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# Everything, everywhere, but not all at once? Time, contingency and the open future

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## Abstract

The subject of this special forum is contingency and the openness of the future, and in this essay we take a route not often travelled in regard of these and focus first on philosophy of time. We contrast static and dynamic theory of time in order to (eventually) acquire some traction on the meaning of both contingency and the open future. We suggest critical realism presupposes dynamic theory and that critical realism provides various conceptualizations that might contribute to dynamic theory.

## KEYWORDS

contingency, dynamic theory of time, open future, static theory of time

## 1 | INTRODUCTION

The subject of this forum ranges across various facets of the openness of the future – adequacy of prediction, the nature of contingency, and so on – a vast subject. In order to create some traction we are going to focus on philosophy of time as a precursor to discussing the treatment of time in critical realism, and by this route we will comment in the conclusion on the meaning and significance of contingency and the openness of the future. Philosophy of time too is a vast subject, and here we will focus on the two main approaches to the nature of time – static and dynamic theory of time. Even in simplified terms this is quite involved, but nonetheless fascinating, so the following will take the oxymoronic form of a “sophisticated basics”. Arguably, critical realism presupposes one of two main approaches to philosophy of the nature of time – the dynamic theory – and critical realist conceptualisation of causation (as well as standard concepts such as depth realism etc.) may also contribute to better understandings of some of the issues that divide the two main positions. Given the mass of material that might be called upon, the range within it, and the nuance that might be brought by that range, the discussion should be considered indicative rather than comprehensive.

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## 2 | TWO MAIN APPROACHES TO TIME

“What is time?” is a fundamental question to which no single definitive answer has emerged. Study has ranged over philosophy, physics, behavioural psychology, theology, sociology and political economy, and explanation and argument has focused on the significance of how time is measured, how it is experienced, whether it is real and what this means.<sup>1</sup> In terms of the nature of time, there is, however, a dividing line between two very different sets of claims. As Emery et al. (2020) set out in the entry on time in the Stanford Encyclopedia of Philosophy (whose summary essays these days serve as the main source of “the basics” on most of the key issues in disciplinary philosophy) these are “static theory” and “dynamic theory”. As they also note, most contributor's work on the nature of time exhibits features of some of the claims typical of one position but not necessarily all, and it is possible to hold hybrid versions – but fundamentally, the two positions contrast (see also Baron & Miller, 2019).

## 3 | STATIC THEORY

In static theory, “time is like space, and there is no such thing as the passage of time” – albeit this requires some elaboration to avoid misunderstanding (Emery et al., 2020, p. 11). Six “theses” articulate static theory, and we will explain some of the terminology and claims which may be unfamiliar after:

1. The universe is spread out in four similar dimensions, which together make up a unified, four planar dimensional manifold, appropriately called *spacetime*.
2. Any physical object that is located at different times has a different temporal part for each moment at which it is located.
3. There are no genuine and irreducible A-properties; all talk that appears to be about A-properties can be correctly analysed in terms of B-relations. Likewise, the temporal facts about the world include facts about B-relations, but they do not include facts about A-properties.
4. The correct ontology does not change over time, and it always includes objects from every region of spacetime.
5. Propositions have truth values *simpliciter* rather than at times, and so cannot change their truth values over time. Also, we can in principle eliminate verbal tenses like *is*, *was* and *will be* from an ideal language.
6. There is no dynamic aspect to time; time does not pass (Emery et al., 2020, pp. 11, 12).

Static theory is profoundly counterintuitive. Our experience of the world intuitively suggests time passes, and lots of things come to mind when we think about whether time passes. From the perspective of an observer or participant able to make sense of experience, time exhibits direction and irreversibility – “time's arrow” as it is called. I remember yesterday, but not tomorrow. If I order a delivery from a 24-hour delivery App on Thursday, the item arrives Friday and not the previous Wednesday. We experience the present as different than the past and future, and “now” seems to have a special status. Languages have evolved tenses, albeit these are seemingly built from spatial awareness (we have senses able to locate us in space, but it is not clear what it even means to have an independent temporal sense (see later)) and language seems to involve metaphorical mapping, built from concepts and terms for location and movement (forwards and backwards in time). Moreover, practical efficacy in the world – both simple survival of the species (fire is hot, lions are dangerous) and development of knowledge of how to intervene, manipulate, influence or build within reality *as we perceive it* – has

required us to grasp cause and effect, action, interaction and consequence, i.e. forms of sequence, as basic to “temporality”. Our very sense of self involves socio-cultural meaning with which temporal processes are imbued (ancestry, legacy, finitude and so on) and our societies have developed and been changed by many different ways of conceiving and measuring time (a society of solar time was quite different than an industrial society run on clock-time)... Moreover, the universe itself seems to involve thermodynamic process or “entropy”, systems undergo a continual transition from a more ordered to less ordered state (low entropy to high entropy) unless there is local interference (such as human activity imposing order in some locale) and this requires energy use and waste creation, drawing on and disordering the wider system or a subsystem...

So, theory that claims time does not pass seems “wrong” on a fundamental level. *However*, as any philosopher reading this is no doubt aware, the previous paragraph is not a set of objections to static theory – rather it is a list of things that come to mind when we think about things which make us discomfited by the idea that time does not pass. Furthermore, the history of philosophy has involved debate regarding the problem of reality and appearance for thousands of years and scientific method is built on establishing the adequacy of theory according to evidence which may change our understanding of the world and change our explanations of how things happen and how things really are. Sometimes these two come together, my daughter, a maths student, has been writing an essay on whether we live in a virtual reality for a college project. This is a question where philosophy, science and speculation intersect. For Descartes, writing in the 1600s, an evil demon may be manipulating our sensory experience and reality might be quite different than it appears – a problem in search of certainty, solved for Descartes by the existence of a benevolent God. For Nick Bostrom the contemporary question is more probabilistic – if we do not think we live in an ancestor-simulation then we must discount the possibility that future generations will run ancestor-simulations, which, given some assumptions about the capacity of technology to run many more simulations in comparison to the one originating base reality, is tantamount to arguing that there are no future generations around to run simulations (a doomsday scenario). The problem of virtual reality may not immediately seem a problem of the nature of time (though it is peripherally relevant – see later), but the point of the example is simply to illustrate reality and appearance may diverge in fundamental ways.

