is that before, I could not say what the answer was, whilst after I could. The situation is symmetrical. Nor will it really do to say that at that instant I determinately either did or did not know the answer: It is just that we do not know and can not tell which.[82]

In this example, continues Priest, we do not need to ponder about some "determinate physical situation at the instant of change which obtained independently of our epistemological and perceptual abilities."[83] In so far, then, as the distinction between reality and appearance can be made, to that extent the questions concerning the moment of change remain, for the problem arises in areas where observation and perception are totally ignored, as in Priest's epistemological example.

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[80]Priest, 1981, p 252.

[81]Priest, 1981, p 252.

[82]Priest, 1981, p 252.

[83]Priest, 1981, p 252.

At best, the distinction between appearance (i.e. erroneous or illusory perception) and reality (i.e. the 'truth' independent of our epistemological and perceptual abilities) made by the Eleatics and McTaggart explains away, rather than explains, change, especially phenomenological change. We must, however, 'save the phenomenon.' Change cannot be explained away. When an appeal to the distinction between appearance and reality is made, the conceptual problem of change is merely delayed or ignored, rather than addressed and explained.

We have already seen that observation alone will not address the problem of the moment of change. In the case of the no-change camp, however, the objection is that an appeal to logic alone cannot solve the situation. In other words, Strobach's logical anarchy should not be prevented by the Eleatic's or McTaggart's logical dictatorship, especially a logical dictatorship that denies the reality of change for, as Zwart rightly notes, according to the "exigencies of observation" change and becoming are the "most conspicuous features of reality."[84] Denying the reality of change and time and rejecting or ignoring the exigencies of observation based upon the dictates of logical analysis alone would require us to live with what Strobach calls "phenomenological unease."[85]

To deal with the second objection against the 'no-change' camp we should remember that the Eleatics and McTaggart appeal to the first principle of classical logic, the law of non-contradiction, in order to ground the conclusion that change and time are not real. Both claim that contradictions cannot exist, change and time are contradictory,

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[84]Zwart, 1976, p 17.

[85]Strobach, 1998, p 12.

and so change and time cannot exist. Their argument that change and time are contradictory would require it to be the case that, as Priest notes, "classical logic is right." But, Priest continues, "it is exactly this point [the validity of classical logic] which is now at issue."[86] On this head Priest says that, with respect to the problem of the moment of change, "the principles of classical logic cannot therefore be invoked without begging the question."[87]

Priest argues that change and time are contradictory but that, against the Eleatics and McTaggart, Priest argues that change can and does exist as contradictory. According to Priest the no-change camp's appeal to classical logic is insufficient to ground their conclusion. Priest would argue that the no-change camp presupposes the principles of classical logic rather than prove that such principles are binding.

The third objection against the no-change camp concerns the claim that change and time are contradictory. But are change and time contradictory? Or can change and time be analyzed in such a way so as to show that change and time are not contradictory?

E.J. Lowe, in *The Indexical Fallacy in McTaggart's Proof of the Unreality of Time*, writes that the structure of McTaggart's argument against the reality of time and change is as follows.

> (1) Time essentially involves change.
> (2) Change can only be explained in terms of A-series expressions.
> (3) A-series expressions involve contradiction and so cannot describe reality.

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[86]Priest, 1981, p 253.

[87]Priest, 1981, p 252.

(4) Therefore time [and change] is unreal.[88]

The third objection against the 'no-change' camp - whether change and time are contradictory - pertains to parts (2) and (3) of McTaggart's argument. That change can *only* be explained in terms of A-series or tensed expressions, expressions using the terms 'past', 'present' and 'future', is a debatable point.

It is conceivable that one could agree with part (3) of McTaggart's argument while at the same time disagreeing with part (2). Only if both (2) and (3) are held will (4) follow. There is no shortage of people who do not accept (4). Those who "oppose McTaggart's conclusion," writes Lowe, "challenge either (2) or (3) or both."[89] One can, then, accept that McTaggart proved that A-series expressions are contradictory and so cannot describe reality. But one can still admit the reality of change and time. Admitting the reality of change and time would be via a rejection of (2).

(2) does not concern whether or not change is contradictory. (2) concerns what is meant by change or how change is to be defined. And (2) additionally concerns how the terms used in the definition of change are themselves to be defined. For an example, let's take the term "time" and the position of D.H. Mellor, who rejects (4).

If we say that 'change' is 'a thing having mutually exclusive properties at different 'times'' and mean by 'time' past, present and future (i.e. what is called "A-series" time), then for Mellor we would suffer the problems McTaggart points out with

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[88]Lowe, 1987, p 63. The 'indexical fallacy' results when words like 'here' and 'now' are confused and misused. Though interesting in its own right, Lowe's articulation of the fallacy and his argument about McTaggart making it is not of importance for the purposes of this chapter, although Lowe's work does raise the possibility of yet another objection to McTaggart's argument.

[89]Lowe, 1987, p 63.

this series. Whereas if we mean by 'time' the "B-series," a series of dates (i.e. (t_1, t_2, t_3)), then we would not suffer the problems of A-series descriptions.[90] We will consider in more detail the difference between the A-theory and the B-theory of time in Chapter Three and how they relate to change.

For the present it is enough to note that the acceptance or rejection of (2) and its implied definition of time is what differentiates McTaggart from Mellor, who unlike McTaggart accepts the reality of change and time. Lowe writes,

> Mellor holds that McTaggart succeeds in demonstrating the unreality of *tense* (there are, for Mellor, no tensed facts), but not that of *time*, since he [Mellor] holds that change can be explained without reference to the A-series.[91]

The fact that, for Mellor, change can be explained without reference to the A-series means that Mellor does not accept (2). Of McTaggart's argument Mellor writes that

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[90]McTaggart argues that the A-series is more fundamental than the B-series. It is for this reason that McTaggart rejects the B-series as much as the A-series based upon problems wholly within the A-series alone. There is, therefore, within McTaggart's argument, an additional (and questionable) premise advocating a "reductionist thesis" of B-series to A-series. This debate is however outside the parameters of this chapter. For our purpose, it is sufficient to show that part (2) and the debates surrounding it are more than controversial and complex and that the 'no-change' camp can be questioned based upon their definition of change and time. For more on the debate between A-series and B-series see, firstly, Josh Parson's 'A-Theory for B-Theorists' in *The Philosophical Quarterly*, Vol. 52, No. 206, January 2002, p 1-20. Parsons here *attempts* to explain the difference between the A- and B-series. While, secondly, see Clifford Williams' 'The Metaphysics of A- and B-Time' in *The Philosophical Quarterly*, 1996, p 371-381. Williams' aim, he says, is "to get at what really differentiates the two theories." But, unlike and against Parsons, Williams argues "that there is no coherent way of stating what this [difference] is." For more on the "reductionist thesis" see Robin Le Poidevin's 'Time, Tense and Topology' in *The Philosophical Quarterly*, Vol. 46, No. 185, October 1996, p 467-481. See McTaggart's *The Nature or Existence*, Cambridge University Press, London, 1968, p13, paragraph 310-312 for McTaggart's articulation of the reductionist thesis. Mellor rejects the reductionist thesis.

[91]Lowe, 1987, p 63.

> [T]he tensed view of time is self-contradictory and so cannot be true. McTaggart showed that in 1908, while trying to show time itself to be unreal. Time, however is not unreal: the rest of McTaggart's argument is wrong.[92]

Mellor will take issue with what Le Poidevin calls McTaggart's "reductionist thesis"[93] concerning the B-series and the A-series. The reductionist thesis argues that the B-series "is to be analyzed in terms of the A-series, and not *vice versa*."[94] The reductionist thesis draws heavily on definitions of time and change that Mellor will not accept. This means, says Lowe, that Mellor "accepts (3) but not (2)."[95]

Thus the no-change camp's argument may be rejected based upon the no-change camp's definition of change and time as contradictory.

What's more, if according to McTaggart A-series propositions are contradictory and cannot describe reality, then why would McTaggart choose - and how *could* McTaggart choose - to describe 'change' in terms of an A-series? McTaggart argues A-series terms are the only available candidates for describing change, B-series terms being unsuitable to the task for the reason that B-series terms are permanent (i.e., if M is ever earlier than N, then M is always, has always been and will always be earlier than N).[96] If,

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[92]Mellor, 1981, p 5.

[93]Le Poidevin, 1996, p 470.

[94]Le Poidevin, 1996, p 469.

[95]Lowe, 1987, p 63.

[96]For McTaggart's argument that change cannot be expressed in B-series terms see *The Nature of Existence* Vol. 2, Bk. V, Chap. XXXIII, Para. 310.

however, A-series terms cannot describe reality, then there is no way in which these terms could describe change. Change could not, then, *only* be described in A-series terms, for nothing can be described in (contradictory) A-series terms.

If A-series terms are contradictory then, at best, McTaggart's conclusion must be limited to the claim that A-series terms cannot describe change, not that change cannot be real (this corresponds to Mellor's conclusion). If McTaggart's premise (3) is true then his premise (2) and conclusion (4) *must* be false: for A-series terms that cannot describe reality are terms that cannot be used as a ground for the rejection of some phenomenon that such terms are being (illicitly) used to describe, namely change.

In summary, the no-change camp creates a distinction between appearance and reality. This distinction does not eliminate the problem of the moment of change, for the problem of the moment of change does not necessarily depend on observations or perceptions for its articulation. Priest's epistemological and phenomenological example indicates this fact. Secondly, the appeal to the principles of classical logic is not without problems of its own, and there are examples of people who will reject these classical principles. Thirdly, the first camp's definition of change and time are questionable and have been rejected.

For these reasons the no-change camp's conclusion should be viewed with the utmost scepticism if not completely rejected.

2.2 The Camp of Real Change

If we do not want to claim that there is no such thing as change then a manner of

dealing with Plato's puzzle that does not deny the reality of change must be articulated. We need now to see how those falling into the second camp - those who argue that change and time are real - deal with change and time in such a way so as to address the conceptual problem of the moment of change.

Strobach argues that all 'solutions' to the conceptual problem of the moment of change are two-fold. Firstly, all entail their own, particular *description* of the moment of change. Secondly, all the descriptions entail a *classification* of the moment of change. Strobach captures the two-fold character of the various ways in which the conceptual problem has been dealt with by means of the following two questions:

> 1. Which (if any) state obtains at the limit between the old state and the new state?
> 2. When (if at all) does an event of changing take place?[97]

People who address these questions and offer a possible solution to Plato's puzzle do not, as the Eleatics and McTaggart do, explain away change.[98]

These two questions accurately indicate the conceptual problem of the moment of change. To address the conceptual problem of the moment of change is to provide systematic answers to these two questions. Strobach makes an additional, important point about the relation between the two questions and their two answers that will help clarify the problem and what a solution to it must take into account.

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[97]Strobach, 1998, p 3.

[98]McTaggart would answer question (2) by saying an event of changing cannot exist (i.e. he would place emphasis on the "if at all" of Strobach's second question). Thus for McTaggart to speak of an old or a new state is contradictory nonsense; he would not, then, agree that question (1) can be asked let alone answered, given how he answers (2).

Strobach argues the two questions can be "answered fairly independently." Thus we must always ensure that we have "distinguished the two questions explicitly." The reason why such an explicit differentiation must always be maintained is that "otherwise an answer to one of the questions might easily be taken to be an answer to the other question - which it is not."[99]

To further clarify what these two questions and their differentiation are supposed to achieve, we should recall that, in Chapter One, the moment of change was isolated and shown to be problematic by means of the following four-part argument.

> (1) Both the before and after states cannot occur in the same object at the same time.
> (2) There are only two possible states for an object in time, rest or motion.
> (3) It cannot change with out changing.[100]
> (4) Changing cannot occur when the old state still is nor when the new state has become.

And we saw in Chapter One that (1), (2) and (4) conflict at the moment of

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[99]Strobach, 1998, p 3. As an example of the difference and relation between the two questions, consider Strobach's interpretation of Plato's and Hamblin's treatment of these questions. Strobach writes that "Hamblin agrees with Plato in describing the moment of change as fundamentally neither belonging to the ending nor to the beginning one of the two states it separates." But that there "are fundamental and interesting similarities" between Hamblin and Plato does not mean, Strobach argues, that there are not "different motives for Plato and for Hamblin using the 'neither-nor' option in describing the moment of change." In other words, two different descriptions motivated by different arguments are not mutually exclusive with respect to the classification of the descriptions. For Strobach's interpretation of Plato see his *The Moment of Change*, Chapter 1, p 20-45. For his interpretation and comparison of Hamblin with Plato see Chapter 4, §4.1.1. p 171-173. According to Strobach's interpretation of Plato, "Plato uses the neither/nor option and allows an event of changing to take place *at the limiting instant*." Hamblin, in contrast, also gets classified as 'neither-nor'; but unlike Plato, Hamblin "wants to abolish instants altogether."

[100]This claim could be construed as the claim that a thing can undergo a μεταβάλλον if and only if μεταβάλλει is true of it at or for some time.

changing from the before to the after, the 'changing' that (3) requires to be explained rather than explained away.

I suggest that Strobach's first question concerns the problematic tension occurring between (1), (2) and (4). This question concerns the states of an object during a change.

Strobach's second question is concerned with part (3) of the argument used to isolate the moment of change. The second question is explicitly concerned with how 'to change' from *F* to not-*F* is related to 'a change,' the difference between *F* and not-*F*. The second question is therefore concerned with the changing of the object's states.

The two systematic questions, when put in relation to the argument used to isolate the moment of change, render clearer the nature of the problem and what is required in order to address it: all of the analyses must take into account (1) the object's states and (2) the changing of the object's state.

Strobach offers no less than twelve *descriptions* of the moment of change. All these descriptions are *classified* according to the following five-fold system.

(1) the either/or option.
(2) the either-way option.
(3) the both-states option.
(4) the neither/nor option.
(5) neutral instant analysis.

Our task now is to describe each classification and to provide an example of each. We must also come to understand why each classification is problematic for "a thorough look at them shows that, when applied, they are not all equally successful." Some of these

options "turn out to be very implausible candidates."[101]

2.3 The Either/Or Option

According to the either/or option "exactly one of the two states obtains at the limiting instant; either the old or the new state."[102] The question that must be raised when this response to the problem of the moment of change is given is 'exactly *which* state is it that obtains at the limiting instant?' Advocating the either/or position means that one can accept that it would be a contradiction for both the old and the new state to occur simultaneously. And one can accept that either one or the other state obtains. This means that the either/or position does not violate or call into question the principles of classical logic; nor does it deny or demote the importance of observation.

The charge that can be raised against this position is that of *arbitrariness*. If we ask Strobach's first question, 'which, if any, state obtains at the limit between the old and the new state?' and reply by saying 'exactly one,' then we have failed to understand or answer the question. For if we agree that the old and the new states are mutually exclusive then we already know that only one state could be the case at any one time, especially at the limiting instant. What we want to know is which state is the one that obtains. Sorabji, an advocate of the either/or option writes,

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[101]Strobach, 1998, p 6.

[102]Strobach, 1998, p 5. See Part 2, Chapter 1, p 125-145 for Strobach's analysis of the either/or-option.

> Suppose we imagine that up to a given instant something is non-existent, or invisible, or of a given colour, and that after that instant it is existent, visible or of quite a different colour. What status ought we to assign to it at the instant of transition? With these discontinuous changes, there will often be no considerations to guide us.[103]

The trick required to make the either/or option palatable is to find a sufficient consideration to guide us in our assignment of a status to the object at the instant of change "without arbitrariness."[104] Strobach agrees with Sorabji in so far as it comes to the need for a reason why the one rather than the other state should be at the limiting instant. To answer the question we need "a reason for assigning the limiting instant rather to the one than to the other state."[105] Failure to provide such a reason would make our assignment an "arbitrary decision."[106]

In the case of discontinuous change and its limiting instant's status the situation is finely balanced between the new and the old state. We therefore need to have something to recommend at least a "minor asymmetry"[107] between the old and the new state in order to escape the charge of arbitrariness when we assign the limiting instant to either the old or to the new state. Priest agrees and stresses in his epistemological example that "the situation is symmetrical." With respect to the limiting instant between the before and after, or knowing and not-knowing, Priest argues that "there appears to be no good reason

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[103]Sorabji, 1983, p 406.

[104]Sorabji, 1983, p 407.

[105]Strobach, 1998, p 145.

[106]Strobach, 1998, p 131.

[107]Strobach, 1998, p 126.

for saying one [state] rather than the other [state]"[108] obtains at the instant of change. Priest offers the act of stipulation as a possible course. He argues that stipulation will not help. Instead stipulation "underlies the problem [for] I am free to stipulate either way."[109]

It is here that the objection against the either/or option is most acute. For whatever is said to provide the asymmetry necessary to escape the charge of arbitrariness may be challenged and found possibly false or inadequate. The either/or option stands or falls on that which is claimed to provide the necessary asymmetry.

As an example consider the debate between Sorabji and Strobach. Sorabji writes that

> The question is whether we should treat the instant of transition between motion and rest as one at which the moving object is in motion, or at rest. The decision is no longer so clearly dictated, but I think there is a consideration which would justify our calling it an instant of rest.[110]

The reason why Sorabji decides to say rest rather than motion occurs at the instant of change or transition has to do with an "assumption," Sorabji writes, that "is the normal one in contemporary physics."[111] This assumption connects "zero velocity with rest and velocities about zero with motion."[112] If we make this assumption continues Sorabji "we get the result that there is no first or last instant of motion, but that there may be first and

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[108]Priest, 1981, p 252.

[109]Priest, 1981, p 252.

[110]Sorabji, 1983, p 406.

[111]Sorabji, 1983, p 406.

[112]Sorabji, 1983, p 406.

last instants of rest."[113]

Strobach writes that the assumption from physics Sorabji recommends is that of "momentary" or "instantaneous velocity."[114] Strobach takes issue with this assumption.

> Physics has been using this concept very successfully since Newton; and if something works, we tend to regard it as completely unproblematic.[115]

However, that a concept can sometimes be useful for physics does not eliminate all possible controversy. The concept of momentary velocity is "not unproblematic."[116] Charles Hamblin, for example, in 'Starting and Stopping,' argues that "the *arbitrariness* of instantaneous values is itself disquieting."[117] For Hamblin the very idea of an instant, let alone an instantaneous value at an instant, is problematic. Hamblin asks "why should we ever talk about truth or falsity *at* an instant?"[118] Hamblin in effect denies that there is any meaning to the notion of an instantaneous value or state.

What's more, there is no shortage of examples in the history of science where once fundamental and 'useful' concepts have been completely rejected.[119]

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[113]Sorabji, 1983, p 406.

[114]Strobach, 1998, p 127.

[115]Strobach, 1998, p 129.

[116]Strobach, 1998, p 129.

[117]Hamblin, 1986, p 412. The emphasis in is Hamblin's text.

[118]Hamblin, 1986, p 412. The emphasis in is Hamblin's text.

[119]For an example consider the difference between geocentric, heliocentric and acentric cosmological concepts. Koyré's work, *From the Closed World to the Infinite Universe,* describes the "development of the new cosmology, which replaced the geo- or anthropocentric world of Greek and Medieval astronomy by the heliocentric, and later, by the centreless universe of modern astronomy." Koyré, 1957, vii. Here it is

Strobach criticizes Sorabji's argument by writing that "if one refrains from tying the definitions of rest and motion at instants to the concept of momentary velocity, [then] there is no more justification for assigning the limiting instant to rest rather than motion."[120] Strobach, like Hamblin, argues that the problems associated with momentary velocity or instantaneous values mean that "the description of the moment of change between rest and motion should not be tied to the concept of momentary velocity."[121] The problem with instantaneous values demands that Sorabji's "argument in favour of an asymmetry must be rejected."[122]

In so far as any particular description classifiable as advocating the either/or option is questionable based upon that to which it appeals in order to suggest the asymmetry necessary to escape arbitrariness, to that extent the either/or option will not provide a sufficiently sound solution to the problem of the moment of change. The import of a degree of arbitrariness means that "the either/or option has shown itself as not to be recommended."[123]

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seen that mutually exclusive concepts have all been held to be fundamental.

[120]Strobach, 1998, p 131.

[121]Strobach, 1998, p 145. The exact problems with the concept of momentary velocity are immaterial here; what is sufficient for our purpose here is to show that it is at least problematic and questionable as the principle of asymmetry. For more on the problems associated with momentary velocity see *The Moment of Change*, Part 2, Chapter 1, §1.1.3. and §1.1.4., p 129-131. One such problem, for example, concerns a "restriction to exclude abrupt beginnings of a motion." This restriction results in a possible confusion between change and processes.

[122]Strobach, 1998, p 131.

[123]Strobach, 1998, p 145.

2.4 The Either-Way Option

Proponents of the 'either-way option' claim that "in a certain respect, the old state still obtains at the limiting instant, in another respect it does not. Moreover, in a certain way the new state already obtains at the limiting instant, but in another way it does not."[124] Brian Medlin is an example of this position.[125]

Richard Sorabji in his *Time, Creation and the Continuum*, discusses Medlin's position. Sorabji writes "Medlin says, in effect, that a thing can be both in motion and at rest at an instant, and equally neither in motion nor at rest at that instant."[126]

Although Medlin discusses change in terms of rest or motion Medlin remarks "the paradox appears to be quite general." And "it concerns not only motion but every thing or property that begins or ceases to exist."[127]

Of Medlin's position Strobach claims that Medlin's "attempts fail" for the reason that the either-way option "turns out to be quite unintelligible."[128] Strobach argues that this position "does not make any sense."[129] Strobach argues that Medlin "would have

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[124]Strobach, 1998, p 5. See Part 2, Chapter 2, p 146-160, for Strobach's analysis of the either-way option.

[125]Medlin, Brian, 'The Origin of Motion'. *Mind*, Vol. LXXII, No. 286, April 1963, p 155-175.

[126]Sorabji, 1983, 407.

[127]Medlin, 1963, p 155. This point has been stressed in Chapter One.

[128]Strobach, 1998, p 10.

[129]Strobach, 1998, p 160.

quite a lot to do to make his claim plausible (which he does not)."[130] Why does Strobach think this position implausibly unintelligible?

Medlin's position in particular and the either-way option in general are, argues Strobach, contradictory and illogical. Strobach thinks Medlin's position contradictory and illogical for, as Sorabji notes in his *Time, Creation and the Continuum*, "the first part [of Medlin's argument] may sound as if it violates the law of non-contradiction;" while the second part of Medlin's argument sounds as if "it violates the law of excluded middle."[131]

Medlin's argument in 'The Origin of Motion' is as follows. Medlin writes,

> if 12.00 is the moment of change then,
>
> (1) The body was in motion at 12.00
> (2) The body was at rest at 12.00
> (1^+) The body was not in motion at 12.00
> (2^+) The body was not at rest at 12.00
>
> are all true.[132]

Sorabji writes that Medlin's position allows that "all four statements can be true together, namely, that a thing is in motion at an instant, not at rest at that instant, and that it is at rest at that instant, not in motion at it."[133]

At first sight it appears that at Medlin's moment of change (1) and (1^+) contradict

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[130]Strobach, 1998, p 158.

[131]Sorabji, 1983, p 407.

[132]Medlin, 1963, p 172.

[133]Sorabji, 1983, p 407- 408.

each other as do (2) and (2^+). Additionally at Medlin's moment of change it appears that if all four are true then the law of the excluded middle is also violated.

Strobach's criticism of Medlin concerns whether or not (1) and (1^+) and (2) and (2^+) are contradictory. Strobach argues they do contradict each other. Medlin (not surprisingly) argues that Strobach's worry is a "groundless worry."[134] Medlin would contend that Strobach fails to comprehend a distinction that is generally overlooked. "This distinction," claims Medlin, is that "between propositional and predicate negation."[135] Strobach's debate with Medlin concerns "Medlin's keyword: 'predicate negation.'"[136]

For Medlin, (1) and (1^+) do not contradict each other for (1) is a proposition whose negation is ~(1) not (1^+). (1^+) is not for Medlin the contradictory of (1), so the two can be simultaneously asserted to be true without contradiction. If (1) is 'the body is in motion at 12.00' then ~(1) would be 'it is not the case that the body is in motion at 12.00.' These two are, says Medlin, contradictory. "The propositions (1) and ~(1) cannot," writes Medlin, "be true together under any circumstances."[137]

(1^+), in contrast, is 'the body is in non-motion at 12.00.' The propositions (1) and (1^+) are thus logically different in nature in spite of their linguistic similarity: the 'not' in the former is a propositional negation while the 'not' in the latter is a predicate negation.

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[134]Medlin, 1963, p163.

[135]Medlin, 1963, p 172.

[136]Strobach, 1998, p 8. For Strobach's complete analysis of Medlin see *The Moment of Change*, Part 2, Chapter 2. For Strobach's analysis of 'predicate negation' see § 2.2.3.

[137]Medlin, 1963, p 171.

$\sim(1^+)$ and (1^+) are contradictory, as are $\sim(1)$ and (1). But (1) and (1^+) are not contradictory. Medlin writes,

> The propositions $\sim(1)$ and (1^+) differ in that while $\sim(1)$ is the propositional negation of (1), (1^+)...is merely the predicate negation.[138]

Medlin argues all four of his statements can be true due to the fact that the word 'not' in (1) and the word 'not' in (1^+) are different in each. Medlin writes, "the distinction between propositional negation and predicate negation is generally overlooked." And he claims that the supposed paradoxes associated with change result from failing to distinguish between predicate and propositional negation. If "we continue to think in terms of propositional negation then we have the paradox," says Medlin.[139]

Medlin's distinction between propositional and predicate negation is described by Strobach.

> "*a* is not white at t" is the propositional negation, "*a* is non-white at t" is the predicate negation of "*a* is white at t.[140]

The objection to Medlin's position derives not from the notion of predicate negation in itself. There is no objection to saying that '*a* is non-white at t', though we still do not know what colour it is. The objection to the either-way option instead arises from and concerns the relation between predicate and propositional negation. What does

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[138]Medlin, 1963, p 172.

[139]Medlin, 1963, p 172.

'*a* is non-white at t' entail? Does '*a* is non-white at t' imply that '*a* is not white at t'? Does predicate negation imply propositional negation (or vice versa)? If the former is true and '*a* is non-white at t', could the latter be false and '*a* not be not white at t'?

For Medlin's argument to hold, predicate negation *must not* entail propositional negation otherwise a contradiction would ensue. If predicate negation implied propositional negation then (1^+) would entail ~(1). Medlin's (1) would then be contradicted by his (1^+) via (1^+)'s entailment of ~(1).

Medlin's distinction between propositional and predicate negations means that for him the proposition '*a* is non-white at t' does not entail that '*a* is not white at t.' Strobach writes, "if the predicate negation implied the propositional negation, there would be the very contradiction Medlin wants to avoid."[141] Therefore Medlin "would like the predicate negation to be true while the propositional negation is false."[142] It is true for Medlin that a thing is not white (qua predicate negation) while it is false, for Medlin, that a thing is not white (qua propositional negation).

Sorabji writes Medlin's position "runs the risk of causing confusion."[143] It seems counter-intuitive to say that '*a* is non-white at t' does not entail that '*a* is not white at t.' Medlin's manner of relating predicate negation with propositional negation is what proves difficult for the intelligibility of his position, not predicate negation *per se.*

Let's assume that *a* is a lamp that is on and Medlin turned it off. Certainly '*a* is

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[140]Strobach, 1998, p 159.

[141]Strobach, 1998, p 157.

[142]Strobach, 1998, p 159.

[143]Sorabji, 1983, p 408.

not on' would be true of *a* when it is changing. But in what sense a not-on lamp could still be on enough to make '*a* is not on' false is unclear.

The introduction of predicate negation does little to clarify or reduce the conceptual difficulty of the moment of change though it seems adept at making the issue more difficult to understand. It is hard to understand why (1) what makes a predicate negation either true or false and (2) what makes a propositional negation either true or false would differ. One does not, I would think, say any more or any less when one asserts that '*a* is not on at t' or 'a is not on at t.' Strobach writes,

> One wonders in any case what, after all, a predicate negation is exactly supposed to be, and how one is to understand the 'not' in (1^+) and (2^+).[144]

The distinction between predicate and propositional negation seems to be a specious and questionable, and perhaps an unintelligible distinction. In so far as the distinction is questionable to that extent Medlin's (1) and (1^+) and his (2) and (2^+) are contradictory. A rejection of the claim that 'predicate negation does not entail propositional negation' means "the attempt to apply the either-way option to the description of the moment of change yields disappointing results."[145]

2.5 The Both-States Option

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[144]Strobach, 1998, p 158.

[145]Strobach, 1998, p 160.

In the both-states option the claim is made that "the old as well as the new state obtains at the limiting instant." This means that at the limiting instant, an objective contradiction is realized. In the logic of this option "the LNC [law of non-contradiction] does not hold in it."[146] Graham Priest is the exemplar of this position. For Priest "there are some changes from p being true to $\sim p$ being true where a contradiction is realized."[147]

Priest's essay, 'To Be and Not to Be: Dialectical Tense Logic,' is explicitly concerned with "the problem of the instant of change."[148] Priest argues that there are three types of change. To understand Priest's three-fold distinction we should

> Suppose that before a time t_0 a system, S, is in a state S_0. After t_0 S is in a state S_1. Accordingly, at t_0 it changed from S_0 to S_1. What state was it in at t_0? There appear to be three possibilities:
>
> (1) S is in exactly one of S_0, S_1.
> (2) S is in neither S_0 nor S_1.
> (3) S is in both S_0 and S_1.[149]

Priest denotes the first type of change a type-α change, the second a type-β change, and the third a type-γ change. Priest's essay and argument about the moment of change concern type-γ changes. It is this class of change that instantiates a contradiction.

Priest argues that we cannot avoid the existence of type-γ changes. "We seem driven," contends Priest, "to the conclusion that there are type-γ changes." Let's consider

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[146]Strobach, 1998, p 161.

[147]Priest, 1981, p 249.

[148]Priest, 1981, p 249.

[149]Priest, 1981, p 249.

why Priest thinks we are driven to this conclusion.

As an example consider the change in the truth value of a proposition, *p*, such as 'the car is at rest at t.' Priest then asks the question "are they [the changes in a proposition's truth-value] type-β or type-γ changes?"[150]

Careful attention to this question shows it omits asking if such a change is a type-α change. This is for good reason. Priest asks his 'either type-β or type-γ' question *after* he rejects the claim that all changes are type-α changes. He writes that "we have seen that some changes from *p* being true to ~*p* being true (or vice versa) are not type-α changes."[151] That all changes are type-α is, he writes, *merely* the "standard assumption."[152]

An essential component in Priest's argument that contradictions exist is his claim that there are type-β changes, and that type-α changes are not sufficient to describe all changes, especially a car's change from rest to motion. We need, then, to consider Priest's argument that there are type-β changes in order to understand why he asks his question as he does, omitting from his question the possibility that the change from *p* being true to ~*p* being true is always or could only be a type-α change. An example will be of help.

As we have all experienced, if a car at rest changes from rest to motion then while at rest with zero velocity it is neither accelerating nor decelerating. When it does accelerate it has zero velocity, although it does not have zero velocity immediately after it

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[150]Priest, 1981, p 253.

[151]Priest, 1981, p 253.

accelerates. After accelerating the car has, say, a velocity of 1m/s (or, at the least, a non-zero velocity). Priest asks us to consider such a car's behaviour in terms of the function, *v*, of one variable, *t*, such that

$v = 0$m/s for $t \leq 0$
$v = t$m/s for $t \geq 0$.

With respect to the *velocity* of the car, at the moment of change the car changed from the prior state of 0m/s at $t = 0$ to a posterior state of 1 m/s at $t = 1$. And this, says Priest, "is unproblematically a type-α change" for, he continues, "at time $t = 0$ the car changes from S_0, $v = 0$, to S_1 $v > 0$." At the moment of change the car was in exactly one of S_0 or S_1. And in this case the car was in S_0 when it changed. Given this functional description of a car's velocity with respect to time we can now, writes Priest, "address the question whether all changes are type-α changes."[153]

We need remember that the point of this digression is to show why (1) all changes are not type-α changes and (2) that type-β changes exist. The reason why we need to show that there are type-β changes is that, for Priest, type-β and type-γ changes "hold or fail together."[154]

Priest asks us to now consider the *acceleration* of the car, $^{dv}/_{dt}$. "At time $t = 0$," Priest writes, "$^{dv}/_{dt}$ is undefined."[155] Unlike the type-α change of the velocity of the car,

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[152]Priest, 1981, p 250.

[153]Priest, p 1981, p 250.

[154]Priest, 1981, p 253.

[155]Priest, 1981, p 250.

which prior to its posterior state of 1m/s was in its prior state of 0m/s (i.e. S_0) when it changed, when the car accelerates it enters a posterior state that it was not previously just in, while, in addition, when the car accelerates, it could not be in its prior state either, for at this prior time the object had zero velocity and no acceleration (i.e. acceleration and $^{dv}/_{dt}$ does not have any value when $v = 0$ at $t = 0$ for $t \leq 0$). The undefined value of $^{dv}/_{dt}$ when v and $t = 0$ for $t \leq 0$ means that with respect to the moment of its change of acceleration the car is neither in the state it was in nor in the state it became when it changed. This, of course, is a type-β change. Priest writes,

> more precisely, if any change is represented by a function which has a singularity where some derivative is undefined, it is a type-β change, for at the singularity the derivative is in neither the state it was in before nor the state it was in afterwards.[156]

Priest uses this example to show that there are type-β changes and that type-α changes cannot account for all conceivable or physically possible changes, namely the change of an object's acceleration when its velocity changes from rest to motion.

Priest's question, we need now recall, is "are they [the changes in a proposition's truth-value] type-β or type-γ changes?" To answer his question, if we analyse the change of p's truth value as an instant of a type-β change, then at the moment of change that 'p is true' is false. And at this moment of change that 'p is false' is also false. At the moment of change in a type-β change p is neither true nor false, neither S_0 nor S_1. At this moment of change the car's acceleration is not zero, nor is it non-zero; the car simply does not

[156]Priest, 1981, p 250.

have a rate of change (acceleration) of its rate of displacement in space (velocity); acquiring such a rate of change of its displacement is a type-β change. And in a type-β change neither the before nor after state obtains at the moment of change. If what is changing is a proposition's truth value, then, Priest writes,

> if the change from *p* being true to ~*p* being true is a type-β change then, at the instant of change both *p* and ~*p* fail and are false.[157]

At the moment of change in a type-β change it is not the case that either *p* or ~*p* is true. The car is not accelerating nor decelerating, neither getting faster nor slower for, in fact, it is not moving at all. Priest writes that "~(*p* v ~*p*)...appears to correctly describe the situation at the instant of a type-β change."[158]

Priest argues, however, that such a change cannot just be a type-β change. Priest argues, as we noted above, that type-β and type-γ changes "hold or fail together." Priest writes, "if there are type-β changes, there must be type-γ changes."[159] Strobach supports this interpretation of Priest. "In Priest's opinion the existence of γ-changes follows from the existence of β-changes."[160]

Let us now consider Priest's argument that type-β and type-γ changes hold or fail together.

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[157]Priest, 1981, p 253.

[158]Priest, 1981, p 253.

[159]Priest, 1981, p 251.

[160]Strobach, 1998, p 164. For Strobach's analysis of Priest and the both states option see *The Moment of Change*, Part 2, Chapter 2, p 161-170.

We have seen that in a type-β change p is false as is $\sim p$. If we assume that for any proposition that is not true, then its negation is true, then the fact the both p and $\sim p$ are false imply, for Priest, the following:

> since p is false $\sim p$ is true, and since $\sim p$ is false $\sim\sim p$ is true. Hence both $\sim p$ and $\sim\sim p$ and presumably therefore p, are true and we have a type-γ change.[161]

What results, argues Priest, is that type-β and type-γ changes must always occur together for, he continues, "to be neither true nor false, is to be both true and false!"[162] This means that for Priest asserting neither true nor false is the same as asserting both true and false. "The duality is, in fact, an identity," he claims. This means that to say a proposition is neither true nor false is logically equivalent to saying it is both true and false. Priest's argument is as follows:

(1) $\sim(p \vee \sim p) \equiv (\sim p \cap \sim\sim p)$
(2) if $\sim\sim p \rightarrow p$ then
(3) $\sim(p \vee \sim p) \equiv (\sim p \cap p)$.

For Priest, then, classical logic - especially the LNC and LEM - should be rejected. He claims that classical logic is based upon an "unargued assumption that truth and falsity are exclusive and exhaustive, and it is exactly this point which is now at

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[161]Priest, 1998, p 253.

[162]Priest, 1981, p 253.

issue."[163] Priest claims that classical logic's restriction to only two exclusive and exhaustive truth-values means classical logic can only account for type-α changes. "If classical logic is right," argues Priest, "all sentences are either true or false but not both [so] only type-α changes are possible."[164] To the extent that Priest has shown that there are changes that are not type-α changes, to that extent, he claims, classical logic is insufficient to analyze change.

In place of classical logic Priest recommends his 'dialectical tense logic.' Priest constructs this logic with the truth values of "the set, *V*, [{0}, {1}, {0,1}] (false, true, and both)." A fourth truth value "Θ (neither) is possible." But, as we saw, Priest argues "this fourth value is unnecessary" for he takes "*neither true nor false* to be the same as *both true and false*."[165]

Priest points out that his reasoning "is not mandatory." And he claims that the conclusion does not follow "if one is prepared to reject the claim that if a sentence is not true, its negation is true."[166] This means that his conclusion does not follow, he admits, if one is prepared to reject part (2) is his argument (i.e. that $\sim\sim p \rightarrow p$).

It should be evident that Priest's arguments hold or fail based upon disputes arising in formal logic. We have seen already, however, that appeals to logic alone yield different results - no change in the case of Parmenides and McTaggart and contradictory change in the case of Priest. A third position is Mellor's; he argues that change is real but

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[163]Priest, 1981, p 252.

[164]Priest, 1981, p 252.

[165]Priest, 1981, p 255. The emphasis is Priest's

[166]Priest, 1981, p 253.

not contradictory. Strictly logical arguments are insufficient to address the problem of the moment of change in so far as such arguments lead to different and often mutually exclusive conclusions.

To further see that Priest's logic is disputable consider Strobach's interpretation of Priest. Strobach argues that Priest's claim that "$\sim(p \vee \sim p) \equiv \sim p \cap \sim\sim p$... is not to be disputed." What is disputable, Strobach's claims, is the "way Priest interprets this fact." Priest contends that this logical formula entails contradictions at the moment of change due to the equivalence of $\sim\sim p$ with p. Strobach argues that "this equivalence does not describe any situation whatsoever. All that this tautology informs us about is that LEM and LNC are equivalent and cannot be denied independently of one another."[167] Priest's premise is correct but, argues Strobach, his conclusion is not.

It is sufficient here to say that in so far as Priest's appeals to logical subtleties are questionable to that extent his strictly logical arguments are not the final word on the moment of change, especially logical arguments that try to persuade us that a lamp that is neither on nor off is both on and off. To what extent this could be possible is unclear. We therefore should adopt a cautious approach with respect to Priest's 'logical' claim that objective contradictions exist.

The strongest objection to Priest's argument derives from the question what is an 'objective contradiction'? If, according to Priest, there are objective contradictions, then to what entity or event does "objective contradiction" refer? For some logicians a contradiction is a relation between two propositions, not a thing like an orange or a

[167]Strobach, 1998, p 166.

banana. This means that there are ontological problems with Priest's claim. He is not exactly clear in his essay whether 'contradiction' is a relation between two states, two propositions or a non-relational thing in-itself. Nor does Priest contend that we can *see* these contradictions at the instant of change so as to empirically determine their characteristics.[168] Strobach outlines this problem with Priest's analysis.

> It may be disputed that the noun 'contradiction' is used as referring to an entity or an event in the world. Possibly 'this is a contradiction' is no more that my comment on two statements whose contents stand in a certain relation to one another. There would be no entity then, to which the word 'contradiction' refers, but rather a relation of contradictoriness between propositions.[169]

The result of these logical, ontological and linguistic difficulties is that there are no good reasons for adopting the both-states option. "One may say," Strobach writes, "that Priest does not seem to have offered any reasons for the existence of objective contradictions beyond his belief in their existence."[170] Adoption of the both-states option has "no real motivation for doing so apart from some kind of emotional affinity towards contradictions."[171]

Priest does not admit an emotional attachment to contradictions. But Priest does try to ground his conclusion outside of the realm of pure logic. Priest appeals to what he

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[168]Priest writes, "as if we could *see* whether it [the pen] was on or not on [the paper] at the instant of change...Certainly the matter is not settled by any physical theory of which I am aware. Neither, of course, is it a matter of observation." See Priest, 1981, p 252.

[169]Strobach, 1998, p 169.

[170]Strobach, 1998, p 169.