Static theory then, needs careful elaboration and temporal reality might not be what you think it is and reality and appearance may be different in some way (see e.g. Callender, 2002; Le Poidevin, 1998; Oaklander & Smith, 1994). The terms of debate for theory of time draw heavily on the British idealist John McTaggart's distinction between A-series and B-series in his “The Unreality of Time” (McTaggart, 1908). According to McTaggart we order actions, events etc. in time in two different ways. First, in the A-series, by referring to temporal positions and tenses, placing something in the past, present and future. In the A-series there are degrees of past and future – the far future, near future, remote past etc., but no similar degree of present – and there is continual transformation as something passes from the future to the present and into the past. In the A-series, statements about time mainly correspond to the perspective of the person making the statement. This is typically illustrated using example statements such as “it snowed yesterday”, “it will snow tomorrow”, “it is snowing now”. These are all examples of tensed statements that depend on the temporal perspective of the person uttering the statement.

Second, and in contrast, in the B-series, actions, events etc. are ordered by place relations. Something is earlier than, on, or later than (or some equivalent term). Instead of “it snowed yesterday”, in the B-series we might say “it snowed on December 25<sup>th</sup> 2022”, “it snowed on the day after December 24<sup>th</sup> 2022”, or “it snowed on the day before December 26<sup>th</sup> 2022”. The key distinction between the A-series and B-series is that statements made in the A-Series undergo change as time passes. “It snowed yesterday,” becomes “it snowed two days ago” and so on (in observer/utterer relative

ways through temporal perspective). B-series statements, however, are tenseless and undergo no such change in statement (they are fixed in relation to other temporal acts or events).<sup>2</sup> As such, A-series and B-series truth values also differ in temporal characteristic. Clearly, statements such as “it snowed yesterday”, “it will snow tomorrow”, “it is snowing now”, can change whether in fact they are true or false as time passes. “It snowed on December 25<sup>th</sup> 2022”, in contrast and subject to further specifying detail, does not.

In any case, according to McTaggart, properties only change their temporal relation in the A-series and with this in mind he suggests one cannot rely only on the B-series if time is to pass, and thus, as he conceives the problem, be real rather than merely apparent – one also needs the A-series. However, he argues the A-series involves an infinite regress and is thus incoherent. The crux of his argument is that events have the property of being past, present and future, but not all of these at once. According to McTaggart, in order to highlight this transition for an event one requires a second set of tensed terms to highlight distinctions (of which there would be nine: “will be past”, “is present”, “was future”, “was past”, “will be present”, “will be future” etc.) and in order to explain that these too are not simultaneous but successive (given that “was past”, “will be future” etc. are different) one has to refer to a further set of tensed terms (“is going to”, “was going to”) and so on (you are likely a little confused now, but the point is merely to note McTaggart constructs a regress; if interested in the detail, the argument is nicely summarised in Dummet, 1960).

To be clear, I am not introducing McTaggart here in order to suggest this brief summary is definitive, complete or persuasive. McTaggart is now a fairly obscure Hegelian scholar, albeit one who influenced some of the early analytic philosophers and who had a novel approach to atheist souls and immortality (McDaniel, 2020). Still, there have been many attempts to critique or defend McTaggart’s argument (Dummet, 1960; Shoemaker, 1969; Smart, 1949; Zimmerman, 2005)<sup>3</sup> and, as of early October 2022, the paper had been cited 2537 times. Our purpose, however, is just to provide some background that helps to make sense of some of the theses (see 3. and 5. and to a lesser extent 6.) and to establish the origin and meaning of A-series and B-series and the standard language of properties and relations used to distinguish static and dynamic theory. Ultimately, in static theory statements expressed in an A-series are not necessarily false (it may be true that it snowed two days ago) but they are not *made true* by facts regarding pastness, presentness or futurity, but rather by tenseless facts in the B-series (“it snowed on December 25<sup>th</sup> 2022”).<sup>4</sup> As the six theses suggest, static theory tends to reject A-series. Static theory, however, does not acquire its current attraction beyond philosophy from McTaggart or similar sources. Nor has current discussion of static theory acquired its interest from esoteric resurrection of Parmenides versus Heraclitus or Zeno’s paradoxes and similar clever thought experiments. Its attraction is rather, rooted in an influential reading of the significance of theory in modern physics, and grasping this requires some initial contextualisation.

The theory of relativity suggests time is “local”. Relativity, however, does not *just* suggest time is local. Theory of relativity introduces spacetime... In 1905 Einstein first set out special relativity and this introduced the idea of relativistic observer effects or the “relativity of simultaneity”, which suggests that whether observed events are simultaneous will differ depending on whether and which direction the observer is moving relative to the light carrying information from the events. Special relativity introduces “frames of reference” and raises issues regarding the relationship of space and time. Put in simplistic terms, the speed of light in a vacuum is treated as a constant and space and time become flexible and related. As such, relativistic time effects bring into question the classical concept of “absolute time”, and relativity of simultaneity brings into question the concept of a common present and thus the nature of a tensed experience of reality.<sup>5</sup>

To elaborate a little more, special theory of relativity leads to the significance of “frames of reference” for the measurement of relative time and in 1908 in an attempt to bring order to observer

reference, the mathematician Hermann Minkowski interpreted Einstein's theory as a four-dimensional spacetime – sets of coordinates – and this led to the (for physicists) familiar light cone and world-line schematics of events in spacetime used to visualise time relations (using “coordinate time”, which in conjunction with measurement of “proper time” – essentially the measure of elapsed time (using a companion clock) between events experienced by an entity – can clarify differences in time experienced for different entities and reference frames).<sup>6</sup> In 1915 Einstein's general relativity conceived this spacetime as curved.

According to special and then general relativity, time dilates according to the speed something is traveling at relative to the constant speed of light and according to differences in gravity and gravity itself is the shape or warping given to space by matter and energy. Time passes more slowly as gravity increases and more slowly if travelling closer to the speed of light than for those not (and so one ages more slowly in comparison to those travelling more slowly or experiencing lesser gravity – hence time is local and effects are contrastive, and hence science fiction's fascination with black hole event horizon time effects and with near speed of light space travellers returning to Earth to find everyone they knew is gone). In any case, to reiterate, relativity introduces spacetime, a combined coordinate system of space and time. This is a way of thinking that not only speaks to a B-series of located relations of “before and after”, but leads to the idea of a “block universe”. If we live in a universe of spacetime it becomes possible to conjecture that *time is no different than space* and it is this that typically sits behind theses 1, 2, 4 and 6. Philosophers have since made much of this (for discussion see Baron & Miller, 2019).

According to block theory of time, all matter and thus all time is created at once – a block of spacetime. If I fly from New York to London, New York does not disappear just because I am now in London. If my journey began in New York at 10 p.m. Saturday October 1<sup>st</sup> 2022 and ended in London at 5 a.m. Sunday October 2<sup>nd</sup> 2022, then 10 p.m. Saturday October 1<sup>st</sup> 2022 has not ceased to exist merely because I am now at a different spatial and temporal location. By extension, the same goes for where I will be on Monday October 3<sup>rd</sup> 2022 and so on. This, as should be clear, is an extension of and variant on B-series thinking. The significant claim is that all time has been created and exists – what we *think of* as the past, present and future. As a four-dimensional entity the real me is located across all points in spacetime where I exist, and I extend not just *in* space but *through* time. My locations in spacetime are just slices of the complete me – if we had a different perspective on this I would grasp that I exist as an elongated being spread through the part of spacetime I exist in – a kind of spatiotemporal worm.<sup>7</sup> Of course, the phrasing “if we had a different perspective” acknowledges that this is not how we perceive the world. However, for static theory, four-dimensional existence in a block universe indicates our perspective is mere appearance, a consequence of consciousness rather than reality per se. “Now” is no different than “here”. As such, time does not “pass”, and our familiar temporally active language of time (the A-series) is a misleading expression of experience – a product, perhaps, of being interior to a system – a part in a whole incapable in our everyday perception of seeing how things really are.

To be clear, there are lots of variations on static theory and various facets are pursued in different ways. The issue of consciousness, for example, might invoke discussion of Kantian critical idealism and the relation between how time is structured and the sensory manifold. We, however, are interested in the general position for the purpose of contrast. Static theory's implications for time are obviously part of an interest in making contrasts regarding the nature of time. The most obvious implication is that while it is possible to refer to points in spacetime, everything exists all of the time; everything interior to the whole is “eternal” with that whole – hence also the claim in static theory that the correct ontology is the same for all points in spacetime (in reality the past is no different than the present or future; while I may not overlap in my spatiotemporal location with Tutankhamun or a Tyrannosaurus

Rex, both exist and are as real for the whole as I am right now – albeit use of “now” is linguistically awkward in ordinary language terms). In his well-known book *Time's Arrow and Archimedes Point*, Huw Price refers to block time as the “view from nowhen” (Price, 1997).<sup>8</sup> This leads to a set of issues regarding determination, determinism, difference, causation and change and this brings us to dynamic theory.

#### 4 | DYNAMIC THEORY

Dynamic theory tends to take opposite positions on key claims to static theory. Emery, Markosian & Sullivan again summarise the theory as six theses:

1. The universe is spread out in the three dimensions of physical space, and time, and time, like modality is a completely different kind of dimension from the spatial dimensions.
2. Any physical object that is located at different times is wholly present at each moment at which it is located.
3. There are genuine and irreducible A-properties, which cannot be correctly analysed in terms of B-relations. The temporal facts about the world include ever-changing facts involving A-properties, including facts about which times are past, which time is present, and which times are future.
4. The correct ontology changes over time, and it is always true that only present objects exist.
5. Propositions have truth values at times rather than *simpliciter* and can, in principle, change their truth values over time. Also, we cannot eliminate verbal tenses like *is*, *was*, and *will be* from an ideal language.
6. The passage of time is a real and mind-independent phenomenon (Emery et al., 2020, p. 12)

As with static theory, there are many variations and arguments for dynamic theory and we cannot do justice to all of them here (see e.g. Bourne, 2006; Callender, 2002; Le Poidevin, 1998). The elaboration in the previous section ought to already make it clear what many of these theses are suggesting. The main difference to static theory is the heavy emphasis dynamic theory tends to place on the present for our understanding of time. We experience the world as past, present and future and these are distinct in terms of characteristics and possibilities. For dynamic theory, we are not an entity extending over spacetime (an already existing spacetime worm always real and existing at all spatiotemporal points that it is found at). Instead, we are a materially constituted being with a unified identity carried through time – we are where we are and nowhere and nowhen else, rather than a spatiotemporal being whose consciousness gives us the *illusion* that we are only here now and acting in that moment in time. We move through and act in space and time and these are different, albeit “in time” is an awkward phrase, since it conveys the impression that time is some kind of inert container dualistically occupied by spatial beings. The main claim is that time as a dimension is different in its characteristics (and so it is an error to spatialise time – a claim that need not reject theory of relativity). Insofar as the past, present and future are different, the dominant dynamic position on the nature of time is that the present is the only thing that “exists”. The past is a referent to former presents (that have existed as the present) and the future is an anticipation of presents yet to be (that may exist as the present). The present then, is a perpetual state of becoming...

Clearly, dynamic theory is less counterintuitive than static theory and typically seeks to make sense of and work with our experience of the world, while also seeking to interpret and draw on relevant science. In dynamic theory, the A-series is not an error or illusion – how we act in the world relates to and is part of how the world is. Our language has developed tenses because we have evolved

in a world of temporality in which we can only act *now*. We know our actions have consequences and that if we do different things different things happen. In this sense, there are no facts of the future, though there can be true statements about the future – we do not say “John died tomorrow”, we might say “[It is true that] John has a scheduled appointment at Dignitas tomorrow.” How things then turn out depends on many things. As such, we can act on and change the world, but there seem to be conditions relevant to doing so.

Dynamic theory then, seeks to make sense of the observation that we do not just have ordered sequences, we have diversity, causation and change and these are tensed.<sup>9</sup> Everything about how we experience the world indicates that things can be otherwise and this is learned in past presents, applied to the current present and achieved (if at all) in future presents. For dynamic theorists it seems more reasonable to suggest that the plausibility of properties of being past, present or future (in terms of a present) provide credence for preferring dynamic theory to static theory. It seems reasonable to prefer a theory in which time really does pass and time's tensed nature is an objective feature of the world, rather than merely a feature of mind.