[171]Strobach, 1998, p 11.

calls the "Leibniz continuity principle [LCP]."[172] This principle, say Priest, "definitely entails the existence of type-γ changes."[173]

Priest claims that the LCP is as follows. "A way of stating the LCP is this: given any limiting process (whether arithmetic, geometric, physical or whatever) whatever holds up to the limit holds at the limit."[174] Priest expresses the principle in another form. "Any physical state of affairs which holds arbitrarily close to a given time holds at that time."[175] He offers a third statement of the principle. "Since S_0 occurs arbitrarily close to t_0, it occurs at t_0. Similarly S_1 occurs at t_0. Thus both S_0 and S_1 occur at t_0."[176] Priest claims "this principle is a very plausible one with a good deal of intuitive appeal." The "LCP seems well grounded intuitively," he writes. But, Priest immediately adds, he is "not absolutely certain why."[177]

First, that Priest is not certain why this principle should be held beyond his appeal to intuition should make his claim extremely suspect. Indeed there are those who claim that this principle is not intuitively plausible at all. Joseph Wayne Smith, for example, writes that

> There is an inherent weakness in any argument for real or objective contradictions that rests on a principle that is less plausible than the principle of non-contradiction itself.[178]

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[172]Priest, 1981, p 261.

[173]Priest, 1981, p 261.

[174]Priest, 1981, p 262.

[175]Priest, 1981, p 262.

[176]Priest, 1081, p 263.

[177]Priest, 1981, p 262.

[178]Joseph Wayne Smith, 'Time, Change and Contradiction.' *Australasian Journal of Philosophy*, Vol. 68,

Bertrand Russell, in *The Philosophy of Leibniz*, claims "there are three kinds of continuity, of all which Leibniz asserts."[179] The first kind is "spatio-temporal" continuity. The second is the "continuity of cases." The third is the "continuity of actual existents."[180] The "general statement of all forms of continuity," writes Russell, is "that nature makes no leaps."[181] *Natura non facit saltus.*

Priest appeals to the 'Leibniz continuity principle' for the reason that if this principle does not hold then there would either be (1) a 'gap' or "hiatus"[182] in nature or there would be (2) an event of changing which took no time, there being instead a jump or *saltus* across the discontinuity created by the *hiatus* between the first state and the second state. But "surely," writes Priest, "if something happens, it must take *some* time, even if just an instant. The idea that something can happen in *no* time appears so close to self-contradictory."[183] Strobach writes that Priest "reasons that it [the LCP] should be applied since otherwise there would be a counter-intuitive jerk at the limiting instant."[184]

Russell however, like Joseph Wayne Smith, claims that Leibniz's continuity principle is "destitute either of self-evident validity or of grounds from which it may be

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No. 2, June 1990, p 178-188. Cited by Strobach, 1998, p 169.

[179]Russell, 1937, p 63.

[180]Russell, 1937, p 63.

[181]Russell, 1937, p 64.

[182]Russell, 1937, p 65.

[183]Priest, 1998, p 263.

[184]Strobach, 1998, p 167.

proved."[185] This characterization of the LCP is diametrically opposed to Priest's characterization. Furthermore and against Priest, there is Charles Hamblin who argues that in spite of our time language with which we can define continuity, nature is not as we define continuity and we would be well to reject the notion that *natura non facit saltus.* Nature, contends Hamblin, is full of "clicks, jerks, flashes, glimpses and impulses."[186] Priest's intuitive appeal to the LCP gets little or no support from the 'intuition' of other philosophers. Such lack of intuitive agreement on this matter makes Priest's arguments more than suspect.

The worst and most damaging objection to Priest's position is seen to arise when his appeal to what he calls the 'Leibniz continuity principle' is taken along with his claim that there are type-β changes. When held or taken together, the notion of a type-β change and the LCP are inconsistent. This means that one cannot hold that (1) there are type-β changes and that (2) the LCP is true. The LCP destroys the very notion of a type- β change.

If, according to the LCP, that which holds arbitrarily close to the limit holds at the limit then there could not ever be an undefined value for the $^{dv}/_{dt}$ function at the moment of change. The $^{dv}/_{dt}$ function would have, if the LCP is true, a value at its 'undefined' singularity. This value would be either the value it had when it was immediately before and arbitrarily close to the limit or the value it had immediately after and arbitrarily close to the limit. Or the value could have, at least in the case of Priest's argument, both the

[185]Russell, 1937, p 64. Russell, interestingly, describes Leibniz's argument as resting upon "that [which] give *pleasure* to the metaphysician." The relation to Strobach's characterization of Priest as *emotionally* attached to contradictions should not be lost here.

[186]Hamblin, 1969, p 414.

value it immediately had before and arbitrarily close to the limit and the value it had immediately after and arbitrarily close to the limit.

Priest's appeal to the LCP destroys the capacity of Priest to prove or claim that there are type-β changes. The LCP argues that there are no undefined discontinuities. The LCP would prevent the undefined singularity in the derivative from existing for the LCP, in effect, defines the value at any supposed discontinuity in a continuum as that which held arbitrarily close to the discontinuity. But we saw that to *prove* that there are type-β changes and type-γ changes Priest appealed to the fact $^{dv}/_{dt}$ is undefined at some point.

Priest's particular position and the both states option in general[187] are not very convincing. The notion of an 'objective contradiction' is confusing in itself. Proving that such a thing exists, if it is intelligible, is equally problematic. Therefore, Strobach rightly concludes, there are not "any convincing theoretical reasons as to why one should accept something as problematic as objective contradictions."[188]

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[187]There are others who argue that there are 'objective contradictions'. This position also has a long history, though for obvious reasons it is and has not been popular. For a view other than Priest's see Simo Knuuttila's and Anja Inkeri Lehtinen's 'Change and Contradiction: A Fourteenth-Century Controversy,' *Synthese* 40, 1979, 189-207. Though I shall not consider these arguments in this chapter it is worth noting that, "in this solution," writes Knuuttila and Lehtinen, "a real contradiction is accepted in nature, because the *termini* of instantaneous change cannot, according to it, belong to different instants of time. The law of non-contradiction is not, however, refuted in logic, because it was thought that the instant of time containing a contradictory state of affairs can be divided, although not physically, into instants of nature." This position, though, seems *more* contradictory than Priest's for in this 14th century argument the law of non-contradiction is violated (in nature) and is not violated (in logic).

[188]Strobach, 1998, p 170.

2.6 Neither/Nor Option

In the neither/nor option the moment of change is described as belonging neither to the old state nor to the new state. The neither/nor option, writes Strobach, asserts that "it is both false that *a* is *F* and that *a* is not *F* at the limit between an *F* phase and a no-*F* phase."[189] Advocates of this option do not argue that *both* states obtain at the moment of change. Advocates of this option do not, then, agree with Priest's claim that to assert 'neither *F* nor not-*F*' is to equally assert 'both *F* and not-*F*'.

We will consider two examples of advocates of the neither/nor option, Plato and Charles Hamblin. We need to use *two* examples to document the neither/nor option for the reason that the neither/nor option may be reached via different (and often mutually exclusive) arguments and it would be well to emphasise this point. This point concerns the difference between the *description* of the moment of change and the *classification* of any one description. The neither/nor *classification* may be reached via different neither/nor *descriptions*.

Hamblin and Plato, though they both assert neither/nor, assert it for different reasons. Strobach writes "Hamblin agrees with Plato in describing the moment of change as fundamentally neither belonging to the ending nor to the beginning one of the two states it separates." But that there "are fundamental and interesting similarities" between Hamblin and Plato does not mean, Strobach argues, that there are not "different motives for Plato and for Hamblin using the 'neither/nor' option in describing the moment of

[189]Strobach, 1998, p 172.

change."[190]

This means that one can distinguish *different reasons* for saying that it is both false that *a* is *F* and that *a* is not *F*. In other words, two different *descriptions* of the moment of change motivated by different arguments are not mutually exclusive with respect to the *classification* of the descriptions.

The neither/nor advocates resolve into two broad groups. There are those who say that (1) true statements can be made about instants. And there are those who say that (2) true statements cannot be made about instants. Plato, we will see, is an example of group (1). Hamblin, we will see, is an example of group (2).

For group (1),

> The limiting instant between the phases is a quite extraordinary 'time' of which it is neither true that *a* is *F* at it nor true that *a* is not *F* at it. However, there are statements which are true concerning this instant, for example that at it, a change between two states is taking place.[191]

Group (2) resolves into two subsets. There are those who argue that (2.1) true statements cannot be made about instants for there are no instants. And there are those who argue that (2.2) there are instants, but nothing true may be said about them for some specific reason. For example, it might be said that instants are empirically inaccessible or that predicates cannot be attributed to instants.

Subset (2.1) holds that there are no instants, let alone limiting instants thus,

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[190]Strobach, 1998, p 171.

[191]Strobach, 1998, p 172. Plato asserts, as we saw, at least four statements about limiting instant in a state of change.

nothing can be true of an instant. Time is not a series of discrete instants or moments. The 'moment' of change does not, then, exist. For this group the problem of the moment of change is a problem generated by or based upon the faulty presupposition that time is made up out of a series of instants or moments. Hamblin makes this point, for example. "The concept of time as a continuum of instants has itself run us into trouble."[192] Subset (2.1) is different than group (1) due to their conception of time. For subset (2.1) to speak of a 'moment' is meaningless and incorrect. For this group we need to realize the "pointlessness of any attempt to be precise about instants."[193]

Group (2)'s second subset, (2.2), holds that there are instants, namely limiting instants between phases; but *nothing can be true of an instant*. Subsets (2.1) and (2.2) share the conclusion that *nothing can be true of an instant* but differ in the reason that leads to the conclusion. (2.1) argues that there are no instants so nothing can be true of them but (2.2) argues that there are instants but nothing can be true of them. Hamblin, for example, objects to subset (2.1). He argues that "there are difficulties in the concept of a time-scale without instants, for surely there must be time *intervals*, and intervals appear to require instants as their ends even if they are not in fact actually made up of continuous assemblages of them."[194] Hamblin is an example of a neither/nor argument belonging to subset (2.2); we will consider his argument after considering Plato, who belongs in the (1) 'neither/nor' group.

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[192]Hamblin, 1969, p 415.

[193]Hamblin, 1969, p 415.

2.7 Plato's Neither/Nor Option

We met Plato's argument from the *Parmenides* in Chapter One when we addressed the conceptual problem of the moment of change. We did not in Chapter One address how Plato deals with the conceptual problem; we only considered the problem itself. We need now to concern ourselves with how Plato addresses the problem of the moment of change and why he may be classified as advocating the neither/nor option.

Plato claims, firstly, that there can be "no time in which anything can be at once neither in motion nor at rest."[195] Secondly, Plato claims that an object cannot change when it is in either its prior or its posterior state. If and when in the prior state the change will not yet have occurred. When in the posterior state the change must have already occurred. "It does not change when it is at rest or when it is in motion,"[196] says Plato.

Strobach calls this second claim "Plato's premise." It is an important premise and essential to Plato's argument. It is also, we noted in Chapter One, a source of great difficulty for those who wish to know (1) *when* an object changes and (2) *what* state that object is in when it is changing.

Plato, as we also learned in Chapter One, argues "it [an object] cannot change without chang*ing*."

There is a tension between Plato's first claim that (1) an object is always either in motion or at rest, (2) 'Plato's premise,' and (3) a belief in an event of changing. For a

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[194]Hamblin, 1969, p 412.

[195]Plato, 1926, p 299.

belief in an event of changing, when conjoined to Plato's premise, proves troublesome for the claim that all objects are either in motion or at rest. Plato's premise denies that at the moment of the event of changing the object could be either at rest or in motion. This tension between Plato's premise and events of changing leads to Plato's 'neither/nor' argument. We should not lose sight of the profound importance of 'Plato's premise' in all attempts to deal with the moment of change, for 'Plato's premise' is a qualification not upon 'time' nor 'objects', but upon events of changing. Strobach writes,

> As long as an author holds the view that there is an event of changing related to the moment of change, the most interesting question is what he thinks of the thesis I will call 'Plato's premise.' It is first to be found in the *Parmenides* (156c) and can be expressed like this: An event of changing cannot take place while the old state still obtains; but when the new state already obtains it cannot take place either.[197]

The problem with saying that all objects in time are either in motion or at rest is that Plato's premise denies that at the moment of an event of changing an object could be either at rest or in motion. For Plato claims in his 'premise' that the changing must have occurred after rest, after the prior state - and it must occur before motion, before the posterior state. This implies that when changing the object is neither in the state it was in before it changed nor in the state it will be in after it changes. Given the difficulty or disharmony between Plato's first claim and 'Plato's premise,' we still cannot, for Plato, deny or analyse away the reality of change. For an object cannot change without

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[196]Plato, 1926, p 299.

[197]Strobach, 1998, p 6.

changing.

An event of changing alters a thing's state-specific predicates. At or during an event of changing, and in accordance with 'Plato's premise', there will be a state different than either the former state or the latter state. This means that there must be at least three states in a change. Plato's premise and the event of changing imply that there must be, argues Plato, "something interposed between motion and rest."[198]

For Plato, that which is interposed between motion and rest is the moment of changing. This moment is arrived at by thinking of a change of state (S) of an object x, say for example, from a state of rest (R) to a state of motion (M). In Plato's analysis of change there is an object, a predicate relation, a time series, and states that follow one another in the time series, i.e., $S_1(x_1, Rx_1, t_1)$, $S_2(x_1, Mx_1, t_2)$. Additionally there is the changing, ΔS, of the object's states within the time series. For Plato there are no less than three states in a change at three different times: S_1 at t_1, $\Delta S_{1>n>2}$ at $t_{1>n>2}$ and S_2 at t_2 such that $S_1t_1 \neq \Delta S_nt_{1>n>2} \neq S_2t_2$.

That which is interposed between the two states in a change, $\Delta S_nt_{1>n>2}$, the event of changing, has an "instantaneous nature." Changing, for Plato, instantaneously occurs interposed between motion and rest.

This interposed instantaneous change is not a state of either rest or motion for the reason that this instant is that instant at which changing either occurs or is occurring. So Plato's premise holds for this instant. Given 'Plato's premise' the state at the interposed instant could only be neither the state before nor the state after.

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[198]Plato, 1926, p 299.

If we thought that the former state obtained at this moment then we would have failed to understand that the changing must not yet have occurred and we are still stuck at S_1t_1. If we thought the latter state obtained then we would have failed to understand that change must have already occurred and that we are at S_2t_2. We would have failed to understand that 'it cannot change without changing'. In other words, $S_1t_1 \neq S_2t_2$ iff $\Delta S_{1>n>2}\, t_{1>n>2}$.

Given Plato's first claim that an object is either at rest or in motion at any time, and given Plato's premise, this instant of changing is "not existing in any time."[199]

The reason why the moment of changing is not 'in time' is that this interposed event of changing cannot take any time or be of any duration. It is the event of changing that is instantaneous not the time or moment at which the change occurs. There is an 'instant' of change for the reason that change is instantaneous. Plato's premise and the event of changing leads to an 'instantaneous nature,' not an explicit definition of the elements of time. Plato is not saying that time has instants and therefore change must occur in the one between the two states. Rather he is saying that if there is a change then it must occur instantaneously, it cannot take any time to occur.

The existence of 'instants' or durationless *time*-points are a *possible* implication of Plato's notion of instantaneous events of changing. There are those who claim this is so.[200] And there are those who claim that this is not so.[201] These arguments about what

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[199]Plato, 1926, p 299.

[200]See, for example, Colin Strang and K.W. Mills, 'Plato and the Instant.' *Proceedings of the Aristotelian Society*, Suppl. Vol. #48, 1974, p 63-79.

[201]See for example, David Bostock, 'Plato on Change and Time in the Parmenides', *Phronesis*, Vol. XXIII, No. 3, 1978, p 229-242.

Plato thought about time are not overly relevant for the reason that the claim 'time is a continuum of durationless instants' is not a part of the argument used to isolate the moment of change. Nor would abandoning the claim that 'time is a continuum of instants' entirely eliminate the problem of the moment or time of changing. This is made evident in Hamblin's paper, 'Starting and Stopping,' where he builds a time-logic in which instants are not fundamental and do not themselves bear truth-values, let alone a third truth value. Truth value changes, however, must still be accounted for with his intervals. Hamblin writes,

> intervals appear to require instants as their ends even if they are not, in fact, actually made up of continuous assemblages of them...[so] intervals may have parts, and hence no predicate can be guaranteed to be uniformly true of, or false of, a whole interval...[202]

The problem of the moment of change arises whether we ask questions about the instant or moment before the moment of change, the instant or moment of change itself and the instant or moment after the change. The problem equally arises if we ask the questions about the interval before, the interval - however short - of changing, and the interval after. Plato's premise proves as problematic for intervals as it does for instants.

Plato's premise is not a qualification upon time *per se*. Rather, it is a qualification on events of changing that affects the time at which or during which such changing could occur. Time may not be composed of instants; but a change equally occurs even if this is so or not so. Given Plato's premise it appears that change could not take any time to

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[202]Hamblin, 1969, 413.

occur, irrespective of one's definition of time.

If the event of changing ever took time to occur or had a duration then the object would neither be at rest nor in motion for some or at some time. This state, however, is ruled out by Plato's first claim. This ruled-out state, however, seems inevitable given 'Plato's premise' and a belief in an event of changing. However, one way that the tension between the first claim, Plato's premise and the event of changing can be addressed is by qualifying the event of changing. This is what Plato does.

Any event of changing in any change must for Plato occur suddenly. It must be durationless and to be durationless is not to exist 'in time.'[203] This means that Plato first argues that the *event* of changing is durationless or instantaneous, not the *time* at which it occurs. In fact he argues that there is no time in which it occurs. With these two clauses the object can, for Plato, be neither in the before nor the after state when changing, keeping 'Plato's premise' intact. And with these two clauses at this 'instant' of change the object, though it will be neither alike to the state before nor alike to the state after, will not ever be not either in motion or at rest at or for some time. Plato writes,

> It is impossible for it to be previously at rest and afterwards in motion, without changing...
>
> And there is no time in which anything can be at once neither in motion nor at

[203]Something that exists 'in time' would be something that would be able to have the t_n in (x_1, Rx, t_n) be variable such that $S_1t_1(x_1, Rx, t_1)$, $S_1t_2(x_1, Rx, t_2)$, $S_1t_3(x_1, Rx, t_3)$ are all possible. In this case x is at rest in some time $\{t_1, t_2, t_3\}$. That $\Delta S_{1>n>2}$ is not 'in time' and that it occurs 'instantaneously' means that ΔS_1t_1, ΔS_1t_2, ΔS_1t_3 are not possible. In a period of time with constant rest we have $S_1t_1(x_1, Rx, t_1)$, $S_1t_2(x_1, Rx, t_2)$, $S_1t_3(x_1, Rx, t_3)$ such that $S_1t_n = S_1t_n = S_1t_n$ when $n = \{1,2,3\}$. In a change we still have three successive states and three times. But the states in a change are such that $S_1t_1 \neq \Delta S_nt_{1>n>2} \neq S_2t_2$. An instantaneous change is then a state that is not preceded or followed by itself such that what precedes it (S_1) is not the same as what follows it (S_2).

rest...

And certainly it cannot change without changing...

[and] it does not change when it is at rest or when it is in motion...

[so] there is this strange instantaneous nature, something interposed between motion and rest, not existing in any time, and into this and out from this that which is in motion changes into rest and that which is at rest changes into motion...

But in changing, it changes instantaneously, and when it changes it can be in no time, and at that instant it will be neither in motion nor at rest.[204]

Plato describes the moment of change as neither/nor and he argues that an instantaneous event of changing is occurring when an object is neither/nor. What needs to be clear is the following. There is a moment of change not because time is a series of little moments. It is Plato's premise and a belief in an event of changing that leads to that which has the instantaneous nature.

Plato fits into the first group: instantaneous changes exist and true statements can be made about this state, namely that (1) instantaneous changes do not exist in time, that such (2) events of changing at instants occur suddenly or instantaneously, and that, e.g. neither P nor $\sim P$ hold at this instant.

Instantaneous events are events that do not take time or have any duration. This means that changes, for Plato, are not temporally extended events like, for example, the hearing of a melody, or being in motion (different places at different, successive times) or being at rest (being at the same place at different, successive times). In a period of time with constant rest, $S_1t_1(x_1, Rx, t_1)$, $S_1t_2(x_1, Rx, t_2)$, $S_1t_3(x_1, Rx, t_3)$, it is possible that with

[204]Plato, 1926, p 299.

respect to S, $S_1t_1 = S_1t_2 = S_1t_3$. Rest, then, is a temporally extended event. But instantaneous change is not an event akin to rest: the series ΔSt_1, ΔSt_2, ΔSt_3 such that, with respect to S, $S_1t_1 = S_1t_2 = S_1t_3$, is not possible. 'Plato's premise' holds when S is changing such that if ΔSt_1 then $St_{1-1} \neq \Delta St_1 \neq St_{1+1}$. Strobach reinforces the idea that the event of changing is for Plato instantaneous.

> The event at the sudden [or instant] has no temporal extension whatsoever. Nevertheless it is there, taking place: an object does not simply arrive in the target position, but virtually switches from motion to rest. An object is not just not *F* any more, but virtually switches from being *F* to not being *F*.[205]

Finally, for Plato at an instant of changing it is true that neither the before nor the after state obtains.

Bostock supports this characterization of Plato's position.

> Plato suggests the change occurs 'in the sudden.' When the thing changes it goes from being in motion (say) to being 'in the sudden,' and from there to being at rest. The sudden is somehow intermediate between the motion and rest, and is not itself in (at) any time.[206]

Owen too agrees on this point.

> In the *Parmenides* Plato argues that if a change is construed as the passage from not-*A* to *A* the change must be instantaneous; for there is no time in which a thing can be neither *A* nor not-*A*, neither at rest (for instance) nor

[205] Strobach, 1998, p 46.

[206] Bostock, 1978, p 237.

> in motion... [Nonetheless] when it changes from rest to motion, it cannot be either at rest (for then the change would be still to come) or moving (for then the change would be past).[207]

For Plato, then, an event of change (1) does not occur in time for (2) it does not take time. The change occurs suddenly or instantaneously. With respect to the state of the object during its instantaneous change, for Plato (3) the state of the object at the instant of change belongs neither to the prior nor to the posterior state.

There are problems with Plato's neither/nor treatment of change and the moment of change. Let's review these problems with Plato's neither/nor treatment then consider another argument in favour of the neither/nor option, Charles Hamblin's position.

First, there are logical issues that press upon Plato's neither/nor option. As we saw above, Priest argues that to assert 'neither/nor' is to assert 'both/and.' Furthermore it is unclear why entities that do not exist in time could violate the law of the excluded middle. Nor is it clear why, if the law of the excluded middle can be violated by entities not in time, the same law could not be violated by entities within time. What's more, if this logical law can be easily violated why not other so-called 'laws'? Strobach, when he raised his objection against Priest's claim that neither *p*/nor not-*p* is equivalent to 'both *p* and not-*p*', wrote that the "LEM [law of excluded middle] and LNC [law of non-contradiction] are equivalent and cannot be denied independently of one another."[208] If Plato's treatment of the moment of change is committed to rejecting the law of the exclude middle will Plato not be forced to deny the law of non-contradiction as well?

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[207]Owen, 1975, p 123.

[208]Strobach, 1998, p 166.

Such logical difficulties make Plato's position suspect.

Secondly, the very idea of an entity that does not exist in time is problematic. And given that in the case of change these instantaneous *extra-temporal* entities are the intermediates interposed between two mutually exclusive states *in time*, how could such entities be in communication with, in contact with, or in relation with entities that are in time? Does it even make sense to speak of things as either 'in' or 'out' of time? We usually speak of events as taking a long or a short time, but not as not occurring in or out of time.

Thirdly, the idea of an instantaneous change, an event that does not take time or have any duration, is thought by some to be a contradictory notion. Priest for example claims he is "prepared to buy changes over very short times, but a change that occurs in no time at all is difficult to swallow...Surely, if something happens, it must take some time."[209] Since the change takes no time there will be no time between its opposite states. But if there is no time between the opposite states how could the change occur between these opposite states? If the instant of change or the event of changing is durationless would there be "no time left for the switching between states"?[210] Priest argues that if one accepts that changes take no time to occur and that change does not occur in time then "there would be no time at which the state was *changing*."[211] We have seen, however, that Plato argues we cannot analyse away the changing; though Priest would say that this is exactly what Plato does when Plato argues that changes take no time or that

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[209]Priest, 1981, p 263.

[210]Strobach, 1998, p 45

changes are instantaneous events.

The fourth problem concerns Plato's neither/nor description of the state of the object when it changes. This description, firstly, violates Plato's claim that all objects are either in motion or at rest. The neither/nor description and Plato's removal of change from time are, then, intimately related: if all objects in time are either in motion or at rest, and if ever an object is neither in motion nor at rest, then that object must not be in time when it is neither at rest nor in motion. The problem that arises from the neither/nor description is that "it induces a certain phenomenological unease when it comes, e.g., to the question: What does anything look like when it is neither at rest nor in motion?"[212]

Fifthly, describing the change between two mutually exclusive states by means of an interposed instantaneous state posits an additional two changes that must be accounted for, namely the change from motion (say) to the neither/nor instant and from the neither/nor instant to rest. One 'neither/nor' change leads, therefore, to two additional changes. And we have a total of three: (1) from motion to rest; (2) from motion to neither/nor; and (3) from neither/nor to rest.

If we adopt this neither/nor doctrine of change then the change (2) from motion to the neither/nor instant and the change (3) from the neither/nor instant to rest are equally changes that must be accounted for. Each of these two additional changes, as per Plato's neither/nor option, would themselves require additional changes. For if the before and the after are separated by a 'neither before nor after', then this 'neither before nor after' is

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[211]Priest, 1981, p 263.

[212]Strobach, 1998, p 12.

after the before but before the after. In other words, if one is less than two and two is less than three, then 1 is less than three; but that two is less than three does not mean that two is not greater than one. The before/after relation occurs between 1 and 3 and 1 and 2 and 2 and 3.

The result of the repetition of the before-after relation between the neither/nor instant and the time before it and the time after it means that our original problem of change from the before to the after remains only more so. Positing the instantaneous state as the intermediate between the mutually exclusive before and after states raises the same difficulty that the instantaneous state was supposed to solve, namely the change from one mutually exclusive state to another. For the instantaneous state is itself mutually exclusive with respect to the before and after state, as per Plato's premise. The notion of the instantaneous neither/nor state, then, leads to a vicious regress that does not solve the initial question; it only postpones the original difficulty *ad infinitum*.

What results from Plato's neither/nor analysis is a conclusion such as Owen's. Owen says that the reason why Plato's neither/nor argument is invalid is that

> The suggestion would set a regress on foot. For when we have postulated one time-atom to house the change from not white to white, there will be another change to be accommodated in the same way.[213]

Owen concludes that "it is a mistake to look for a special time-reference such that the subject is then neither white nor non-white."[214] The neither/nor option, argues Owen,

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[213]Owen, 1975, p 124. Owen here is describing what he takes to be Aristotle's objection to Plato.

[214]Owen, 1975, p 124.

is inadequate. "It will not help," Owen argues, "to postulate a time-atom between the period in which something is not white and the subsequent period in which it is white, with a view simply to providing a time for the change to occur from not-white to white."[215]

Bostock agrees with characterizing Plato's neither/nor argument as involving a regress.

> On Plato's suggestion our thing changes from being in motion to being in the sudden, and then from being in the sudden to being at rest. So we started with one change, from motion to rest, and we located that at the sudden. But now we find that we have two more changes to account for, one from motion to the sudden and the other from the sudden to rest. We might ask (though Plato does not): when do *these* changes occur? Presumably they too will each occur at a sudden, and by the same argument the two new suddens cannot be the same as the original one. (For while a thing is coming to be in a sudden, it cannot already be in it.)[216]

Strobach does not agree with either Owen or Bostock on this matter of the regress. Strobach argues that this danger is "avoided if one allows an event of changing only between such states which are themselves temporally extended but not between an extended state and an instantaneous event."[217] There is not, however, any support for Strobach's proviso in Plato's text. Nor does Strobach give a reason why we should restrict changes in the way he suggests. What's more, the either/or option advocated by Sorabji proved problematic due to Sorabji's appeal to instantaneous states. Plato's

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[215]Owen, 1975, p 124.

[216]Bostock, 1978, p 237.

neither/nor option, which requires the notion of an instantaneous state, should not be over hastily accepted for the same reason, namely that the notion of an instantaneous state is problematic.

Owen's argument about why the regress arises is wrong, however, though he is correct to say that there is a regress. Plato does not, as Owen claims, "postulate a time-atom...with a view simply to providing a time for the change to occur." Rather, the time-atom in Plato is a possible consequence of instantaneous changes, though not necessary for it. Plato's argument is that if there is changing then it must occur instantaneously, not that changes occur at instants. Plato does not postulate time atoms. Plato - as Strobach helpfully points out – with his proviso qualifies events of changing not temporal entities.

Bostock's regress is, I think correctly, derived from the notion of instantaneous change and instantaneous states and not from some supposed postulate about time *per se*. That 'time is a series of instants' is not a part of the argument used to isolate the moment of change.

Given the regress along with the notion that atemporal entities exist and can escape logical 'laws,' and given the problems with instantaneous states and durationless events, let alone durationless times, Plato's neither/nor option is a problematic analysis of change. The important points to remember about Plato's analysis are, first, what Strobach called 'Plato's premise' and, secondly, Plato's claim that 'it cannot change without changing'.

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[217]Strobach, 1998, p 46.

2.8 Charles Hamblin's Neither/Nor Option

Charles Hamblin advocates the neither/nor option. But unlike Plato Hamblin does not appeal to the notion of an instantaneous state or instant of time to ground his conclusion. Rather Hamblin fits into group (2.2): for Hamblin statements about instants cannot be made for the reason that instants are not the fundamental elements of time. "The first and fundamental" part of Hamblin's position is an exploration of the "properties of intervals, treated as entities in their own right and not necessarily as sets of instants."[218]

As Hamblin sees it, the problem of the moment of change arises due to a logic and language that we ineffectively try to impose on the world. Hamblin argues that our usual logic and language attempts to apply a two-valued statement to any object at any one time. This means that, for example, we wish to say that 'x is in motion' is true or 'x is in motion' is false for any time t. Hamblin argues that "this is the project that runs into difficulties."[219]

The difficulties and the problem arise, of course, when we define t as the moment when 'x is in motion' is true changes to 'x is in motion' is false. We have seen that when t is the moment of changing it is problematic to determine the status of x in terms of a two-valued logic. Plato's premise is a plague upon such a two-valued determination.

For Hamblin, the problem of the moment of change arises when the language and

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[218]Hamblin, 1969, p 415.

[219]Hamblin, 1969, p 415.

the logic we wish to use for predicates and the language and logic we use for time conflict with each other. This conflict between our language and logic of predicates with our language and logic of time is most acute and problematic when

(1) 'Time' is thought to be composed of a series of instants.
(2) Statements predicating properties of objects are thought to be statements about those objects at instants of time.
(3) All statements are determinately either true or false.

Hamblin rejects (1) and therefore also (2), though Hamblin will accept (3). For Hamblin, statements predicating properties of objects are not statements about an object's instantaneous state nor about objects at instants. For Hamblin predicate statements are made about intervals, even if such intervals have 'instants' as first or last elements. If statements predicating properties to objects are not about objects at instants but about objects in intervals then it is neither true nor false that an object has or does not have some property at an instant or that an object has an instantaneous property (e.g. '...is changing'). Strobach writes that for Hamblin "an instant neither satisfies a predicate nor does not, because there are no predicates taking instants."[220] Strobach writes that the result of Hamblin's analysis is "that sentences such as 'the car is in motion at 8 a.m.' or '*a* is red at instant t' are nonsensical."[221] Such statements are neither true nor false for they cannot be either true or false.

All the proposed solutions to the problem of the moment of change have so far

[220]Strobach, 1969, p 179.

[221]Strobach, 1969, p 179.

varied with respect to the logic of changing predicates, not the logic of time. The either/or option employs a two valued logic. And it tries to non-arbitrarily decide which of the two values obtains when the change takes place. In contrast Priest's both-states option rejects two-valued logic and proposes a three valued logic claiming that 'neither true nor false' is the same as 'both true and false'.[222] Plato also proposes a three-valued logic but only for instantaneous events of changing, events that are not 'in' time.

Hamblin's proposal for a solution to the problem of the moment or instant of change is to work with the time-language that we use, not with the two-valued logic we use when analysing a change in a thing's mutually exclusive predicates. Hamblin will not, as Plato does, introduce a third, instantaneous state of 'neither/nor' at the limiting instant in a predicate change nor will Hamblin, like Priest, argue for a third value saying that objective contradictions exists, options that would have us modify two-valued logic. For Hamblin "a three-valued logic is in fact an embarrassment."[223]

Hamblin's position begins by taking notice of a point about the problem of the instant or moment of change raised by Priest. Priest writes,

> The whole discussion [about the instant of change] so far has been predicated on the assumption that time has instants. Obviously the problem of the instant of change disappears if this is denied.[224]

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[222]Although Priest calls his logic "dialectical *tense* logic' his logic really has nothing to do with an analysis of tense or time. Priest restricts his analysis to states and predicates of objects at the instant of change and admits that the whole problem of the instant of change would disappear if one denied that time has instants, something he does not do in his essay. Priest would have been better to title his logic dialectical *predicate* logic.

[223]Hamblin, 1969, p 422.

[224]Priest, 1981, p 254.

This assumption about the importance of instants for time is exactly what Hamblin will deny. This is what I meant when I wrote that Hamblin works with our logic and language of time rather than two-valued predicate logic when he addresses the problem of the moment of change. Embarrassing, three-valued logics, whether contradictory or not, are for Hamblin the result of a failure to address aspects or presuppositions about time and a failure to keep aspects of our predicate logic from tainting our conception of time.

Plato, as we saw, came to the notion of an instantaneous neither/nor state via a logical analysis of the predicate '...is changing.' And Plato concluded that an entity could only have this predicate for a durationless amount of time, hence it could not have this predicate 'in' time. Hamblin, however, will rule out the possibility of an instantaneous neither/nor state via an appeal to the logic of time. Plato's premise in Plato's neither/nor argument allows instantaneous change to occur such that there is an instantaneous state of neither motion nor rest. Hamblin equally argues that the moment of change should be described as neither/nor but not because there is an instantaneous *state* of neither/nor. For Hamblin statements about properties cannot be either true or false about anything with an 'instantaneous' nature, such as an instantaneous event or an instant of time. What needs to be kept clear is that when Plato asserts 'neither/nor' he is not in agreement with Hamblin when Hamblin asserts neither/nor. Hamblin would contend that Plato's predicate logic is affecting his temporal logic such that the limitations of predicate logic imply the temporal notion of an instantaneous event.

For Hamblin, the problem of the (so-called) 'instant' of change may be addressed with a "less lavish time scale containing short but not infinitesimal intervals." This time

scale for Hamblin must have a "logic in which intervals are the primary elements." Hamblin's "basic idea" is that "intervals may *abut* one another independently of whether there also exist other entities describable as 'points of abutment.'"[225] The 'point' of abutment is here analogous to the instantaneous time of an instantaneous change. This point of abutment is also analogous to Priest's singularity where some derivative is undefined. Of his system of temporal logic Hamblin writes "there is nothing in the system that is far out of line with orthodox representations of time. Only the absence of 'instants' is in any way unusual."[226] The notion of an 'instant' or 'instantaneous event' derives for Hamblin from our predicate logic. Hamblin argues such a notion should not be transferred from our predicate logic onto our temporal logic. For Hamblin "changes of value of a predicate are the only true candidates for instantaneity. But, if this is so, why should we ever talk about truth or falsity at an instant? If instants exist at all, it is surely in some secondary sense."[227]

For Hamblin 'instants' do not exist as entities in their own right in spite of the fact that we have a noun 'instant.' According to Hamblin we should not think that every linguistic name we can employ actually denotes a determinate entity. The number of things in the world should not be multiplied by the number of names we can say. We have words 'instantaneous event' or 'instant of time,' this is true. We have already seen that, for example, Plato arrives at such a notion as 'instantaneous' by means of an analysis of the change in a two-valued predicate, not from an analysis of time as such (i.e.

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[225]Hamblin, 1969, p 415.

[226]Hamblin, 1969, p 420.

that 'time is a series of instants' is not a premise in the argument isolating the moment of change). But, for Hamblin, that there is such a *name* 'instant of time' or 'instantaneous event,' a name our predicate logic may lead us to declare, in no way guarantees that there is such a *thing*. This means that Hamblin's logic and language of time makes instants and instantaneous states "victims of Occam's razor."[228]

For Hamblin we can understand change without having to claim that there are instants of time or instantaneous events. If instants or instantaneous events are not needed to understand change; and if *entia non sunt multiplicanda praeter necessitatem*, then we should not assume that there are instants or instantaneous events. Thus, for Hamblin, "it can be real progress in philosophy to notice that one noun (- phrase) or another does not 'label' any entity."[229] Hamblin's analysis of time places instantaneous states or instants of time in the same class as the present King of France, bald or not. The instantaneous event of changing that a two-valued predicate logic implies given Plato's premise is not for Hamblin a denotable entity in itself for such an entity is analysed away as a denoting phrase with no referent. Hamblin wishes to relieve us of the burden of looking for instants or instantaneous events.

For Hamblin the problem of the moment of change arises when we (1) do not separate our two-valued logic of predicates and its merely possible implications about time from our logic and language of time - especially if our logic of changing predicates has temporal implications, which the notion of an instantaneous event of changing

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[227]Hamblin, 1969, p 414.

[228]Strobach, 1998, p 176.

certainly has. Additionally for Hamblin the problem of the moment of change arises when we (2) try to make the latter, time, conform to the former, two-valued predicate logic. Hamblin argues that what we need to ultimately come to understand is that two-valued predicate statements

> cannot flow smoothly from falsehood to truth, and yet our time-language presents us with a continuum on which to define them.[230]

Hamblin begins constructing his temporal logic by defining his "primitive notion," which he calls "abutment." To introduce Hamblin's definition of abutment let's first consider what he means by "precedes" or "is less than." In effect, abutment may be defined as 'immediate intransitive precedence.'

For Hamblin '*a* precedes *b*' means "*either a* abuts *b or* there is another interval *c* such that *a* abuts *c* and *c* abuts *b*." To 'abut,' for Hamblin, is defined as "*a* abuts *b* when *a* precedes *b* and there is no interval *c* such that *a* is less than *c* and *c* is less than *b*."[231] This results in what Hamblin calls a "reciprocal definition"[232] of precedence in terms of abutment. Hamblin's temporal logic employs abutting intervals as fundamental elements, not intervals that precede each other (even though abutting intervals precede each other).

If we were to take precedence and not abutment as the fundamental temporal relation then we would slip into the notion that time is composed of a series of instants,

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[229]Strobach, 1998, p 176.

[230]Hamblin, 1969, p 414.

[231]Hamblin, 1969, p 415.

[232]Hamblin, 1969, p 417.

where the 'instant' would be the time *c* between *a* and *b*. If *a* merely or simply preceded *b* and if we forgot completely about the (more fundamental) relation of abutment then there would be a *c* after *a* and before *b*. *a* would then precede *c* and *c* would precede *b*. This repetition of the precedence relation between *a* and *c* and *c* and *b* would require there to be a *d* less than *c* but greater than *a* and an *e* greater than *c* but less than *b*. This means that the series (t_1,t_2,t_3) if only or fundamentally related by means of the precedence relation would yield the series (t_1,t_4,t_3,t_5,t_2). This latter series would then according to the precedence relation yield the series $(t_1,t_6,t_4,t_7,t_3,t_8,t_5,t_9,t_2)$. This repetition of the precedence relation could conceivably be carried on *ad infinitum*. (Indeed, this is the objection raised by Bostock about Plato's instantaneous change - there is always a need of a preceding change for every preceding change such that "we shall need infinitely many suddens [or instantaneous events or instants] before we are finished."[233])

Forgetting about the possible regress for the present, thinking of time in terms of the precedence relation would additionally lead to the problematic infinitesimal instant, the equally problematic limiting instant (in the case of those who deny infinitesimals in their calculus). Or it would lead to the notion of an instantaneous event of change between two mutually exclusive intervals at either the infinitesimal or limiting instant. Hamblin argues these three options in particular, and talk of time-atoms, moments or instants in general, give an incorrect analysis of time due to the use of the relation of precedence, rather than that of abutment, as the fundamental temporal relation.

For Hamblin, if interval *a precedes* interval *b* then interval *a* may not necessarily

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[233]Bostock, 1978, p 237.

abut interval *b*. However if interval *a* abuts *b* then *a* will necessarily precede *b*. In other words, 1 is less than 3 even though 2 is greater than 1 but is itself less than 3. 1, therefore, precedes both 2 and 3. Abutment, however, only occurs between 1 and 2 and 2 and 3. Abutment does not occur between 1 and 3 in spite of the fact that 1 precedes 3. Hamblin wants us to understand that all abutments imply precedence, but not that all precedence implies abutment. Describing 'abutment' as immediate precedence may capture the difference between abutment and precedence.

We may describe precedence as a 'transitive' relation while abutment as a non-transitive relation. If '*a* abuts *b*' then Hamblin writes "$a < b$" or "aAb". If we adopt 'aPb' to mean that '*a* precedes *b*' then to say that precedence is 'transitive' is to say that if aPc and cPb then aPb. But to say that abutment is 'non-transitive' is to say that if aAc and cAb, then *a* does not abut *b*, i.e. then ~(aAb).