However, before moving on it is important to recognize that to say that dynamic theory is more intuitive is not to say that dynamic theory is likely to be true merely because it *seems* to make sense of our common sense experience of the world. “Seems” is an important word here. To say a theory works with our experience of the world can be misleading, since this might suggest that the theory in question just is our experience of the world – and yet perception of time is not a simple issue of having a sensory experience of time, which we can call on as simple evidence for a mind-independent tensed reality. There is then, a great deal of crossover between philosophical discussion of perception of time and discussion of the nature of time – and while dynamic theory can be a beneficiary of this interchange there is not simply one debate (see Le Poidevin, 2019).

For example, dynamic theory typically argues that the present is what exists, but this raises the problem of “What is the present?”. In experience terms, we have senses that determine location in space but no equivalent sense that determines location in time – we do not hear or see time, and yet we *perceive* that time has passed, and we can cognate that time has passed even if we are for some period deprived of senses (our interior state of thought is an active directional process). Moreover, we see objects as near and far, left and right, and hear sounds that are distant yet immediate (a language use that does not indicate action at a distance, but rather auditory experience of distance). Time is different, we perceive only “the present”, we don't perceive last Thursday (we recall it), we don't perceive next Friday (we anticipate it), and while we may choose where to be in space, we do not choose whether we progress from Thursday to Friday. The fact of experience that we cannot but choose to be “in the present” seems to support the conceptualisation of time as different than space, where the present has singular metaphysical significance, but the insight has by no means settled debate. The concept of the present invokes a moment or point and this invites classical philosophical paradox and argument regarding the extension of a point. If the present is a point then the present lacks qualities of interval – our brains may be continually processing packets of sensory data, and yet our minds do not perceive moments, they experience continuous time and duration. For example, while we can and do pick out individual events, we *see* flames flicker, smoke billow, trees sway, wheels turn, clocks tick – drawing on what philosophers interested in this problem call the “specious present” – we do not see a series of back to back individual frames of separate locations of objects or matter and its state (a present point-moment – infinite regress notwithstanding), but rather movement, flow or process, and here we experience time passing as movement (hence McTaggart's insistence on this insofar as our experience of time is a perception of something other than time that invokes the concept or experience of time).<sup>10</sup>

Debate then arises as to the source of (and hence metaphysical status of) the present and our restricted experience of it... For example, re consciousness, what is our brain doing to represent time



to itself (and this is an issue that Hugh Mellor and Daniel Dennett notably disagree on)?<sup>11</sup> What is it that a brain is doing that differentiates the present (and so makes the present different than the past and future for our brains) – is our experience of a present merely an evolutionary quirk of the limited processing power of sensory awareness and cognition whose efficiency simply requires attention to the most immediate events in an order or sequence – could a more capacious mind be aware of everywhen? That we have evolved to make sense of the past, present and future need not then entail that reality is tensed in quite the way dynamic theory implies (and one is back to the limitations of the human invoked to defend static theory).

So, the idea of the “present” is not simple and the idea of why there is a present is similarly not simple – dynamic theory may work with our experience of the world, but this also raises issues regarding the nature of our experience of the world as indicative of metaphysical issues for the nature of time. An objective mind-independent present is not what perception of time conveys, it conveys experience as the perception of time – this may speak to theory dependent on the A-series, but more is required to prefer dynamic theory. The subtler issue is why would we have an experience of the world that is different than how the world really is. Clearly, the evolutionary argument can be interpreted in ways that support both static and dynamic theories (local efficiency fools us versus a mind that has evolved in conformity with how things are), but this does leave one further issue worthy of comment before we move on.

Recall we suggested earlier that dynamic theory seeks to work with the insight that we have evolved in a world of temporality in which we can only act now and that actions have consequences – perception of past, present and future is not merely of inert “before and after”, but of activity in the world that gives character and form to sequences of events. Causation, especially conscious willed activity intended to create an outcome, would seem to create problems for static theory, since without a tensed experience of the world, the quality of action in the world would be different – “if I do x, y will happen” is not merely an observed sequence involving before and after, it is a formulation of activity dependent on thinking in terms of activity in time that gives sense to agency. It may be possible to redescribe events in terms of the B-series to locate events in time (“x happened on 25<sup>th</sup> December at 10.23 am, y happened on 25<sup>th</sup> December at 10.24 am, x happened before y, y happened after x”), but that does not indicate experience of passing of time was irrelevant to whether the activity by some agent was undertaken and how it was done and with what consequences.

This, of course, immediately leads back to reality and appearance and also to consideration of whether conscious agency is an exception to reality or a capacity of some entity to reflect on the nature of reality in which agents are an indicative constituent (an old problem that can take one back to Kant). In any case, consider an example inspired by the possibility that our tensed view of reality is a quirk of evolution (an efficiency consequence), which implies that a differently evolved entity – a more capacious mind – could be aware of everywhen. The recent TV sci-fi mini-series *Watchmen* includes the character Mr Manhattan, a radically mutated human whose consciousness now perceives all points in time simultaneously.<sup>12</sup> While this is a brilliant plot device, it also reveals the basic tension in static theory. Mr Manhattan is an active agent of events in the sequence of events that unfold as a continuous present for everyone else, but he is everywhen. One might argue that the only difference is that Mr Manhattan knows what the “then” will be, but for events to unfold as they do, requires a consciousness limited to acting now in linear time to invoke action of an “if-then” variety, since “if-then” choices are temporal *decisions* not mindless actions. Put another way, to act everywhen required Mr Manhattan like everyone else to act somewhere and sometime according to linear time comprehension in the present according to a located first-person perspective, something he does not possess and yet adheres to. This is awkward.<sup>13</sup>

Clearly, one of the more disturbing features of static theory is it seems to invoke fatalism, determinism and an absence of freewill. And yet “determination” is not necessarily the same as

“deterministic”, if by the latter one means *predetermined* for the whole. An instantaneous coming into being of everything and everywhen may still allow for becoming as a constituent of what instantaneously arose – and for this to be so then time must be both static from a complete perspective but dynamic from an interior perspective of a component in the complete block universe – this suggests no more than that it is conceivable that both varieties of time are real. If one returns to Boström on whether we live in a virtual reality, his argument turns on the capacity of a world computer to produce all of human history in less than a second. It does not require us to confirm that reality is a simulation to grasp that this illustrates that time may have two co-existing formulations. So, it could be that spacetime was produced “all at once” but that in some sense choices were made – things could have been otherwise, they just weren’t (though perhaps they were in alternate realities where different paths were followed). If so, this is a formulation that leads to “so what?” or irrelevance of a block universe eternalist position to an interior perspective. And once we start introducing “could be” we are into the realm of variations on static and dynamic theory and hybrids. As Emery et al. (2020) note, there are several hybrids – “growing block theory”, “moving spotlight theory” and so on.