In terms of abutment and precedence, if we take the claim that in a change $S_1t_1 \neq \Delta S_nt_{1>n>2} \neq S_2t_2$, then Hamblin would say that (1) S_1t_1 precedes $\Delta S_nt_{1>n>2}$ and S_2t_2 and that (2) $\Delta S_nt_{1>n>2}$ precedes S_2t_2. Hamblin would also say that (3) S_1t_1 abuts $\Delta S_nt_{1>n>2}$ and that (4) $\Delta S_nt_{1>n>2}$ abuts S_2t_2. But he would not say that (5) S_1t_1 abuts S_2t_2.

Hamblin writes that aAb "implies that *a* immediately precedes *b* so that bAa is not equivalent to aAb." For Hamblin if aAb or $a < b$ is true then bAa or $b < a$ is false. This means that for Hamblin the non-transitive relation of abutment and the transitive relation of precedence are both asymmetrical: these relations are not equivalent to their converses. This means that aAb and bAa express radically different and mutually exclusive states (i.e. if aAb or aPb is true then bAa and bPa must be false.) Nor, therefore, can the asymmetrical relations of abutment and precedence be neutral with respect to the order of

the elements in the relation.[234] In effect then, the asymmetrical relations of abutment and precedence are designed to capture the order as much as the time of an occurrence of an event like a change.

In effect, Hamblin's temporal logic rules out the instantaneous state interposed between motion and rest by means of the use of abutment. A state of motion and a state of rest *abut* one another. This means that the two mutually exclusive states (that, for Hamblin, always occur over intervals and cannot ever occur within the same interval) *immediately* precede each other such that there is not another, third state in the temporal order of the object's existence, in spite of the fact that a two-valued predicate logic suggests that there is such a third state. A two valued predicate logic suggests that there is a *preceding* state between the first and second mutually exclusive states, but for Hamblin the more fundamental temporal relation of abutment shows that there is not such an additional, third instantaneous state.

The result of Hamblin's time-logic is that there is not a fundamental 'unit' of time of a given length or duration, especially an instantaneous length. Intervals can be longer or shorter than one another, but never absolutely short. What's more, predicates do not apply to absolutely short 'intervals' or 'time-instants.'

Hamblin argues "if we could subdivide intervals in some way which would lead us eventually to 'atoms,' within any one of which no change takes place, we would have

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[234]For more on the difference between converse and neutral relations see Kit Fine's work 'Neutral Relations,' *The Philosophical Review*, Vol. 109, No.1, January 2000, p 1-33. In short, consider this example: if *a* is on top of *b* then *b* is not on top of *a*. Conversely, if *b* is below *a* then *a* is not below *b*. But with respect to 'vertical placement' it does not matter if *a* is vertically placed with respect to *b* or if *b* is vertically placed with respect to *a*: the relation is the same in both cases. Whereas with 'on top' or 'below' it is not. In the latter the order matters, whereas in the neutral (e.g. vertical placement) relation the order does not matter.

solved the problem."[235] Thus, for Hamblin there are "certain time-intervals which have a privileged position."[236] Hamblin calls these privileged time intervals - *his* so-called 'atoms' - "elementary intervals." An elementary interval is one in which there are no truth-value changes in any proposition about the states obtaining during the interval. These always extended intervals of various duration are Hamblin's so-called 'atoms,' i.e. his fundamental time units, though these units are 'atoms' that are not either instants or durationless times defined by instantaneous events. Hamblin writes,

> Let us suppose that our language contains elementary statements P_1, P_2, P_3..., finite or infinite in number, and imagine the universe as a time-sequence of states describable by conjunction-chains of these statements, straight or negated... An *elementary interval* is an interval within which no change of truth-value of any of the P's occur.[237]

Strobach calls these elementary intervals "maximally changeless periods."[238] Of these elementary intervals or maximally changeless periods Strobach writes that they

> Are an elegant way of working with periods within the framework of a two valued logic without having to assume time-atoms.[239]

Indeed, Hamblin claims that his "logic of elementary intervals" is "fully two-

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[235]Hamblin, 1969, p 423.

[236]Hamblin, 1969, p 423.

[237]Hamblin, 1969, p 424.

[238]Strobach, 1998, p 174.

[239]Strobach, 1998, p 174.

valued" and that it is a "complete basis for a logic of time without instants."[240] But is this logic up to the task of addressing the problem of change?

The fundamental reason why Hamblin's solution will not address the problem of the moment of change is that Hamblin assents to Priest's claim that "the whole discussion [about the instant of change] so far has been predicated on the assumption that time has instants."[241] But what should be obvious from the exposition of Plato is that the problem of change derives from (1) a belief in an event of changing and from (2) Plato's premise. Priest's claim is false: nowhere in the four-part argument used to raise the problem about change is the claim that "time is a series of instants." The problem of change is *not* predicated upon the assumption that time has instants. So analysing instants away, replacing them with intervals, will not address the problem.

Priest himself warns us of the danger of the interval theory of time which denies instants and instantaneous events of changing. Priest writes,

> The interval thesis may well solve the problem of the instant of change. However it does so only by producing a curious account of change. For suppose that during a certain time a state S changes from S_0 to S_1. Then there must be two abutting intervals such that a wholly precedes b, S_0 is true throughout a and S_1 throughout b. Now given that there is no instant [or interval] dividing a and b we can not ask whether S is in S_0 or S_1 at it. However, because there is no such instant, there is no time at which the situation *is changing*: a is before the change, b is after it. Thus, in a sense, there is no change in the world at all.[242]

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[240]Hamblin, p 424-425.

[241]Priest, 1981, p 254.

[242]Priest, 1981, p 254.

Like Plato and Priest, Strobach emphasis the danger of analysing away changing; and like Priest Strobach agrees the 'abutting interval thesis' Hamblin advocates implies that "no change is actually taking place; he [Hamblin] banishes change from any time he permits."[243] Hamblin fails to account for Plato's premise and events of changing, the two elements that lead to the notion of instantaneity and the problem of the moment of change. Hamblin, therefore, has misconstrued the problem so his 'solution' obviously will not do.

Plato's premise in effect defines '...is changing' as a special sort of predicate called by Strobach an "instantaneous predicate" or a "μ-predicate"[244] A μ-predicate is a special sort of predicate that can be only be true or false of an instant. Hamblin cannot account for such a predicate in his time logic for he argues that predicates are true or false only for time intervals.

For Hamblin "predicates are durable."[245] By this he means that, for example, "the red book on my desk could turn green for half a second or half a century but it could not turn green temporarily and durationlessly at the stroke of twelve, remaining red at all times earlier and later."[246] If $S_r t_1$ is Hamblin's book being red and $S_r t_2$ is Hamblin's book being red and these are two states forming abutting intervals of time, then an instantaneous state of being green, $S_g t_{1>n>2}$, immediately after being red at $S_r t_1$ but immediately before being red at $S_r t_2$ is temporally and predicatively impossible for

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[243]Strobach, 1998, p 177.

[244]Strobach, 1998, p 179.

[245]Hamblin, 1969, p 414.

[246]Hamblin, 1969, p 414.

Hamblin.

For Hamblin instants do not exist in a temporally fundamental way and our predicates cannot be true of durationless durations, so we should not try to talk of truth or falsity at an instant. Strobach writes, "the only predicates Hamblin is prepared to allow are 'durable predicates' which can only be satisfied by periods (Hamblin's 'intervals') but not by instants (which do not exist anyway)."[247] Strobach efficiently denotes Hamblin's position: "durable predicate + instant = nonsense."[248]

The problem with Hamblin's position is that we can accept the slogan 'durable predicate + instant = nonsense.' But, as noted, Plato's premise suggests that '...is changing' is a μ-predicate or an instantaneous predicate rather than a durable predicate, or a what I shall label a 'δ-predicate'. Admitting the distinction between μ-predicates and δ-predicates, something I think Plato's premise demands, would allow us to claim that 'μ-predicates + instant ≠ nonsense.' This means, writes Strobach, that we can accept Hamblin's claim that there is "nothing to be said against the view that instants do not belong to the domain of a durable predicate." But in taking this view "we need not abolish μ-predicates altogether, since they are not durable but instantaneous predicates."[249] And there is nothing against the view that instants "belong to the domain if a μ-predicate."[250] By failing to distinguish between μ-predicates and δ-predicates Hamblin analyses changing away, argues Strobach.

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[247]Strobach, 1998, p 173.

[248]Strobach, 1998, p 180.

[249]Strobach, 1998, p 180.

[250]Strobach, 1998, p 180.

For the reason that Hamblin analyses changing away with his 'abutting internal thesis' his neither/nor argument must be rejected as a thesis that, like Plato's neither/nor argument, cannot satisfy an inquiry into the problem of the moment of change.

2.9 Neutral Instant Analysis

An Analysis of the (1) either/or-option, the (2) either-way option, the (3) both-states option and the (4) neither/nor-option has revealed that each option has at least one significant problem that made it at least a questionable, if not an unintelligible or wholly false, option. We now lastly come to what Strobach calls 'neutral instant analysis.' There is a reason why we are dealing with this option last.

That any one of the first four options could not alone address the problem of the moment of change "suggests looking for a mixed description of the moment of change."[251] Strobach claims that "a good compromise could only be expected between the either/or and the neither/nor option."[252] Neutral instant analysis is such a mixed compromise.

The problem with the notion of such a mixed compromise of the either/or option with the neither/nor option is that the weakness of each of the particular options arise within the combination.

First, the NIA suffers from the problem Hamblin failed to address, namely the

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[251]Strobach, 1998, p 183.

[252]Strobach, 1998, p 183.

reality of changing. In NIA flux and change seem to be a "mere illusion,"[253] writes Strobach.

As a second example take the 'phenomenological unease' raised in objection to the neither/nor option as articulated by Plato. Strobach writes that "when dealing with the NIA [neutral instant analysis] the phenomenological unease occurs."[254] What, Strobach wonders, could a thing neither in motion nor at rest look like? "A satisfactory picture of the moment of change must be able to remove this unease,"[255] he writes.

To the extent that the objections against the to-be-mixed options equally apply to the mixed-option, the NIA option may be rejected. Given this transfer of the problems of the to-be-mixed options to the NIA option the particular details of the mixed NIA option are not overly relevant. They will not therefore be given here.

2.10 Conclusion

The conclusion that follows from above is that (1) arguments against the reality of change are unacceptable. And that (2) Strobach's five options for analysing the moment of change are on their own and in combination insufficient to address the problem of change.

We need now, in Chapter Three, to offer an alternative position on change that (1) does not deny the reality of change altogether nor (2) fall prey to any of the objections

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[253]Strobach, 1998, p 197.

[254]Strobach, 1998, p 197.

raised of the five options described.

[255]Strobach, 1998, p 197.

3 Tensed or Tenseless Change?

The definition of change offered in Chapter One was that a 'change' is 'an object having mutually exclusive properties at different times.' And in Chapter One it was said that the ultimate aim of this thesis is to test the adequacy of this definition given Strobach's problem of the moment of change. This problem was discussed in Chapter One and its (albeit ultimately unsuccessful) 'solutions' were documented in Chapter Two.

The questions that need be faced now are: is the above definition of change sufficient given Strobach's problem? And if the definition is not sufficient given the problem of the moment of change then how can the definition be augmented to give an adequate treatment of change?

Alternatively, does this definition of change require a treatment that takes into account the problem of the moment of change? That is, is there an interpretation of change that does not raise - let alone 'solve' - the problem of the moment of change as that problem has been raised by Plato and chronicled by Strobach?

The above definition of change is employed by D.H. Mellor in his work *Real Time*. There Mellor writes that change "is having a property at one time and not at another.[256] Mellor unlike Strobach augments the definition of change by focusing upon the meaning of time. Mellor writes, "more specifically, it [change] is something having incompatible properties at different *dates*."[257]

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[256]Mellor, 1981, p 88.

[257]Mellor, 1981, p 88. Italics mine.

Strobach shares with Mellor the notion that there are two states in a change, states that cannot both occur in the same object at the same time. Strobach writes that a change "takes place between two opposite states. Their obtaining simultaneously would be a contradiction."[258] Newton-Smith also defines change in a similar way in his work, *The Structure of Time*. Change for Newton-Smith occurs when "something has such-and-such a property (or, lacks such-and-such a property) at one time and then later the same thing lacks that property (or, possesses that property)."[259] In other words, a change occurs when a thing with property *F* at one time is the same thing at another, successive time such that that thing is not-*F*. Of such a change Strobach writes that "it is one of the oldest problems in the philosophy of space and time: How is the change from one state to its opposite to be described?"[260]

Could it be the case that the problem of the moment of change is a problem that is generated by the way Plato and Strobach analyze *time*, rather than from change *per se*? Strobach writes that "we conjure up time by conjuring up the moment of change. Doing so is a way of becoming aware of time."[261] But when we are aware of time just what is it that we are aware of? How does an individual's conception of time affect their conception of change?

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[258]Strobach, 1998, p 1.

[259]Newton-Smith, 1980, p 14. This definition of change, we learned in Chapter One, is what Mark Heller called a triadic definition. We also learned that Russell shares this definition.

[260]Strobach, 1998, preface.

[261]Strobach, 1998, p 1.

3.1 Three 'Metaphysical' Questions

That change is related to time, and that time is related to change, is not a blessing. Strobach rightly adds that

> Suddenly, we are facing questions of metaphysics. What is time? What is the relation between time and present? How can a boundary in time be conceived and experienced?[262]

Strobach carefully limits his inquiry into the moment of change. He accomplishes this by making *one* of his three metaphysical questions more important than the other two. Which of Strobach's three metaphysical questions is the most important? The first two of the three questions Strobach raises are *not* the focus of his inquiry.

> Of these questions it is not the *big one* concerning the nature of time which I want to tackle in this book. Rather, I want to deal with the question concerning the structure of a temporal boundary.[263]

Strobach is concerned with the structure of a temporal boundary for the reason that, for him, the event of changing that occurs at the moment of change is the time of passage of the temporal boundary between the old and the new states. The problem of the moment of change could then be rephrased as the 'problem of the passage of a temporal

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[262]Strobach, 1998, p 1.

[263]Strobach, 1998, p 1. Italics are mine.

boundary.' Consider Strobach's first example, the change from 2002 to 2003 on New Years Eve. He writes:

> We wait for a certain position of the hands of the clock or for an announcement on the radio, until, sure of *having passed* a certain boundary in time to which we have attached some meaning, we wish each other a happy new year.[264]

When we focus upon the moment of change at the temporal boundary between the earlier and the later state then we encounter problematic questions: When 2002 changes to 2003 are we in 2002 still or 2003 yet? If we are when we are changing from 2002 to 2003 no longer in 2002 still but are not in 2003 yet, then when we are passing or when we are at the temporal boundary we cannot still be before the boundary (2002) nor can we yet be after the boundary (2003). But if at the boundary or when passing the boundary we must be neither before nor after the boundary, then for how much time are we neither in 2002 nor 2003? An infinitesimal amount of time? And if that is too little an amount then how about the smallest possible amount of time? But how small is that? Perhaps then we would be better to agree with Plato that "when it changes it can be in no time."[265] But where, finally, would we be then?

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[264]Strobach, 1998, p 1.

[265]Plato, 1926, p 299.

3.2 Real Time: Strobach's Tenses or Mellor's Dates?

D.H. Mellor's books *Real Time* and *Real Time II*, like Strobach's book, ask 'metaphysical' questions about time. In *Real Time II* Mellor writes that "like its ancestor, *Real Time*, this book [*Real Time II*] is about such of the metaphysics of time as follows from settling the basis in reality of our distinctions between past, present, future."[266] In other words, of the three metaphysical questions Strobach raises, Mellor's books tackle the big one, Strobach's first question. Mellor writes that his books are about "the most intriguing and basic question in metaphysics: what is time?"[267] This question, 'What is time?', says Mellor, demands that we investigate the status of what in *Real Time* he calls "tense." Mellor writes,

> Its [tense] status is itself the main and most contentious metaphysical question about time, and on it depends much else besides.[268]

One of the things dependent upon the status of tense, continues Mellor, is "time's intimate connection with change."[269]

I argue that by not answering his first metaphysical question about time Strobach implicitly assumes a tensed theory of time. Secondly, I shall argue that, at least from Mellor's perspective, the tensed theory of time is contradictory and cannot be true.

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[266]Mellor, 1998, p 1.

[267]Mellor, 1998, I.

[268]Mellor, 1981, p1.

[269]Mellor, 1981, p 1.

Thirdly I shall argue that Strobach's tensed assumptions about time lead to the problem of the moment of change. And, finally, I shall argue that by rejecting Strobach's tensed assumptions about time, Mellor's account of time and change pre-empts the problem of the moment of change.

What is tense or a tense-theory of time?

According to the tense theory of time there are (1) three specific temporal locations: past, present, future. Tense also involves (2) an analysis of the changing relations between these three temporal locations in so far as what is present was future and will be past. For tense theorists, then, (3) temporal locations change their temporal location: for what is now (e.g. at t_1) is not what is now (e.g. at t_2). In other words, what is now at t_2 was future at t_1; while what was now at t_1 is past at t_2.

We should note that, in *Real Time II* Mellor excises his use of the term "tense." Mellor prefers to call past, present and future "A-times."[270] Mellor wants it made clear that 'tenses' or better still A-times are not merely grammatical. Mellor writes,

> in *Real Time* I followed the custom of calling temporal locations like past present and future 'tenses,' while distinguishing them of course from the corresponding forms of English verbs.[271]

By changing to "A-times" from 'tense,' Mellor aims to make clear he is not talking about the conjugation of verbs, and he aims to reinforce the importance of the distinction for a "failure to observe this distinction [i.e. between grammar and time] still

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[270]Mellor, 1998, xi.

[271]Mellor, 1998, p xi.

vitiates much philosophy of time."[272] To inoculate us from this failure Mellor in *Real Time II* restricts the use of the term 'tense.' "The terms 'tensed' and 'tenseless' I confine to their original, proper and trivial grammatical uses."[273] Mellor then directs us to "McTaggart's now standard distinction between his A and B series."[274]

3.3 McTaggart's A-Series/B-Series Distinction

The reason why we should consider McTaggart's arguments in *The Nature of Existence* regarding his distinction between the A and the B series or the A-theory and the B-theory of time is that these theories are offered as answers to Strobach's first question, what is time? As we have seen, Strobach is not considering this first question in his book *The Moment of Change*. As I am arguing that as a result of not addressing the first question Strobach implicitly assumes an A-theory of time and that this is why he finds change problematic, it is prudent to consider McTaggart for McTaggart (1) introduces the distinction between the A and the B theory and (more importantly) McTaggart argues that (2) the A-theory of time is not true for it cannot without contradiction account for the changes that are supposed to occur to it, namely the change of the temporal location of A-series temporal locations: for what is now (e.g. at t_1) is not what is now (e.g. at t_2).

To begin with McTaggart's A-time/B-time distinction, McTaggart says that "positions in time, as time appears to us *prima facie*, are distinguished in two ways." The

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[272]Mellor, 1998, p xi.

[273]Mellor, 1998, p xi.

first way is by means of 'earlier than' or 'later than', the second by means of 'past', 'present' and 'future'. And it is

> For the sake of brevity [that] I [McTaggart] shall give the name of the A series to that series of positions which runs from the far past through the near past to the present, and then from the present through the near future to the far future, or conversely. The series of positions which runs from earlier to later, or conversely, I shall call the B series.[275]

The B-series is, for McTaggart, "a collection of terms such that, of any two of them, either the first is in this relation to the second, or the second is in this relation to the first."[276] Only one of 'earlier than' or 'later than' is needed to form the B-series: *both* 'earlier than' and 'later than' are not required to form a B-series. For if the event M is earlier than the event N then, *ipso facto*, N is later than M, and vice versa.

'Earlier than' and 'later than' are says McTaggart *conversely* related to each other. Williamson defines a converse relation as the claim that "for x to have one to y is for y to have the other to x."[277] McTaggart's point is that the relation of x to y can occur without the relation of y to x, but wherever there is a relation of x to y there will be a relation of y to x such that the relation of y to x will not be the same as the relation of x to y. McTaggart writes that "to constitute a B-series there is required *a* transitive asymmetrical relation...[and] we may take here *either* the relation of 'earlier than' *or* the relation of

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[274]Mellor, 1998, p xi.

[275]McTaggart, 1968, p 10.

[276]McTaggart, 1908, p 10.

[277]Williamson, 1985, p 249.