In any case, static theory has various responses to a Mr Manhattan or similar kind of objection – many involving convoluted claims about the difference between reality and appearance – and while dynamic theory may accommodate relativity and many of the problems thrown up by local time (since, for example, these need not alter whether local ordered events occur according to causal consequence) the issues remain an irritant. We could go on, and we notably haven’t discussed quantum theory and time – though the aforementioned possibility of alternative realities might invoke Hugh Everett III’s many world’s alternative to the Copenhagen interpretation of quantum theory. Here, it should be noted that besides books on the weird implications for our conceptualisation of time of quantum phenomena, explored and developed in cutting-edge theory (see Rovelli, 2018), there are works in philosophy that make the case for timelessness that include quantum theory, but, for example, timelessness that recovers agency (see Baron et al., 2022).<sup>14</sup> However, the discussion above is sufficient to contrast static and dynamic theory and to indicate that dynamic theory is not only more intuitive, it might legitimately ask, does it make sense to theorise time in a way that not only implies that our tensed experience of time is an illusion, in the form of a psychological quirk of consciousness, but that such illusion seems necessary to at least some kinds of causal processes. One might suggest it is just simpler to suggest our experience of time passing is in accordance with a mind-independent tensed reality, where the present has particular significance and a process of becoming means the future is not certain in how it will be before it passes to become the present and then past. To a critical realist, of course, there seems a lot more to say here regarding the reality of the present, its particular significance, the concept of cause and the contingency of the future...

## 5 | THE TREATMENT OF TIME IN CRITICAL REALISM

Without wanting to downplay the sophistication and nuance of work on philosophy of time (the previous sections evidence both), a lot of the issues seem to turn on eliminative or reductive approaches to what is real and/or problematic theory of causation. That said, there is relatively little engagement with philosophy of time literature by critical realists, and yet critical realist theory has a great deal of bearing on issues of temporality. One of the few to discuss the literature is Roy Bhaskar in *Dialectic: The Pulse of Freedom* (Bhaskar, 1993). He makes several references to McTaggart (consistently misspelled as MacTaggart), notably:

I defend the irreducibility of MacTaggart’s A series (past, present, future) to his B series (earlier than, simultaneous with, later than), that is, to be more specific, the *reality of tense* and the *irreducibility of space-time* on any world-line both for the transitive

observer and for the intransitively observed... [I stress] the tri-unity of space, time and causality in tensed (spatializing) process, understood as the mode of becoming of effects. But what exactly is the reality of the tenses? *The reality of the past* is that of the *existentially caused and determinate* (where caused means produced, determined and it is the case that a thing can be determinate even if not determinable); that of the *present* of the (indefinitely extendable), indeterminate *moment of becoming*; and that of the *future*, that of the more or less *shaped* (conditioned, circumscribed, grounded) *mode of possibility of becoming* (under some set of descriptions) and hence becoming in due course existentially intransitively determined and determinate.

(Bhaskar, 1993, p. 210)

For Bhaskar space and time are not inert, spacetime is a feature of a “kinetic pluriverse”, a developing totality in which causation is not merely the doing or way of acting of things leading to events, but also a becoming through which change, transformation and variety occurs (Bhaskar, 1993, pp. 77 and 251). The universe is recognizably developing both in its constituents and entirety, events are produced, processes are directional and outcomes are conditional. Time is irreversible, much as backward causation is impossible, and for Bhaskar causation is at the heart of the significance of time. As such, he argues that our experience of the A-series cannot be dispensed with. If one reads *Dialectic*, however, Bhaskar does not discuss what time “is”, rather he folds it into his argument for a realist interpretation of everything. Mention of world-lines and invocation of frames of reference and observer effects notwithstanding, *Dialectic* is not a book about the physics of time or a detailed engagement with the philosophy of time literature (though one might note he has slightly more to say in *Plato Etc.*). This leaves open the possibility of interpreting *Dialectic* in relation to various longstanding positions on the nature of time. Scott Mann takes this route regarding Bhaskar's work and does notably discuss the literature, albeit he does not adopt the general division between static and dynamic theory (Mann, 2006).

Mann points out that Bhaskar seems to attribute causal power to spacetime but that Bhaskar does not discuss how this might be grounded in theory of spacetime and how it might deal with issues like relativity of simultaneity, four dimensional block universe and so on. He suggests this is problematic, given that critical realism purports to work with science, natural and social, providing a differentiated ontology to make sense of both from an under-labouring point of view. For Mann, Bhaskar seems to endorse a classical physics notion of absolute time. Given how little Bhaskar says about the subject this is highly debatable, though it seems clear that Bhaskar is presupposing a dynamic theory of time (and I would suggest this is common to critical realism).<sup>15</sup>

Interpretation of theory in physics, of course, has played a considerable role in critical realism over the years and Bhaskar takes his *A Realist Theory of Science* (and *Possibility of Naturalism*) as givens for *Dialectic* and his purpose in *Dialectic* is not physics but rather to ground a realist version of Hegelianism – a process of self-realisation whose integral form is progressive and emancipatory – an argument that makes much use of the controversial concept of absence as real cause and of “absenting absences” as a key constituent in change and transformation (for discussion see Norrie, 2010, p. 29; Norrie & Morgan, 2021). Still, as Mann also points out *A Realist Theory of Science* does not deal with the physics of spacetime either. It is perhaps worth noting though that Rom Harré, writing as a scientific realist, albeit not as a critical realist, does have more to say. In *Varieties of Realism* (Harré, 1986) he rejects the standard account of the block universe (and its moving spotlight hybrid) and reinterprets the significance of relativity of simultaneity and world-lines in Minkowski space<sup>16</sup>:

If ‘now’ is created indexically by each observer there can be no universal now.<sup>17</sup> But if existence is tied to the present it would seem to follow that there can be no universal

existence claim. But all that follows from special relativity is that there is no universal 'now'... The block universe view is based on a mistake about the logical form of the synthetic totality of moments. Each human observer can establish him or herself indexically at their own 'now'. [it remains the case that] There is an objective 'now' for each observer... each observer knows the truth of his or her own indexical statements... [and] real effects have real causes... if the present is real whatever causes produce it must be as real as the present itself...

(Harré, 1986, pp. 137–139)

This argument is one that most critical realists might recognise. However, Harré then goes on to claim:

The final step in defending relational space-time [is] the change to a conception of the world-line not as a physically real being, but as a map of the successive speech acts of a community of ideal observers. Reality is the collective totality of what exists now, but only the distributive totality of what exists at each and every moment. While we can form a conjunction of indexical statements [i.e. using past, present and future] to describe the history of the universe, we can do no more than disjoin [i.e. not conjoin and collectivise into a unity] the totality of indexical statements of all the observers we may believe are our contemporaries.

(Harré, 1986, p. 141)

For Harré there can be successful acts of spatiotemporal reference and he suggests this supports scientific realism, but also for Harré spacetime itself becomes an “abstract notion” and a “human construction of certain real relations of succession, coexistence and exclusion that obtain in the material world” – the construction takes the form of a narrative ordered network of speech acts by persons, a referential grid which we refer to as spacetime (Harré, 1986, pp. 141–143). For Harré, there is a significant ontological difference between the physical and human sciences and the problem of time sits between the two in terms of how humans make sense of their experience (a matter that he places in terms of a social construction approach to the “new psychology”).

Anyone familiar with Rom Harré's relationship with critical realism will be aware that he was Bhaskar's thesis supervisor, a founding editor of *Journal for the Theory of Social Behaviour* (Porpora & Morgan, 2020), and that Harré and Madden's *Causal Powers* is often cited alongside Bhaskar's *A Realist Theory of Science*, but that as the final quotation above might intimate – he later parted company with critical realists (over the conceptualisation of social structure and he subsequently offered various modifications to “save critical realism”, see Varela & Harré, 1996; Harré, 2009). In any case, Harré does discuss philosophy of time, is sceptical of block universe theory, and for our purposes draws attention “to real effects have real causes... if the present is real whatever causes produce it must be as real as the present itself...” (Harré, 1986, p. 139). One does not have to agree with where Harré takes the argument to suggest that this statement is significant for how one conceives temporality and thus not just the relation between the past and present but how we conceive the present, and these are matters critical realists have much to say in regard of.

Consider, the physics of time with which philosophy mainly works conceptualizes spacetime via a coordinate system. Each coordinate is a location in spacetime and that coordinate point is described as an event. The order of events is then manifested in world-lines and in a block universe and, given both irreversibility in an entropic universe and the impossibility of backwards causation, causation is typically integrated into the ordering of events.<sup>18</sup> As any critical realist reading this has surely already realised, a minimal claim on reality as the coordinate location of events and ordered events, leaves

open the issue of how to make sense of what is real at each coordinate, how to make sense of the connection between each event, and ultimately how to make sense of the nature of time. While critical realism may or may not have anything profound to say about the nature of time (if by that we mean a unique metaphysical conjecture regarding time) over and above its affinity with dynamic theory, it clearly bears on the other two issues. Given the limits of a short journal article we will just briefly mention a few of the more significant contributions.

Ruth Groff is perhaps the most accomplished critical realist working on the issue of causation (e.g. Groff, 2017, 2019, 2021). In a recent interview she provides an overview of her work, and several of the discussion points seem relevant here, albeit the interview was not a discussion of the metaphysics of time (see Groff & Morgan, 2022). Re causation, as Groff notes, the Humean legacy remains influential.<sup>19</sup> In Humeanism:

causation is a matter of regularity; that there are no essences or kinds; that substances are bundles of impressions; that there are no necessary connections; that there is no bona fide activity.

(Groff & Morgan, 2022, p. 16)

Following on, there is a significant dividing line between “passivist” and “anti-passivist” metaphysics:

[Passivism] is metaphysically akin to the apparent animation that we observe when we flip quickly through the series of stills in a flipbook—or on a roll of film. Just as in the case of a flipbook, or a bit of film, says the passivist, in all cases what seems to us to be activity is in fact a succession of static states.

(Groff & Morgan, 2022, p. 19)

If one reads back through the static and dynamic theory sections, static theory clearly evokes passivism and passivism is clearly a formulation dynamic theory would want to avoid, and yet to do so requires some account of causation, as Harré puts it above, such that, “if the present is real whatever causes produce it must be as real as the present itself... real effects have real causes” (Harré, 1986, pp. 137–139). As the interview makes clear, anti-passivism allows for powers and dispositions:

it is powerful particulars that have causal powers, X has power to A in virtue of its intrinsic nature (powers are part and parcel of what a thing is), they behave in some ways and not others, they make things happen – a claim of ‘natural necessity’ but not entailment (quite different than a Humean perspective where atomicity implies lack of internal connection to anything else and thus a problem of why one thing follows from another and why things have consistent properties – a Humean cannot readily account for enduring entities, properties and effects).

(Groff & Morgan, 2022, p. 20)

Events then, are produced and this requires a thicker ontology than the minimalism of coordinate spacetime. Anti-passivism seems to provide dynamic theory with a way to make sense of causation and as Groff sets out (including extensive engagement with Harré and Madden's *Causal Powers*) critical realism is anti-passivist. Furthermore, an anti-passivist powerful particulars approach potentially adds consistency to a dynamic theory approach to the problem of free-will:

the so-called problem of free will is an artefact of a bad underlying metaphysics of causation... once you dispense with the latter there is no conflict between causation and

agency. There are just different kinds of powerful particulars, to use Harré and Madden's term, with different kinds of causal powers. The complex power(s) of consciousness is included in that mix, and is had by some but not all kinds of powerful particular.