'later than,' both of which, of course, are transitive and asymmetrical."[278]

To say that 'earlier than' and 'later than' are *transitive* is to say that if M is earlier than N and N earlier than O, then M is earlier than O. To say that 'earlier than' and 'later than' are *asymmetrical* is to say that if M is earlier than N then N is not earlier than M. Defined by means of the notion of a converse relation, an asymmetrical relation is one that is not equivalent to its converse relation: the relation of, say, x to y must not be the same as the relation of y to x.

As for the A-series - the series of positions which runs from the far past through the near past to the present, and then from the present through the near future to the far future, or conversely - McTaggart claims that any given A-series position and its contents can only be one of either past, present or future. These three positions in the A-series, he writes,

> Are incompatible determinations. Every event must be one or the other, but no event can be more than one.[279]

Continuing, McTaggart writes that "if I say that any event is past, that implies that it is neither present nor future, and so with the others."[280]

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[278]McTaggart, 1968, p 10.

[279]McTaggart, 1908, p 20.

3.4 The Difference Between the A- and B-series

There is a major and importance difference between the A-series and the B-series and it is here where the problems with the A-series begin. McTaggart writes, "the distinctions of [the B-series] are permanent, while those of the latter [the A-series] are not."[281] B-series temporal locations and their contents do not change their temporal location, while A-series temporal positions and their contents do. McTaggart concisely makes his point when he writes

> If M is ever earlier than N, it is always earlier. But an event, which is now present, was future and will be past.[282]

In the A-series, every event occurring at any given now, at any given present time or any A-series time (1) was future in the past prior to (2) being present, and (3) it will be past in the future after having been present. In other words, every event and position in the A-series has every position in the A-series even though the positions are incompatible determinations. McTaggart writes, "the three characteristic belong to each event." But "how is this consistent with their being incompatible?"[283]

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[280]McTaggart, 1908, p 20.

[281]McTaggart, 1908, p 10.

[282]McTaggart, 1908, p 10.

[283]McTaggart, 1908, p 20.

3.5 The Contradiction in the A-series

McTaggart points out that it would be contradictory to say that an event was each possible determination at the same time. This means that "it is never true," writes McTaggart, "that M *is* present, past and future."[284] The only other way, argues McTaggart, that each event and position in time could have the different, mutually exclusive positions in time is by having each position successively. McTaggart writes, "the attribution of the characteristics past, present and future to the terms of any series leads to a contradiction, unless it is specified that they have them successively."

The successive possession of the incompatible determinations is captured by saying that what "*is* present, *will be* past, and *has been* future. Or it *is* past and *has been* future and present, or again *is* future, and *will be* present and past."[285] The three determinations cannot have all three determinations at the same time, so instead they can only have them one after the other. The appeal to successive possession of the mutually exclusive positions argues that

> The characteristics are only incompatible when they are simultaneous, and there is no contradiction to this in the fact that each term has all of them successively.[286]

The problem with the appeal to successive possession is that the statement about

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[284]McTaggart, 1908, p 21. Italics are McTaggart's.

[285]McTaggart, 1908, p 21. Italics McTaggart's.

[286]McTaggart, 1908, p 21.

M's successive possession of the incompatible properties, namely that M is present, will be past and has been future means argues McTaggart "that M is present at a moment of present time, past at some moment of future time, and future at some moment of past time."[287] The moments, however, at which M is successively past, present and future are themselves past, present and future and all are mutually exclusive of each other. This means that, writes McTaggart, "a similar difficulty arises." There would be a contradiction if it was said that these second order times governing the successive possession of the first order mutually exclusive times were each past, present and future simultaneously. With these second order times we face McTaggart's only other option, namely to say that the terms are each had successively. But, McTaggart writes, to specify that the terms are had successively is to say

> That they have them in relation to terms specified as past, present and future. These again, to avoid a like contradiction [i.e. the contradiction from simultaneous possession], must in turn be specified as past, present, and future. And, since this continues infinitely, the first set of terms never escapes from contradiction at all.[288]

Simultaneous possession of A-series temporal locations is contradictory and the theory of successive possession requires an infinite number of A-series. But "such an infinity is vicious," writes McTaggart, it only prolongs the contradiction, rather than eliminate it. The A-series, given its incapacity to account for the changes necessary for it to be the A-series, must be regarded as false. "The reality of the A-series," says

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[287]McTaggart, 1908, p 21.

[288]McTaggart, 1908, p 22.

McTaggart, "leads to a contradiction and so must be rejected...nothing is present, past or future."[289]

Mellor agrees with McTaggart's analysis of the A-series and A-times. Mellor writes, "the tensed view of time is self-contradictory and so cannot be true. McTaggart showed that in 1908."[290] Mellor agrees with the reason why the A-series is contradictory: it cannot account for its own change. Mellor writes, "tenses [A-times] cannot change, as they must to be tenses, and therefore cannot exist. Nothing real therefore can depend on the differences between them."[291] Mellor summarizes McTaggart's argument in *Real Time II*:

> McTaggart's proof is simple. Many A-times are incompatible with each other. An event that is yesterday, for example, cannot also be tomorrow, because past, present and future are mutually incompatible A-times. Yet because each event is always changing its A-times, it has to have all of them. But nothing can really have incompatible properties, so nothing in reality has these times. The A-series is a myth.[292]

Nor continues Mellor will arguing as McTaggart has already suggested that each position is had successively. For then, Mellor writes,

Instead of three simple A-times [past, now, future or *P*, *N*, *F*], we have

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[289]McTaggart, 1908, p 22.

[290]Mellor, 1981, p 5.

[291]Mellor, 1981, p 103.

[292]Mellor, 1998, p 73.

> nine complex ones *PP*, *PN*, *PF*; *NP*, *NN*, *NF*; *FP*, *FN*, *FF* [i.e. past in the past, past now, past in the future; now past, now now, now future, etc]. But McTaggart's argument applies equally to them. Since the A-times of events are always changing, every event that has any of these nine-complex A-times must have all of them; but not all of them are compatible.[293]

Giving even more complex times to govern the first nine complex A-times will just produce more of same problem. The ultimate result is that "in short, we have an endless regress, a regress that is vicious."[294] The A-theory then, for Mellor as much as for McTaggart, is "guilty of a capital offence, namely self-contradiction."[295]

3.6 Time and Change

One of the things dependent upon the status of tense, continues Mellor, is "time's intimate connection with change."[296] After Mellor addresses the big question about time, Mellor rejects - or at least greatly restricts, the reality of tense due to the contradiction in the A-series resulting from its incapacity to account for its own changes.

Strobach's third question, the only question Strobach is addressing, the question about the passage of a temporal boundary, contains assumptions - tensed assumptions - about time that Mellor rejects. Real Time, for Mellor, is not tensed time.

By considering the three questions Strobach asks, I argue that the third question is

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[293]Mellor, 1998, p 74.

[294]Mellor, 1998, p 74.

[295]Mellor, 1998, p 72.

[296]Mellor, 1981, p1.

dependent upon the first question's answer. Mellor's rejection of A-time or tense and his "B-Theory" of time and change is an answer to the first question, what is time? For Mellor we are not bound within a present A-series moment that passes from, say, 2002 to 2003. In other words, the proposition 'it is 2002' does not for Mellor change from being true to being false on New Years Eve.

My thesis is that by attending to Mellor's treatment of time, an account of change may be given that does not raise the problem of the moment of change - the problem of the passage of a temporal boundary - for the reason that Mellor's treatment of time rejects the tensed or A-time presuppositions necessary for the problem of the passage of a temporal boundary. This means that Strobach's third question - at least from Mellor's perspective, is dead. The third question arises if and only if one answers Strobach's first question - What is time? - with the answer 'time is an A-series.'[297]

Let's consider an example showing where the first question's answer affects the third question. We will consider Strobach's use of the term 'event.'

3.7 Events: Tensed or Tenseless?

Why focus on events? Because the nature and temporal structure of an event of changing is at the heart of the problem of the moment of change. To be sure, the very problem of the *moment* of change (qua event of changing) contains a temporal term,

[297]This is not to say that there are not A-theorists that modify their claims so as to avoid the problems of change. Whitehead and Pearce as well C.D. Broad offer differ conceptions of time than either Plato, Strobach or Mellor. My thesis here concerns only the objections that Mellor would raise against the problem of change as that problem has been raised by Plato and chronicled by Strobach.

namely the notion of a moment. The temporal structure of events cannot be ignored if change is to be sufficiently analyzed. To give an adequate definition of a temporal event would require an answer to Strobach's first question, What is Time? But we have seen that Strobach is not attempting to answer this particular question. The nature and temporal structure of an event differentiates Mellor's account of change from Strobach's account of change.

In effect, it is Strobach's *lack* of an account of the nature of time and the temporal structure of an event that leads to the problem of the moment of change. Strobach's third question - the question he is addressing in his book - is about the structure of a temporal *boundary*, not an event. Strobach is concerned with the boundary for the reason that he is analysing the event of passage of such a boundary. But in order to need to worry about the structure of the boundary Strobach first must assume that a temporal event includes or is the passage of a temporal boundary. But whether or not there is such temporal passage depends upon the answer to the metaphysical question about time (what is time?) - the question that Strobach is *not* concerned with.

Instead of giving a thorough analysis of time and temporal events, Strobach argues that he "can *only* appeal to our intuitive knowledge [of] how the word 'event' is *properly* used."[298] To give meaning to the word 'event,' Strobach merely appeals to our "linguistic intuition."[299] And Strobach claims that "this appeal [to linguistic intuition] is

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[298]Strobach, 1998, p 6. Italics mine.

[299]Strobach, 1998, p 7.

legitimate since we have this knowledge as competent speakers of English."[300]

Strobach's appeal to linguistic intuition to define the temporal structure of an event is not an appeal that can be accepted. With respect to Strobach's three metaphysical questions about time, it is the answer to the first question that would determine what the proper meaning of 'event' is. Strobach appeals to linguistic intuition for the proper meaning of the term event for the reason that he has not explicitly addressed his first question.

Unfortunately for Strobach's appeal, intuition does not guarantee either uniformity of intuitive opinion, nor accuracy, nor does this appeal allow an exact understanding of just what is supposed to be intuited as the *proper* meaning of the term 'event.' Strobach's appeal to intuition is not an argument, let alone an acceptable argument, for the nature and temporal structure of an event. An appeal to intuition is not the same as an answer to the first metaphysical question about time. Should we, for example, intuit a *proper* Strobachian event as an instantaneous A-series event or a B-series event? This question cannot be answered until the first metaphysical question has been fully answered: for the temporal structure of events can be that of an A-series if and only if time is an A-series, but that time is an A-series is just what Mellor denies.

3.8 Truth-Functional Model of Change

It is possible to model A-series and B-series change in a system of propositions,

[300]Strobach, 1998, p 7.

their truth-values and their truth-conditions (i.e. the facts that make the propositions have the truth value that they have when they have it). These propositions are about objects and their properties at the times at which these objects have these properties. Modeling change in this way will help clarify the problem of the moment of change. Modeling change in this way will also enable us to exactly clarify the difference between Mellor's and Strobach's account of time and change. And such a model will help to explain the objections to Mellor's account and how Mellor deals with the objections. An example will help.

If the proposition 'the light is on at t_1' is true; and if the proposition 'the light is on at t_2' is false, then that the light has changed from on to off can be modeled as the difference obtaining amongst the truth-values of the two time-indexed propositions about the same lamp's state. In the case of it being true (T) that the lamp is on at one time (t_1) and false (F) that the lamp is on at some other time (t_2), that the lamp has changed from on to not-on may be modeled as (Tt_1, Ft_2). Russell, in the *Principles of Mathematics,* defines change in this way. There he writes,

> Change is the difference, in respect of truth or falsehood, between a proposition concerning an entity at a time *T* and a proposition concerning the same entity at another time *T'*, provided that the two propositions differ only by the fact that *T* occurs in the one where *T'* occurs [in the other].[301]

Change, then, occurs to a self-same or identical thing over time. This means that

[301]Russell, 1964, p 469. Emphasis mine.

the same thing must occur or be referred to at both times.[302] The two states and the two times at which they occur are mutually exclusive. What is important to take notice of here is that (1) at least two different times must be referred to in a change. (2) A third time is not necessary. And (3) the truth value of the propositions about a changing thing do not themselves change (i.e. the proposition about the lamp at $t_1$does not change its truth value at t_2).

On all these three points Strobach will object. I aim to show that Strobach objects to (1), (2) and (3) due to his implicit A-series assumptions about time and change.

Whether or not the truth value of a proposition changes is at the heart of the difference between the A-series and the B-series. It also at the heart of the primary objection to Mellor's account of change. As McTaggart said, B-series relations are permanent, whereas A-series relations are not. So, if a proposition about a thing is ever true it is always true (on the B-series); or if it ever was a fact at time t_1 that *P*, then it always will be and has been a fact that *P* at t_1. But on the A-series, if a proposition about a thing is true now (e.g. at t_1), then that proposition would have been false (when it was future at t_0) and it will be false (when it is past at t_2).

For Strobach, 'the lamp is on at t_1' is true if and only if t_1 is now. 'Now' is an A-series term such that t_1 was future and will be past. When t_1 was future 'the lamp is on at t_1' was false - for t_1 is not now. And when t_1 is past 'the lamp is on at t_1' will be false -

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[302]In Chapter One we learned that failure to accept this identity clause would result in confusing change with a simple succession of different things with different properties at different times. Also, Mellor argues, that without such an identify clause change could not be distinguished from variation over space. One of the objections against Mellor's account is that it cannot distinguish change over time with variation over space. Mellor argues that this objection is mute. We shall consider objections to Mellor's account and his replies to them in due time.

for, again, t_1 is not now. In effect, the A-series requires constant change in the facts about the world. All facts occur at specific times and what time it is is always changing according to the A-series (i.e. the future becomes present then past). Strobach therefore objects to point (3) above. The constant change in the A-series affects the facts occurring at A-series times. A-series facts must themselves change. In effect, Strobach argues that in order for change to occur the facts that make propositions true must change; thus a proposition's truth value - which represents or models facts - must also change when these facts change. Strobach, then, gives assent to McTaggart's claim that

> If, as I [McTaggart] have maintained, there can be no change unless facts change, then there can be no change without an A-series...[for] no fact about anything can change unless it is a fact about its place in the A-series. Whatever other qualities it has, it has always. But that which is future will not always be future, and that which was past was not always past.[303]

As we shall see, Mellor disagrees with the claim that only the A-series could give an account of change. For Mellor, unlike McTaggart and Strobach, the facts need not change in order for things to change. This means, in terms of our model, that for Mellor the propositions expressing facts about things need not change their truth value in order for change to be, whereas for McTaggart and Strobach the propositions must change their truth-value in order for change to be.[304] On Mellor's account, the B-series can give an

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[303]McTaggart, 1968, p 14. McTaggart argues that such A-series change cannot occur, and that there really is no change in the world at all. It should be noted that Strobach does not make any mention of McTaggart's analysis. Strobach's position can be classified in terms of McTaggart's analysis. Strobach, like McTaggart, argues that the B-series cannot account for change; but unlike McTaggart, Strobach argues that the A-theory can. Mellor agrees with McTaggart's argument against the A-series; though he disagrees with McTaggart about the B-series' capacity to explain change.

[304]As we have seen McTaggart argues that this A-series change cannot occur, so for McTaggart there is in

adequate treatment of change even though no facts expressed in B-series terms ever change.

Because Strobach objects to (3), (2) and (1) must go as well. For Strobach no less than three times must be included in the model of change. A-series time analyses time as a three term series of either (α) past, present (or now), future; or (β) earlier and later, where 'earlier' and 'later' are defined as either before or after the 'present' (i.e. as earlier, present (now), later). Strobach's third moment (in number) in his analysis of change is the second moment in order in a tensed temporal series. It is at this third moment that, Strobach claims, the proposition's truth value changes from being true to being false. It is at this moment that the lamp would satisfy the predicate '...is changing.'

This means that Strobach describes change as an ordered triplet of time-indexed terms. Ordered are the states of things and the events they undergo; and both of these (states and events) are dated in time. With respect to the order of change, the first state is followed by an event of changing of states and this is in turn followed by the second state. These three states are all mutually exclusive, they cannot occur at the same time. Strobach's analysis of change requires *three* different successive times with three different successive 'states,' the second of which is an *event* of changing - a state of the coming to be of the difference between states. This moment when present and active is used to date the first state as earlier than the second state. Moreover, for Strobach without the temporally interposed present and active event of changing at the third time there

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reality no change. Strobach, however, thinks that such A-series change can occur without which there would be no change. Whereas Mellor agrees that A-series change cannot occur but unlike McTaggart and Strobach Mellor argues that the B-series can account for change.

could not and would not be any difference between the state before and the state after. Unless the interposed event of changing is included, the proposition 'the lamp is on' would not change from being true to being false; that is, without the event of changing there would be no difference between the lamp's earlier and later states. For Strobach to leave out this time of truth-value change would be to analyze change away.[305] Strobach, then, agrees with McTaggart's statement that "there can be no change unless some propositions are sometimes true and sometimes false."[306]

In terms of our model, the problem of the moment of change arises from the premise that if the lamp is on at t_1 then not-on at t_2; that is if (Tt_1, Ft_2), then there must be a moment after t_1 but before t_2, namely the moment $t_{1>n>2}$, at which the event of changing from on to off either occurs or is occurring. For Strobach there must be a moment or time in the lamp's existence during which is it on. Following this moment or time of being-on there must be a moment or a time at or during which the lamp 'is changing' from being-on to not-being-on. The lamp must undergo an *event* of changing if it is to be a lamp that changes, and this event must occur according to the proper order, an order which puts the event of changing after the first state but before the second. Accordingly, a proposition modeling change in the lamp must also change its truth-value at or during the moment of

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[305]That change is analysed away is the objection that Strobach raises against Charles Hamblin's position (we considered Hamblin's position in Chapter Two). Hamblin's "elementary intervals" are defined as follows. "Let us suppose that our language contains elementary statements P_1, P_2, P_3..., finite or infinite in number, and imagine the universe as a time-sequence of states describable by conjunction-chains of these statements, straight or negated...An *elementary interval is an interval within which no change of truth-value of any of the P's occur*" [Hamblin, 1969, p 424]. Strobach calls these elementary intervals "maximally changeless periods" [Strobach, 1998, p 174]. Strobach objects to Hamblin's position by writing that "no change is actually taking place; he [Hamblin] *banishes* change from any time he permits." [Strobach, 1998, p 177]

[306]McTaggart, 1968, p 15.

change. At this moment the event of a change in truth-value ($\Delta TFt_{1>n>2}$) occurs. But at this moment in a Strobachian change - the moment when the lamp satisfies the predicate '...is changing' - it is almost impossible to say of the lamp that it is either on or not-on, or to say of the proposition 'the lamp is on' that it is either true or false.[307]

Is it true or false that 'the lamp is on' and why? What non-arbitrary rule would settle the question?[308] Could it be the case that the lamp is on, off, not-on and not-off at the moment it changes from on to off?[309] Or could 'the lamp is on' be both true and false at $t_{1>n>2}$? And if so are we prepared to say that contradictions exist?[310] Perhaps 'the lamp is on' is neither true nor false at the instant of change,[311] or that "it is impossible to know which."[312] What is the truth-value of the proposition asserting that 'the lamp is on' when that lamp is changing from being on to not-being on? To answer this question is to 'solve' the problem of the moment of change.

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[307]McTaggart, of course, denies that such change can occur.

[308]We learned in Chapter Two that Richard Sorabji's argument may be charged with arbitrariness. See *Time, Creation and the Continuum.* Duckworth and Co. Ltd., 1983, Chapter 26.

[309]This, we learned in Chapter two, is Brian Medlin's confused attempt to address the problem in 'The Origin of Motion.' *Mind*, Vol. LXXII, No. 286, April 1963, p 155-175.

[310]In Chapter Two we learned that Graham Priest argues in favour of objective contradictions in 'To Be and Not to Be: Dialectical Tense Logic'. *Studia Logica*, Vol. 41, 2/3, 1981, p 249-268.

[311]Charles Hamblin, in his essay, 'Starting and Stopping,' *The Monist*, 53, 1969, p 410-425, advocates the neither/nor option, though we learned in Chapter Two that Hamblin's analysis leaves no time for change, that is, Hamblin analyses change away.

[312]Priest, 1981, p 252.

3.9 Tense Logic

In *Real Time* and *Real Time II* Mellor discusses "an academic industry known as tense logic."[313] In *Real Time II* Mellor tells us "what makes tense logic worth studying." What makes it worth studying is that tense logic attempts to "make truths false and falsehoods true."[314] Tense logic is supposed to help explain change in so far as the proposition 'the lamp is on' is true at one time that is now and not-true (or false) at some other time which is now.