(Groff & Morgan, 2022, p. 24)

Clearly this also bears on whether experience of a tensed reality is merely psychological – there seem to be grounds to argue that apportioning different powers to different particulars speaks to a differentiation of what acts in the present for the combination that become events. Moreover, this in turn speaks to other conceptualisations common to critical realism, and those are stratification, emergence and depth realism.<sup>20</sup> These conceptualisations potentially add nuance to dynamic theory. A stratified and emergent reality is one in which the human capacity to have psychological states is part of the order of reality rather than problematic in terms of that reality (a reversal of critical idealism while still allowing for the possibility that perception can be in error). Depth realism, meanwhile, modifies the metaphysics of “now” – what is real in the present for the present, and how the past, present and future connect – allowing for continual causal production and reproduction of what happens – a generative approach to what is real rather than a minimal coordinate approach to pinpointing events. This, in turn, allows for non-observables and trans-factually operative causal powers, whose combinations may or may not be manifest in events but do not cease to be real if they are not (a position that in turn allows what we conceptualise as spacetime to be a placeholder for some real substrate possibility of different “emergents”). The conceptualisation also invokes further considerations regarding process, order and the phasing of temporal events, and in critical realist circles Margaret Archer's SAC, analytical dualism and morphogenetic/morphostatic framework (discussed Archer & Morgan, 2020) is perhaps the best known articulation of this as a temporal matter and I conclude this section with an illustrative quote from her work:

The morphogenetic/morphostatic framework is put forward as the practical complement of social realism because it supplies a genuine method of conceptualizing how the interplay between structure and agency can actually be analysed over time and space. It is based on two basic propositions:

- (i) That structure necessarily predates the action(s) leading to its reproduction or transformation;
- (ii) That structural elaboration necessarily post-dates the action or sequence which gives rise to it. (Archer, 1995, p. 15)

## 6 | CONCLUSION: CONTINGENCY AND THE OPEN FUTURE

In philosophy, an “open future” turns on the asymmetry between past and future, i.e. how the two are differently cognate (recollection versus anticipation), how the two stand (determinate and completed versus yet to be determined or completed) and what status of “otherwiseness” is ascribed to each (cannot be otherwise because it has been, could be otherwise because it has yet to be) (see Torre, 2011). The common definition of contingency in philosophy, meanwhile, is “neither true nor false under all truth values” i.e. if contingent, there are circumstances where something can be true and where it can be false.<sup>21</sup> In ordinary language use, contingent usually means one or both of two things, dependent on some other event, or particular to some set of events on which it is dependent. The implication then, is that this has bearing on the openness of the future, something may or may not happen – so contingency contributes to whether there is an “otherwiseness” to events. The additional component is emphasis on the relation between one thing and another (it is “contingent *on*”).

Clearly, what we make of both an open future and contingency is intimately bound up with theory of time. In static theory of time, a concept of the open future amounts to what we (don't) know of what already is (insofar as the matter reduces to particular spacetime locality-bound consciousness) and contingency lacks traction, though matters might be complicated by a hybrid position on philosophy of time, notably growing block theory of time. In any case, a combination of an open future (as more than mere epistemic barrier or quirk of psychology, perception etc.) and contingency sits more comfortably with dynamic theory. *However*, as Archer's essay for this forum indicates, matters of contingency (and how we relate to the future) might benefit from similar ontological elaboration along realist lines to those which might add a thicker ontology to the minimalism of spacetime as coordinate-event sequences (though her focus is not theory of time) (Archer, 2023). As she suggests, various high-profile interventions regarding futures studies seem to suggest contingency is where agency momentarily breaks free of determining structure – a point of indeterminacy or uncertainty that resolves itself. This, furthermore, is in tension with what “plausibly may be”, with its focus on “what we persuade ourselves of” (since this need not be *contingent* on anything). According to Archer, neither pays due attention to the continual nature of determination that structure, agency and culture play in phased, tensed activity. One might argue then, that contingency may introduce degrees of variation, but one ought to pay greater attention to how variation is produced, and if we return to the common understanding of contingency in the first paragraph of our conclusion, one might argue that the definition ought to pay greater attention to what events *depend on* rather than merely to truth value status and that events “depend” (since this seems to share a lacunae with theory of time itself – a tendency to minimal accounts of events following events).

So, paralleling Archer's and others comments, it is worth reminding ourselves that from a critical realist point of view everything depends, what matters is what it depends *on*. This may at first sight seem a trivial point but it is significant in at least two ways. First, in terms of the difference between the non-social and social (and, as readers are no doubt aware, this has been a focal point of debate over the decades – see Lawson & Morgan, 2021). Second, in terms of a focus on causation rather than events, since this allows a different take on the meaning of contingency, insofar as relations may be internally necessary to what something is and how it acts or merely contingent in terms of the given conditions by which some particular thing happens. This is another subject that critical realists have had a great deal to say about (e.g. Archer, 1995, p. 303, Figure 18).

There is, of course, a great deal of work in futures studies and on possible futures that Archer does not get around to discussing, but this does not render her central point irrelevant, since this is about due attention to ontology as always relevant rather than whether there are those who pay attention to it. In her contribution she mentions the work of the American pragmatist Nicholas Rescher (e.g. Rescher, 1996, 1998; Rescher & Morgan, 2020), and the social ontologists Phil Faulkner, Jochen Runde as well as various others, though among critical realists one might also mention Heikki Patomäki (e.g. 2011, 2020), and among fellow travellers deeply immersed in the literature, James Derbyshire (e.g. Derbyshire & Morgan, 2022). Moreover, what things depend on is not irrelevant to the predicament our species finds itself in and we conclude with this.

It does not seem unreasonable to state that we live in an era in which we “know” more about the future than has ever been the case before – Auguste Comte's *Positivism* may have been grossly inaccurate regarding the progress of knowledge, but it is nonsensical to suggest there has been no progress over the centuries; the more ominous side of this in terms of knowledge of the future, is that we also know more about what will be because of the things we have done and continue to do that have (eventually) known consequences for the biosphere i.e. anthropogenic climate change and ecological breakdown. Still, our ordinary language use can mislead, “know more about the future” does not equate to things can only go one way. If dynamic theory of time holds, we do not just discover the

future as it becomes present. As Rescher suggests, the kind of prediction we are often interested in is self-cancelling, it is the “if-then” of adverse outcomes which we actively work to avoid (and whose success is measured in the failure of the outcome to manifest). This is the predicament of our times and it is existential.

## DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

## ENDNOTES

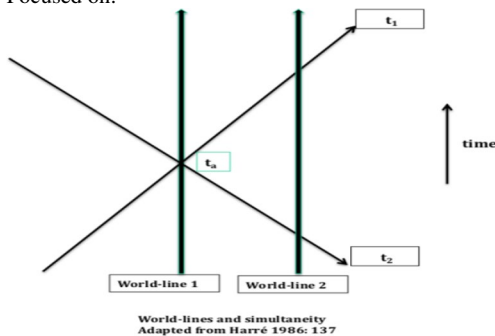
- <sup>1</sup> On physics and time see Rovelli (2018); on history of measurement see Mondschein (2020); on experience and perception of time see Le Poidevin (2019); on visual perception of time see Healy et al. (2013); on metaphor and behavioural psychology see Casasanto and Boroditsky (2008), Bender and Beller (2014); on sociology of time see Adam (2004); on political economy of time see Thompson (1967); on physics and theology and time see Polkinghorne (2006). For interdisciplinary debate separated by fifty years see Whitrow (1967), Fraser (1967), Rickles and Kon (2014), Dowker (2014), Hoerl (2014).
- <sup>2</sup> And so are relative to those other acts or events but not observer relative in the tensed sense (which is not to be confused with frame of reference issues for theory of relativity).
- <sup>3</sup> Smart, for example, introduces a new regress in critique of A-series – if time passes then one can ask at what rate it passes but this requires a new time dimension and so on.
- <sup>4</sup> It is not a property of being “tensed” that matters but rather a location in relation to other events.
- <sup>5</sup> The difference between absolute time and relativistic time is another common way to distinguish the conceptualization of time. The classical physics of Newton treats time as an abstract mathematical reality, its count is universal and constant, its measure is independent of space and events. Theory of relativity and spacetime renders time, insofar as it exists, a constituent of the universe – coming into being with the universe and dependent on matter and energy processes and events.
- <sup>6</sup> In simple (probably too simple) terms, “proper time” is a scalar measurement (a uniform count using some unit of a physical system like a clock) that can be compared to coordinate time – a body in rest will have the same coordinate and proper time, but once it starts to move and especially at high speeds the proper time of the clock becomes a way to represent the difference in time experienced for the entity relative to others (the space traveler experiences 5 years clock-time but coordinate time on return to Earth in a round trip is far higher).
- <sup>7</sup> Visit: <https://www.abc.net.au/news/science/2018-09-02/block-universe-theory-time-past-present-future-travel/10178386>.
- <sup>8</sup> Price has his own novel approach to causation and time.
- <sup>9</sup> Note, to say that causation is tensed is a complex subject and there is a great deal more to say here on both sides of the argument. Moreover, reference to causation and time should not be confused with causal theories of time. John Smart summarizes these as a family of theories that seek to construct the structure or topology of spacetime on the basis of causality – causal connection or connectivity of before and after in a sequence – a theory of relational time where causes for events in a light cone must be within that light cone and causes (as events) must be prior to effects (as later events) in the structure of the cone. This subject received a great deal of attention in the 1960s and 1970s.
- <sup>10</sup> Movement and time go back to classical Greek philosophy (and movement as time is discussed extensively by Aristotle). As Le Poidevin (2019) notes, drawing on Ernst Poppel, there are different elementary time experiences: duration, non-simultaneity, order, past and present, change (while some of these may seem different ways to express the same there are arguments to suggest they are not the same). One ought also to mention the work of Henri Bergson here, which offers a different way of thinking about the issues.
- <sup>11</sup> According to Le Poidevin (2019), Mellor holds that perception of time is time dependent (perceived temporal order induces perception of temporal order - X precedes Y in temporal perception so X causally affects temporal perception of Y). Dennet argues temporal consciousness is not time-dependent in this way but content dependent.
- <sup>12</sup> <https://www.imdb.com/title/tt7049682/>.
- <sup>13</sup> An everywhen perception is distributed yet punctuated, it lacks standard first-person perspective and would seem to not be bound by temporal causal sequence and yet activity follows a temporal causal sequence (to mix metaphors,



the sequence unfolds as irreversible direction of the worldline) that seems to be dependent on tensed linear time (the “because” of a reason to act seems to depend on a tensed component). Furthermore, why would an everywhen perception induce motive, creating reason to act in linear time? There would be no reason for the everywhen entity to do the things necessary for the outcome that an everywhen being knows will occur. One is, of course, left with the conclusion that the entity is bleakly unable to do otherwise or that the tension implies the unreality of the claimed structure of reality that leads to the tension, or that the attention to the present is metaphysically necessary to the reality of time – a slightly different implication than it is a mere evolutionary psychological quirk.

- <sup>14</sup> Quantum theory deals with the sub-atomic world and focuses on the granularity of reality at small-scale – quanta are discrete indivisible packets of energy or matter; various experiments have been conducted to test behaviour at this scale, leading to observations such as wave-particle duality, entanglement and various developments of the probabilistic nature of events and how we might interpret these given the role intervention/observation plays (superposition etc.). Quantum theory leads to questions of whether time too is granular (a Chronon unit analogous to a photon; see: <https://arxiv.org/abs/quant-ph/9706059>) and whether it is a property of the macro-universe, dependent on quantum processes (e.g. asking, where irreversibility and entropy come from) and whether time even exists at all – it at least drops out of the mathematics in some attempts to unify relativity and quantum theory – “quantum gravity”, though as Rovelli notes of the Wheeler-DeWitt equation: “The immediately puzzling aspect of the WdW equation, and the one that has raised the largest confusion, is the absence of a time variable in the equation. This has been often wrongly attributed to some mysterious quantum disappearance of time. But things are simpler: the disappearance of the time variable is already a feature of the classical Hamilton-Jacobi formulation of general relativity. It has nothing to do with quantum mechanics. It is only a consequence of the peculiar manner in which evolution is described in general relativity.” See: <https://arxiv.org/pdf/1506.00927.pdf>.
- <sup>15</sup> Mann goes on to suggest that spacetime might be conceived as a “natural kind of thing” giving rise to the possibility and influencing the causal potential of particles and fields.

<sup>16</sup> Focused on:



- <sup>17</sup> As well as “now” temporal indexicals include expressions such as tomorrow, yesterday, last month, next year etc. i.e. terms used in tensed formulations. See Perry (2015).
- <sup>18</sup> Albeit there is a lot of discussion of whether causation simply is the direction of spacetime and there is some discussion of whether causation must be forwards.
- <sup>19</sup> Note, the following could have been discussed with a focus on Kant's legacy to similar ends using Dustin McWherter's work.
- <sup>20</sup> One might, of course, also mention open systems versus closed systems.
- <sup>21</sup> The concept of “truth values” is a key component in philosophy of logic (Shramko & Wansing, 2021).

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