Take, for example, Graham Priest's essay 'To Be and Not to Be: Dialectical Tense Logic,' which we discussed in Chapter Two. Here Priest argues that when a lamp is changing from being-on to not-being-on the lamp is neither on nor not-on. Priest argues, via logic, that for a lamp to be *neither* on *nor* not-on is for that lamp to be *both* on *and* not-on. The result of Priest's analysis by means of *tense* logic is the conclusion/solution that it is true that the lamp is on and it is also true that the lamp is not-on when the lamp is changing from being on to not-being-on. For Priest a "contradiction is realized"[315] at the moment of change: propositions about the lamp being either on or not on will be both true and false when the lamp (and the propositions about it - e.g. 'the lamp is on') changes from being true to being false.

Mellor in his account of change does not accept the claim that the truth-value of the propositions about a changing thing themselves change in a change. The facts need

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[313]Mellor, 1981, p 22.

[314]Mellor, 1998, p 14.

not change in order for things to change, argues Mellor. In contrast, Strobach's moment of change is the moment when the true claim that 'the car is red at t_1' changes to being a false claim at t_2. In contrast, for Mellor, if 'the car is red at t_1' is true at t_1 then at t_2 that 'the car is red at t_1' is *still* true. Tenseless or B-theory relations do not change. For Mellor, if it is true that the 'car is red at t_1' then it need not be false that the car is red at t_1 when at t_2 it is true that the car is not-red. Mellor does not add, either explicitly or implicitly, a tensed or A-series analysis of time. The truth or falsity of 'the car is red at t_1' does not, for Mellor, depend upon it being a fact that t_1 is now. But to understand why Mellor argues in this way we need consider what he calls "temporal truthmakers."

3.10 Temporal Truthmakers: A-facts or B-facts

In the terms of our model of change, T and F *represent* the lamp being on and the lamp not-being on, while t_1 and t_2 *represent* the times at which the proposition 'the lamp is on' is true and false respectively. What is represented are, simply, the 'facts', such as the fact that the light is on then not-on at t_1 and t_2 respectively. Facts are what make our propositions true; or, rather, propositions express or state facts and such propositions are true if and only if the fact that is expressed exists. Distinguishing between our propositions (which are either true or false) from the facts that make such propositions true, facts that either exist or do not exist, will allow us to concentrate upon and explicitly discuss the latter, the facts that make our propositions either true or false. When we

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[315]Priest, 1981, p 249.

consider the problem of the moment of change we see that the propositions used to express it make reference to time. It is for this reason that we need to give close attention to what Mellor calls "temporal truthmakers."[316] These are the temporal facts, so to speak, that make temporal propositions either true or false.

There is an important point being made by Mellor when he makes this distinction between (1) a true proposition and (2) the fact, temporal or otherwise, that makes it true. Mellor's point is that all propositions (at least) *express* a fact; but the fact that is simply expressed may not, in fact, exist. Or, in other words, users of a language can talk about things or generate semantically correct propositions that clearly express facts that do not, in fact, exist. It is for this reason that Strobach's appeal to *linguistic* intuition to define the structure of time and temporal events is insufficient. An example will help clarify this; but I should quickly add a premise about this chapter's argument so as to make clear why we need to discuss the temporal facts that make temporal sentences true.

Strobach's analysis of change, I claim, uses what Mellor calls A-facts. Mellor's account does not. Mellor analyses change using B-facts. Mellor additionally argues that A-facts do not exist - the notion of an A-fact is, says Mellor, self-contradictory, according to the argument given by McTaggart. The self-contradictory character of A-facts is what, I claim, leads Strobach and others to the problem of the moment of change. *Looking* for or *believing* in A-facts that make propositions about changing things either true or false is what, I think, generates the problem of the moment of change. This contradictory character of A-fact analysis - or what is also referred to as 'tense logic,' leads a writer like

[316]Mellor, 1998, p 23.

Priest to develop a "dialectical tense logic" that makes it "plausible to suppose that true contradictions are realized in some changes."[317] In other words, when Priest is faced with the moment of change, Priest offers a tense logic that Strobach classifies as supporting the "both-states option,"[318] i.e., for Priest, the lamp is both on and not-on or 'the lamp is on' is both true and false. Mellor, in contrast, does not use tense logic to analyze time or change for the reason that Mellor does not think that the temporal facts appealed to to make tensed propositions true exist. There are no A-facts for Mellor: tensed propositions cannot be made true by tensed facts.

I have endeavoured to show that Strobach's moment of change is a *tensed* moment and that propositions about it require tensed facts or tensed temporal truthmakers in order to be true. For these two reasons Strobach's tensed moment of change ($\Delta TFt_{1>n>2}$) is logically difficult. Mellor in contrast does not have such a problematic tensed moment of change. In Mellor's B-theory or 'date' theory "there are no analogous facts about B-times for a 'date logic' to state."[319]

There is not according to Mellor's account of change, a tensed moment when a proposition's truth value changes. In other words, for Mellor the facts and the propositions expressing them need not change in order for things to change. For Mellor "we can easily omit this gratuitous A-scale information."[320] Consequently, in terms of

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[317]Priest, 1981, p 249. A note on terms. Mellor's terms A- and B- theories correspond to a distinction between the *tensed* and *tenseless* schools on time.

[318]Strobach, 1998, ch 3, p 161-168.

[319]Mellor, 1998, p 15.

[320]Mellor, 1998, p 10.

our model, for Mellor the truth value of the propositions expressing the facts about a changing thing do not themselves change when things change. And the reason why there is not such a change in the truth value of the propositions is that time is not for Mellor an A-series or tensed temporal series. According to Mellor's B-theory "the B-times of events, unlike their A-times, never change."[321] This means, Mellor writes in *Real Time*, that propositions modeling change "neither acquire nor then lose truth-value."[322] Continuing Mellor writes that "it is varying truth values that we [Mellor] find hard to handle, not unvarying ones."[323]

In Mellor's model of change true propositions need not become false propositions in order for change to be modeled. Here Mellor is arguing against McTaggart's claim that unless the facts about, say, a poker change, the poker itself does not change. McTaggart writes,

> if my poker, for example, is hot on a particular Monday, and never before or since, the event of the poker being hot [on that Monday] does not change...But this makes no change in the qualities of the poker. It is always a quality of that poker that it is one which is hot on that particular Monday. And it is always a quality of that poker that it is one which is not hot at any other time. Both these qualities are true of it at any time - the time when it is hot and the time when it is cold. And therefore it seems to be erroneous to say that there is any change in the poker. The fact that it is hot at one point in a series and cold at other points cannot give change, if neither of these facts change - and neither of them do.[324]

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[321]Mellor, 1998, p 11.

[322]Mellor, 1981, p 103.

[323]Mellor, 1998, p 27.

[324]McTaggart, 1968, p 15.

Mellor disagrees with McTaggart. Mellor distinguishes between *things* - such as a poker - from the *facts* about such things- such as 'the poker is hot on Monday.' Things, for Mellor, change, while the facts about them do not. Mellor's objection to McTaggart and to those like Strobach who employ a tensed analysis of change is that they fail to make the distinction between things and facts. Mellor writes,

> If the facts, for example, are that a poker was hot one day and cold the next, why is that not change, just because those always were and always will be facts? Why should *things* be unable to change unless *facts* do?[325]

By distinguishing things from facts, Mellor need not appeal to the A-series in order to argue that change exists. For although *facts* expressed on the B-series do not change, the *things* the facts are about do indeed change. As soon as the distinction between things and facts is reinforced then objections to the B-theory of change become mute, as does the need for a tensed analysis of change. Therefore Strobach is wrong to argue that propositions expressing facts must change their truth value in order for change to occur to the things that the facts are about.[326]

Mellor augments his discussion of time and change by "explaining away A-facts." Mellor not only argues that changing A-facts are not needed in order for change to be: as we have already seen he argues, using 'McTaggart's proof,' that A-facts do not exists for they are self-contradictory.

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[325]Mellor, 1981, p 103. The emphasis on things and facts is mine.

[326]We have already seen that Strobach objects to Charles Hamblin's position based upon the fact that none of Hamblin's propositions in his elementary intervals change their truth value.

Mellor asks the question, "are A-beliefs made true by A-facts, as A-theorists believe, or by B-facts, as we [i.e. Mellor] believe?"[327] Mellor says that the debate between A-theorists and B-theorists can "look pointless. But it is not." And he clarifies the debate by writing that "what we [A-theorists and B-theorists] disagree about is whether A-facts or B-facts - in the substantial sense of 'fact' [i.e. the truthmaker sense] - make temporal beliefs true."

Mellor asks us to consider the proposition 'x is P' where x is "Nobody" and P is "...is smaller than a flea."[328] 'Nobody is smaller than a flea' is true of anybody, especially nobody, and we would all (I think) be prepared to accept this as true. But we must, says Mellor, accept that 'nobody is smaller than a flea' is true without believing that there is in fact in existence a Nobody who is smaller than a flea. The fact that makes the proposition 'Nobody is smaller than a flea' true is not the fact that Nobody is smaller than a flea. Mellor writes,

> What makes this ['Nobody is smaller than a flea'] true is not that there *is* such a person as Nobody, who is smaller than a flea, but that no person is that small.[329]

The point of this example is to show that we must carefully analyze our propositions otherwise we might believe that there exists something that does not exist, such as the existence of a Nobody or the present King of France, bald or not. This is no

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[327]Mellor, 1998, p 23.

[328]Mellor, 1998, p 2.

[329]Mellor, 1998, p 2.

less the case for any of our propositions that include a time in its truth conditions, that is, in propositions that must have temporal truthmakers or temporal facts in order to be true.

Mellor distinguishes between two types of temporal propositions or statements, A-propositions or statements and B-propositions or statements. We can, for Mellor, have true A-propositions and true B-propositions. But for Mellor we need not believe in the existence of A-facts (facts using A-times). Nor for Mellor should we believe in A-facts given McTaggart's proof. For Mellor "the tensed view of time is self-contradictory and so cannot be true."[330] The existence of A-facts, argues Mellor, is "a myth."[331]

3.11 Token Reflexive Truth Conditions

The objection that Mellor faces when he says that there are no A-facts is that human beings can certainly express A-propositions and know them to be either true or false, just as we can know that 'nobody is smaller than a flea' is true. But how can we know A-propositions to be true if the existence of A-facts is a myth? An objector will point out that we know, for example, that if Jim races on June 2nd and it is June 3rd, then 'Jim races tomorrow' and 'Jim is racing now' are both false, for said on June 3rd 'Jim races tomorrow' entails that Jim races on June 4th; while said on June 3rd 'Jim is racing now' implies that Jim is racing on June 3rd.

The token-reflexive account of the truth conditions of tensed or A-propositions is instrumental for Mellor's argument. The theory of token reflexive truth conditions is

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[330]Mellor, 1981, p 5.

[331]Mellor, 1981, p 34.

what Mellor uses to account for the fact that tensed or A-propositions can be known to be either true or false without their actually being any A-facts to make them true. The token reflexive account is what Mellor uses to explain away A-series facts, to show that B-series facts can account for the truth of tensed or A-propositions.

Mellor distinguishes between *types* of sentences and *tokens* of them. A *type* of a sentence is all the sentences of a given sort; it is akin to a class or a set of all the actual token sentences of the class. The token sentence is a particular manifestation of a sentence of a given type. Mellor writes, "a token of a word or sentence is a particular specimen of it, in the sense in which a horse is a specimen of that species (or type) of animal."[332]

Take Mellor's desire to listen to a daily radio program every day of the week at one o'clock. All the sentences stating that 'it is now one o'clock' that Mellor utters during the week are tokens of the sentence type 'it is now one o'clock.' There is not according to Mellor's view a tensed fact 'it is now one o'clock' that will make each of these token sentences true or false. Such a fact would not be of much use anyway, for it is always true that it is now one o'clock at one o'clock. For Mellor, what makes any token of 'it is now one o'clock' true is the fact that the token's date occurs simultaneously with the date one o'clock. But that the token about one o'clock occurs at one o'clock is a B-fact, not an A-fact: for it is always true that it is now one o'clock at one o'clock.

Mellor's token reflexive theory aims to find "B-truthmakers for A-

[332]Mellor, 1981, p 35.

propositions."[333] And he writes "that B-facts can be tokens of A-propositions is crucial to the B-theory."[334] Mellor uses as his example the claim that 'Jim races tomorrow.' What makes this claim true is that it occurs a day earlier than Jim's race, not that there is a tomorrow in the future that will soon be present. Mellor writes,

> Even if I know on 1 June that Jim races tomorrow, which does entail that he races then, my token knowledge is still not an A-fact...all it entails is that my belief that Jim races tomorrow is true, not that what makes it true is an A-fact, which is the point at issue.[335]

Mellor gives a general formula or algorithm for determining the B-truth-conditions for any A-statement. The purpose of this formula is to determine what B-fact makes an A-proposition true. As we have already seen, for Mellor, what fact makes 'Nobody is smaller than a flea' true is not the fact that there is a Nobody who is that small. In the same way, in the case of A-propositions, there is no truth-making A-fact despite what A-propositions seem to suggest. Mellor's formula analyses away A-facts, just as an analysis of 'Nobody is smaller than a flea' analyses away the Nobody who is that small. For every A-proposition '*P*' about any event *e*," writes Mellor,

> Any token of '*P*' is true if and only if it [the token of '*P*'] is as much earlier or later than *e* as '*P*' says the present is than *e*.[336]

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[333]Mellor, 1998, p 29.

[334]Mellor, 1998, p 29.

[335]Mellor, 1998, p 29-30.

[336]Mellor, 1998, p 31.

Mellor restates the formula to account for statements about the future, the past and the present. He writes,

> If '*P*' says that *e* is *n* units (seconds, years...) *future*, then its tokens are true if and only if they are *n* units earlier than *e*. Similarly, if '*P*' says that *e* is *n* units *past*, then its tokens are true if and only if they are *n* units later than *e*...[and] if '*P*' says that *e* is *present*, then its tokens are true if and only if they are *simultaneous* with *e*.[337]

'Earlier than', 'later than' and 'simultaneous with' are all B-series terms. Thus Mellor's formula allows us to understand how each and every A-proposition can be known to be either true or false without there being any A-facts. Mellor writes,

> This [formula] shows how the truth value of a token *u* of an A-proposition about an event *e* varies with facts about how much earlier or later *u* is than *e*. These facts moreover are all B-facts, since they entail no A-facts: '*u* is *n* units earlier/later than *e*' entails nothing about the A-time of either *e* or *u*. So we B-theorists can use these facts to say what makes (tokens of) A-propositions true or false.[338]

Mellor calls his account of time and change the "token reflexive B-theory."[339]

Strobach does not make this distinction between *types* of sentences and *tokens* of them. When Strobach models change he argues that a contradiction occurs when, for example, 'Jim races tomorrow' is true on, say, June 1st, and when 'Jim races tomorrow' is false on June 3rd. For Strobach, 'Jim races tomorrow' being true on June 1st contradicts

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[337]Mellor, 1998, p 31.

[338]Mellor, 1998, p 32.

[339]Mellor, 1998, p 32.

itself on June 3rd when 'Jim races tomorrow' is false. For Mellor this is not the case. For although 'Jim races tomorrow' said on June 1st and June 3rd are the same *type* of proposition, the 1st of June's and the 3rd of June's propositions are different *tokens* of that *type*. And two different *tokens* differing in their truth no more contradict each other than do two different propositions differing in their truth.

3.12 The Need for Tense

As we have seen Mellor does not accept the claim that there are tensed facts and the token reflexive theory is used to explain away A-facts. Mellor does, however, accept the claim that there are tensed *beliefs*. The reason Mellor adds tensed beliefs to his analysis of time without admitting that anything else is tensed is to accommodate human action. Mellor claims that without tensed beliefs humans could not be the particular agents that they are, active, perceptive agents that need to act at certain times. "Whatever acts on its perceptions must have tensed beliefs. Action is what really makes tensed beliefs indispensable."[340] Mellor writes,

> We must obviously know more than the dates and grid references of things and events. To govern our interaction with them, and with other people, we must also know which we are faced with at any time, i.e. which are spatially and temporally present.[341]

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[340]Mellor, 1981, p 82.

[341]Mellor, 1981, p 78.

Again, take Mellor's desire to listen to a radio program at one o'clock. That it is one o'clock at one o'clock is true at all times, even when it is not one o'clock. If, then, we are to listen to the radio program at one o'clock, we need know more than that it is one o'clock at one o'clock. What we additionally need to know is that one o'clock is *now*. Mellor writes,

> Suppose...that I want to hear the one o'clock news; so I push the switch at one o'clock. Why did I do that at one o'clock and not minutes or hours earlier or later? Obviously, what I need to believe is that it is *now* one o'clock. Until I acquire that present tense belief I shall do nothing, however much I want to hear the news.[342]

Our tensed beliefs, like tenseless propositions purportedly expressing facts, may be true or false. But the truth of our tensed beliefs in no way, argues Mellor, implies that there are tensed facts. We need tensed beliefs only in so far as we need to act on our beliefs in the world. The truth of our belief that it is now one o'clock in conjunction with our knowledge that the radio program begins at one o'clock is what leads to our timely action. Without the former the latter is insufficient to lead us to turn on the radio. But Mellor has denied that there are tensed facts so how could we ever act on a belief that is tensed? If I believe that, say, it is now one o'clock, what will make my tensed belief true and lead me to act upon my belief if there are no tensed truth conditions? Mellor does not think this is a question overly difficult to answer. He writes,

> Action will be timely if it satisfies the token reflexive conditions of the

[342]Mellor, 1981, p 82.

> tensed beliefs it depends on. To hear the one o'clock news, I need to turn the radio on at one o'clock. I turn it on when I believe that it is now one o'clock because the truth conditions of that belief are satisfied, and only satisfied, at one o'clock. It is a belief such that, if I act on it when it is true, my action will succeed. And to have that desirable property, it must be tensed, because only tensed beliefs have truth conditions that include the time at which the belief is held.[343]

In other words, as long as my belief is simultaneous with the date one o'clock, then my action will succeed.

But to say that two things are simultaneous is to say that they share the same date, not that they are both occurring now. 'It is now one o'clock,' on the token reflexive theory, means that one o'clock is neither earlier nor later than the time of the utterance of the token 'it is now one o'clock.' And that is all that is needed to make the act of turning on the radio occur at the right time. A tensed fact 'it is now' is not needed. Mellor writes that

> We have seen that using tensed sentences demands nothing more than knowledge of when they are true and when false, i.e. of their tenseless token reflexive truth conditions; so that, I suggest, is all there is to the tensed beliefs they express. The idea that tensed sentences also express non-token-reflexive beliefs in tensed facts...is a gratuitous and idle supposition.[344]

And in *Real Time II* Mellor writes that

> Suppose I look at the clock at 2.15. Since the clock is right, it says '2.15,'

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[343]Mellor, 1981, p 83.

[344]Mellor, 1981, p 87.

> a token of the now-propositions 'It is now 2.15.' So if I trust the clock, it will cause me to believe that very proposition. And since it is right, then (ignoring the time it takes me to believe it) it will cause me to believe 'It is now 2.15' at 2.15, thus causing me to have this now-belief when it is true. This, in B-theory terms, is what a good clock does: it causes those of us who look at and trust it to have now-beliefs about the time which are true when we have them. And that, after all, is what we want our clocks to do.[345]

Mellor, then, does not wholly explain away tense - he only explains away tensed facts. Tensed beliefs Mellor accepts, but he explains how we can know these beliefs to be true or false without an appeal to tensed facts.

3.13 Observed Time: The Presence of Experience

Opponents of Mellor's position argue against his tenseless, token reflexive account of the truth conditions of tensed facts by claiming that we have an immediate awareness of the present. The claim is that all of our experiences are known to occur now. No argument, the objection runs, can explain away this fact of experience. Mellor describes the objection.

> B-truthmakers fail to capture a key aspect of experience, namely its temporal presence. Being present seems to be essential to any experience, i.e. essential to it being an experience. To give only the B-times of my experiences, without saying which of them I am having now, is to leave out precisely what makes them experiences.[346]

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[345]Mellor, 1998, p 45.

[346]Mellor, 1998, p 41.

This objection to Mellor's account of time and change requires that Mellor give a tenseless account of the presence of experience. "The presence of experience is the crux," writes Mellor. "We need a credible B-theory of it before we can begin to deny the existence of A-facts."[347] On this point Mellor is arguing against those who claim that we "directly observe the A-times of events."[348]

Mellor argues that he easily meets this objection. Mellor claims that we *believe* that our experiences occur in the present, but this belief is no guarantee that there is, in fact, such a present. Likewise, we believe that nobody is smaller than a flea even though there is not a Nobody who is that small. Mellor writes, "even when our observations and other experiences tell us truly that they are present, they really are not."[349] The idea that there is such a preset time results from an invalid extension of our experience on to the objects that we are experiencing. The belief that there are A-times, writes Mellor, results solely from "our interest." Mellor writes,

> This temptation to adopt an A-theory of time [due to the 'presence' of experience] should be resisted. For even when our interest in events is what we may call an A-interest, that, as we shall see, is a property not of the events themselves but of our interest in them.[350]

As we have seen Mellor claims that his token reflexive theory can accommodate for our A-time interests without the need to posit the existence of A-times. Those who

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[347]Mellor, 1998, p 41.

[348]Mellor, 1998, p 15.

[349]Mellor, 1998, p 17.

[350]Mellor, 1998, p 16.

have the idea that observation and experience show that there are A-times are those who confuse (1) what we observe with (2) our observation of it.

The result of portraying Mellor against Strobach and other tense analysts (e.g. Prior, Priest, Hamblin etc.) with regard to their belief in the existence of A-facts due to the presence of experience, is that the champions of tense have not paid attention to what I shall call 'Russell's Caveat.' Russell writes that

> It is of the utmost importance not to confuse time-relations of subject and object with time-relations of object and object; in fact, many of the worst difficulties in the psychology and metaphysics of time have arisen from this confusion.[351]

A-facts *appear* to exist due to our relation as subjects of experience to the objects of our experience. There appears to us to be a present time that is now, and we can make true statements about the present time, such as it is now 1:40 PM on October 1st. But just as we should not assume that there is a Nobody who is smaller than a flea who makes 'Nobody is smaller than a flea' true, so we must not assume that, because we can make true statements about what appears to us in our *present* experience, that there is in fact a 'present' that makes, say, '*e* is present' true. Russell writes,

> Past, present, and future arise from time-relations of subject and object, while earlier and later arise from time-relations of object and object. In a world in which there was no experience there would be no past, present, or future, but there might well be earlier and later.[352]

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[351]Russell, 1945, p 212.

[352]Russell, 1945, p 212.

Strobach claims the main problem surrounding time and change is to "find a satisfactory conceptual treatment of what we observe; for what is happening is obvious."[353] Mellor however, will argue that 'what is happening' is not simply obvious. Mellor writes, "ideas about past, present and future are central to our concept of time. But they are not self-evidently right. They want explanation."[354] When Mellor analyses time he concludes that "we do not really observe the A-times of events."[355] Mellor, then, questions what we can "directly observe."[356] After his analysis he claims "the world, I believe, is a B-world: no event is in itself either past, present or future."[357] But this is to argue that what we immediately observe to be present is not, in fact, present. To believe there is a present that is now because all of our experience occurs to us as present results, argues Mellor, from "confusing what we observe with the experience of observing it."[358]

3.14 Strobach's Assumption: Instantaneous Events

There is another feature that distinguishes Mellor from Strobach. Strobach argues

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[353]Strobach, 1998, p 2.

[354]Mellor, 1998, p 7.

[355]Mellor, 1998, p 16.

[356]Mellor, 1998, p 15.

[357]Mellor, 1998, p 15.

[358]Mellor, 1998, p 17.

that changes "have no duration."[359] Change, for Strobach, is an instantaneous event: it does not take time to occur. "I propose," Strobach writes, "to regard changes as instantaneous events."[360] For Strobach, then, a solution to the problem of the moment of change must be "centred around a theory of instantaneous states."[361] Instantaneous events and states have "no temporal extension whatsoever," says Strobach.

We need now recall from Chapter Two Charles Hamblin's essay 'Starting and Stopping.' There Hamblin advocates a time-system about which "only the *absence* of instants is any way unusual."[362] Hamblin offers a tense-logic without instants for the reason that "the concept of time as a series of instants has itself run us into trouble."[363] Whitehead also issues a warning against instants as well, writing that for him "the primordial element is nothing at an instant."[364]

Continuing, Strobach writes that "they [instants] are limits in time, mere boundaries of periods."[365] Even though instants are mere boundaries of periods, and in spite of the difficulties concerning the existence of 'instants' and the notion of

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[359]Strobach, 1998, p 2.

[360]Strobach, 1998, p 12.

[361]Strobach, 1998, p xi.

[362]Hamblin, 1969, p 420. Italics mine.

[363]Hamblin, 1969, p 415.

[364]See Whitehead's *Science and the Modern World*, Macmillan, New York, 1926, p 52-56. Cited from Milic Capec's *The Concepts of Space and Time: Their Structure and their Development*. 537. D. Reidel, Boston. *Boston Studies in the Philosophy of Science*, Vol. XXII. Whitehead's selection from *Science and the Modern World* is entitled (I assume by Capec) 'The Inapplicability of the Concept of Instant on the Quantum Level,' p 535 - 537. D. Reidel, Boston. *Boston Studies in the Philosophy of Science*, Vol. XXII.

[365]Strobach, 1998, p 15.

'instantaneity,' problems raised by both Hamblin and Whitehead, Strobach will "assume that instants are there anyway."[366] And he assumes that an event can wholly occur within an instant.

We learned that, for Strobach, change is three-fold: when analyzed in terms of a thing's states Strobach analyses change as a *three*-term successive, temporal series such that $S_1t_1 \neq \Delta S_nt_{1>n>2} \neq S_2t_2$. When analyzed in terms of truth-values, Strobach analyses change as a three term series: Tt_1, $\Delta TFt_{1>n>2}$, Ft_2. In either manner of expression (i.e. in terms of states of things or the truth-value of propositions), Strobach's analysis includes three distinct times that occur in a distinct order. The second time in the three-term series is for Strobach when an event of changing is supposed to occur.

In contrast, Mellor's account of change is only two-fold. For Mellor only two times are employed, t_1 and t_2, and these are related as either 'earlier than' or 'later than.' Mellor's two-fold analysis of change involves removing the third A-time at which the $\Delta S_nt_{1>n>2}$ (the event of changing of states) or the $\Delta TFt_{1>n>2}$ (the event of changing of truth values) is supposed by Strobach to occur. Mellor removes Strobach's moment of change for two reasons.

First, for Mellor there are no instantaneous events, so there cannot be an instantaneous event of changing interposed between t_1 and t_2. In *Real Time II* Mellor writes that,

> Neither people nor weddings are instantaneous: we can no more locate either at a single moment than we can locate them at a single spatial

[366]Strobach, 1998, p 16.

point.[367]

In effect, Strobach argues that an event can be located wholly at a single moment.

Secondly, Mellor argues that *events* have temporal parts: more than one time or more than one temporal part is required for an event to be an event. What does Mellor mean by a 'temporal part'? Mellor argues that a temporal part is wholly analogous to a spatial part in so far as the whole of which the part is a part is not wholly located in that part, such that a part of the whole can exist independently of the whole of which it is a part. Mellor writes that by a temporal part he means

> What we all mean by spatial parts, like the parts of our bodies: namely, things or events whose existence is logically independent of the wholes they are parts of.[368]

Mark Heller, in his paper 'Things Change,' writes about how "to make sense of temporal parts." Heller writes that

> Temporal parts are parts in the same sense as spatial parts are. Just as spatial parts fill up a sub-region of space filled by the whole, temporal parts fill up a sub region of time filled by the whole.[369]

Thus my foot is a spatial part of me because I can, for example, cut off my foot and I would still exist as much as my foot even though we have been separated from each

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[367]Mellor, 1998, p 8.

[368]Mellor, 1998, p 87.

[369]Heller, 1992, p 695.

other. Likewise, the event 'eating dinner' begins with an appetizer - the first temporal part of eating dinner, then a main course follows as the second temporal part, and this is in turn followed by the third temporal part, dessert. Each course is a temporal part of the event 'eating dinner,' and just as it is easy to cut off my foot and so distinguish a spatial part of me from me, so we can distinguish the appetizer from the dessert, and both from the whole meal. After all, I am not wholly in my foot, and the event 'eating dinner' does not wholly occur when I am finally eating the last of my dessert. An event's temporal parts are then analogous to a thing's spatial parts.

Mellor argues that even though *events* have temporal parts, *things* do not. Mellor writes that not all things "have temporal parts. Events do: each course of a meal is a temporal part of it. But things do not [have temporal parts]: atoms, people, and planets have only spatial parts."[370]

Given that Mellor argues events have temporal parts, an event for Mellor cannot wholly occur in an instant, for by definition an instant has the smallest possible (if not an absolutely small or zero) temporal extension, which means that an instant cannot be an aggregate of smaller temporal units. As Mellor argues that events have temporal parts, events for Mellor cannot be instantaneous. Mellor uses as his example the climbing (an event) of Mount Everest (a thing) by Hillary and Norgay (two things). Mellor argues that no one should

> Say that only parts of Sir Edmund Hillary and Tenzing Norgay climbed only a part of Everest in 1953...those two whole men climbed that whole

[370]Mellor, 1998, p 86.

> mountain, and both were wholly present throughout every temporal part of that historic event.[371]

Neither should we say that Mount Everest changed from being unclimbed to being climbed instantaneously, although on Strobach's theory we would be committed to saying such. As good as Hillary and Norgay were, they could not climb Everest that quickly.

With the rejection of Strobach's two key assumptions, namely (1) that time is a three-fold A-series and that (2) there are instantaneous events or events without temporal parts, Mellor's account of change does not raise the problem of the moment of change as that problem has been raised by Plato and chronicled by Strobach.

3.15 The First Objection: Definition or Reduction?

For Strobach, to not include the third, albeit problematic, moment *T''* after *T* but before *T'* would be to eliminate all change from the whole of reality. If *T''* or ($\Delta TFt_{1>n>2}$) is excised then, for Strobach, the results of an event of changing would exist without the event of changing ever having existed; but how the could results of an event be if the event never was?

Strobach argues that the two-time definition of change offered by Mellor and Russell *reduces* change to 'being different at different times.' We need now consider what Strobach means by 'reduction.' We will use the definition of motion as an example to illustrate what I shall call a 'reducing' or 'reductionist' definition.

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[371]Mellor, 1998, p 86.

We need consider this notion of reduction for the reason that Strobach's objection against a tenseless definition of change such as that offered by Mellor is that the two-time definition of change reduces change to being different at different times such that there is no changing in the world. Strobach argues that Mellor's and Russell's two-time definition implies that the predicate '...is changing' would never be satisfied by any object. The reason why we shall use the definition of motion as the example to help illustrate what is meant by a reductionist definition is that Strobach makes the same objection against Russell's definition of motion.

Strobach claims Russell's definition of motion is also a 'reduction' analogous to the reduction in Russell's two-time definition of change. Likewise, Strobach argues that Russell's definition of motion implies that no object satisfies the predicate '...is moving.'

If 'motion' is defined as 'being in different places at different, successive times' then '...is moving' is omitted, or reduced or boiled away, so to speak, from the definition. For Russell, even if we do observe that a thing is first in one place then in another we must "entirely reject the notion of a *state* of motion."[372] Russell announces his reductionist account of motion when he writes "motion consists *merely* in the occupation of different places at different times."[373] Continuing, Russell writes "there is no transition from place to place, no consecutive moment or consecutive position, no such thing as velocity."[374] This means that for Russell "the concept of motion is logically subsequent

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[372]Russell, 1964, p 473, § 447. Italics are Russell's

[373]Russell, 1964, p 473, § 447. Italics are Russell's

[374]Russell, 1964, p 473, § 447.

to that of occupying a place at a time."[375]

Whitehead in *Science and the Modern World* characterizes the resulting view of motion. "It is as though an automobile, moving at the average rate of thirty miles an hour along a road, did not traverse the road continuously; but appeared successively at the successive milestones, remaining for two minutes at each milestone."[376] There are other characterizations of this conception of motion.[377]

The objection to this reductionist conception of motion is indicated by Priest when he asks "can a going somewhere be composed of an aggregate of going nowheres?"[378] Being at different places at different times is not the same as moving from one place to another, even if it is true that if something is moving from one place to another it will be in different places at different times.

Strobach, against Russell's reductionist definition of motion, says that "reduction is not the same as definition."[379] Strobach argues that, although it may be true to say that if something is moving it will be in different places at different times, "it is impossible to reduce motion to being in different places or rest to being in the same place at different

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[375]Russell, 1964, p 469, § 442.

[376]Whitehead, *Science and The Modern World.* See Milic Capec, Ed., *The Concepts of Space and Time: Their Structure and their Development.* D. Reidel, Boston. *Boston Studies in the Philosophy of Science*, Vol. XXII.

[377]See, for example, Colin Strang's and K.W. Mills, 'Plato and the Instant.' *Proceedings of the Aristotelian Society*, Suppl. Vol. #48, 1974, p 63-79, especially p 74. For Strobach's discussion of Strang's "graphical representation" of motion see Strobach, 1998, p 38-39. This referred to as the "staircase theory."

[378]Priest, Graham, 'Inconsistencies in Motion,' *American Philosophical Quarterly*, 22, 1985, p 339-346, p 340. cited in Strobach, 1998, p 203.

[379]Strobach, 1998, p 201.

instants."[380] Strobach adds some clauses about the nature of definition.

Strobach writes that "we require of a definition that the *definiendum* is true whenever the *definiens* is true and vice versa."[381] In the case of the reductionist definition of motion, if '*a* is in motion' is true then '*a* is in different places at different times' will be true. But, adds Strobach, "motion might still be more than that."[382]

Analogously, Strobach, adds a stronger sense to his definition of 'change,' just as he adds a stronger sense to his definition of motion. And he adds the stronger sense to both 'motion' and 'change' by means of his anti-reductionist stance. Therefore in addition to being different at different times, by 'change' Strobach also means 'coming to be different.'

Strobach argues that in the two-time definition of change there is no time at or during which the thing comes to be different, and this precludes the reality of all change altogether. For Strobach a thing cannot be different at two different times unless it first becomes different at some third time. This is the exact objection raised by Strobach against Hamblin's 'neither/nor-option,' which we considered in Chapter Two. Strobach says of Hamblin's 'Interval Theory' that "if this is what Hamblin wants to say, no change is actually taking place, he banishes change from any time he permits."[383]

Strobach cites Priest's analysis of change in support of the view that without an intervening, third time in the ordered series in a change there would be no change in the

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[380]Strobach, 1998, p 201.

[381]Strobach, 1998, p 201.

[382]Strobach, 1998, p 201.

[383]Strobach, 1998, p 177.

world at all. Priest writes that the two-time definition of change succeeds "only by producing a curious account of change."[384] Priest excellently sets forth the argument for the third time.

> Suppose that during a certain time a state S changes from S_0 to S_1. Then there must be two abutting intervals a and b such that a wholly proceeds b, S_0 is true throughout a and S_1 is true throughout b. Now given that there is no instant dividing a and b we can not ask whether S is in S_0 or S_1 at it. However, because there is no such instant, there is no time at which the situation *is changing*: a is before the change, b is after it. Thus, in a sense, there is no change in the world at all, just a series of different states patched together. The universe would appear to be more like a series of photographic stills shown consecutively, than something in a genuine state of flux or change.[385]

Strobach claims that all reductionist definitions fall prey to the "snapshot myth." And all such definitions fail to accommodate for the reality of genuine change or flux. Indeed, Priest raises the same objection against Russell's definition of motion. Priest writes, "on this account motion is rather like a sequence of photographic stills shown so fast that the body appears to move."[386]

Mellor, however, argues that he avoids the charge of giving a reductionist account of change. Mellor argues that the objection that his theory "reduces change to changeless facts" is "not an objection."[387] One who makes this objection fails to appreciate the

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[384]Priest, 1981, p 254.

[385]Priest, 1981, p 254.

[386]Priest, Graham, 'Inconsistencies in motion,' *American Philosophical Quarterly*, 22, 1985, p 339-346, p 340. Cited in Strobach, 1998, p 203.

[387]Mellor, 1998, p 84.

distinction between *things* and the *facts* about such things. The latter need not change in order for the former to change.

As for the claim that according to Mellor's theory there is no genuine flux, Mellor would argue that this is a wholly false characterization of his position.

Mellor argues that time is "the causal dimension of spacetime."[388] What provides 'genuine flux' for Mellor's theory is causal activity. Mellor's causal theory of time is somewhat beyond the scope of this thesis on change. However it must be noted that Mellor's causal theory of time gives him a unique position on time. Many philosophers use, writes Mellor, "the time order of events to fix their causal order, defining a cause as the earlier of two causally related events. I do it the other way round, using an independently defined causal order to fix the time order of all events."[389] By adopting a causal theory of time, the 'genuine flux' that the likes of Strobach and Priest desire is given by causal activity, not the passage or flow of A-theory time.[390]

3.16 The Second Objection: Change and Spatial Variation

The second objection to Mellor's account is that it "has no way of distinguishing

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[388]Mellor, 1998, p xiii and p 84.

[389]Mellor, 1998, p 5. This means that Mellor constructs the transitive, asymmetrical B-time scale by means of the causal relation, which is itself transitive and asymmetrical.

[390]In a way, then, for Mellor the temporal order has a non-temporal source. Scott Hestevold, in 'Passage and the Presence of Experience,' *Philosophy and Phenomenological Research*, Vol. L, No. 3, March 1990, p 537-552, describes Mellor's position on time as invoking a doctrine of "static time" [p 537]. However, it should be clear that this is an inaccurate representation of Mellor. Although Mellor does not advocate the passage of A-theory time, Mellor's causal theory of time requires causal activity, which is far from being a static account.

properties varying over time from properties varying over space." Mellor argues that this objection "is false."[391]

Mellor puts great emphasis upon the capacity to distinguish (α) change from (β) spatial variation. That *things* do not have temporal parts must, argues Mellor, be accepted in order to distinguish change from spatial variation. For Mellor, in so far as any conception of change cannot make the distinction between (α) and (β) clear and unambiguous, to that extent that conception of change should be rejected.
Mellor argues that the belief that *things* have temporal parts cannot make (α) and (β) clear. What's more, confusing time with space would surreptitiously eliminate all change. The belief that things had temporal parts would mistakenly treat (α) as wholly analogous to (β), resulting in a confusion of time with space and the rejection of change. Mellor writes that

> There is no spatial change in a poker being at once hot at one end and cold at the other. The hot and cold ends of a poker are not a case of change because they [the spatial parts of the poker] coexist: the spatially tenseless world contains them both, only located in different parts of tenseless space.[392]

The coexisting spatial parts of the poker do not themselves change as one move in space from, say, the left side of the poker to the right side of the poker. In this case the whole poker does not change from being hot at one end and cold at another. Things have spatial parts, so there is no change over space because none of the spatial parts change.

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[391]Mellor, 1998, p 84.

[392]Mellor, 1981, p 90.

What we have in the case of the poker hot at one end and cold at the other is different (spatial) parts with different properties.

The poker *is* hot at one end and *is* cold at the other end; there is no change occurring in the whole poker for none of its (spatial) parts change. There are differences amongst the parts of the poker; but what we need to take heed of here is that differences amongst the parts of a thing are not changes in the thing. Mellor writes, "the whole poker is neither hot nor cold - only its ends are - and *a fortiori* does not change from being hot to being cold."[393]

Thus in the case of the poker there is no change in the poker for the reason that the whole poker is not (spatially) present in any one single spatial part. Mellor writes "the poker at once hot at one end and cold at the other is not wholly present at each end as a poker first hot and then cold is wholly present at both times."[394] Change over time is real change and not simple variation for the reason that, for Mellor, things do not have temporal parts.

3.17 Conclusion

The to-be-tested definition of change - that change is an object having mutually exclusive properties at different times - can, argues Mellor, be augmented by a B-theory of *time*. Mellor's B-theory of time eliminates the problem of the moment of change as

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[393]Mellor, 1981, p 111.

[394]Mellor, 1981, p 111.

that problem has been raised by Plato and chronicled by Strobach.

Plato's and Strobach's account of change assumes a particular version of the A-theory of time. Plato and Strobach employ instantaneous events. They do not reinforce the distinction between things and facts, and they wish the latter to change if the former change. It is for these two reasons that both find change problematic.

Mellor, by rejecting the problematic A-theory elements of time given by Plato and Strobach, argues that the problem is a dead problem. Mellor argues that the B-theory of time and change is preferable, and Mellor argues that he can meet the most significant objections to his B-theory of time, namely that it reduces change to changeless facts and it fails to distinguish time from space.

This is not to say that there are not other versions of A-theory time that avoid the problem that arises from Plato's and Strobach's A-theory. Nor are there not difficult questions to be asked of Mellor's account, especially questions about the source of his B-series and his definition of time as the causal dimension of space-time. But other A-theories and detailed questions about the intricacies of Mellor's account are beyond our scope.

This thesis is limited to (1) giving Plato's and Strobach's A-theory of time and change, (2) to showing the problems that arise within this theory, (3) to showing how these problems have been dealt with by others and (4) to giving Mellor's argument in favour of a B-theory of time and change.

It is hoped that both theories and the arguments in favour and against each are clear.

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